1 Hip (including infection)

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ARTIFICIAL INTELLIGENCE TO PREDICT PERIPROSTHETIC INFECTION AFTER TOTAL HIP REPLACEMENT

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Background: The prevalence of peri-prosthetic joint infection (PJI) after THR is expected to rise in line with increasing prevalence of hip arthroplasty.This will be associated with significant morbidity to the patient, and cost to the healthcare provider. Treatment and diagnosis is difficult, making targeted prevention key. To facilitate this, we used artificial intelligence to build a tool to predict PJI within one year of a THR using variables that could be collected prior to operation.
Methods: A retrospective analysis of prospectively collected data for 3349 patients who underwent a THR within Fife was undertaken. 15 predictor variables that could be collected during pre-operative outpatient clinics were included in the final analysis. These included clinical, demographic, and procedural factors. The random forests algorithm was trained and performance assessed using OOB metrics.
Results: The overall accuracy was calculated as 93.1% (95% CI 88.8-97.4). Sensitivity and specificity were found to be 87.4% (95% CI 81.2-93.6) and 94.1% (95% CI 86.5-100.0), respectively. The positive and negative predictive values of the tool were 44% and 99.5%, respectively. The model highlighted that increases in SF-36 score, age, harris hip score, and serum hemoglobin decrease the probability of infection. BMI was positively associated with infection rate, however.
Conclusions and Implications: Future work will involve externally validating the tool to assess its generalizability beyond the regional data used in this project. All predictor variables can be collected prior to operation with minimal cost to the healthcare provider. It could have clinical utility in risk-stratifying patients for follow-up, further confirmatory diagnosis and/or infection prevention protocols. It could also assist in the provision of informed consent by facilitating discussion with high-risk patients, in addition to providing reassurance to patients identified as low-risk of infection.
Conflict of Interest: Nothing to disclose

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SAFETY OF IN-HOSPITAL ONLY THROMBOPROPHYLAXIS AFTER FAST-TRACK TOTAL HIP AND KNEE ARTHROPLASTY - A PROSPECTIVE FOLLOW-UP STUDY IN 18,409 PATIENTS

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Background: Total hip and knee arthroplasty (THA/TKA) are considered high-risk procedures regarding venous thromboembolic events (VTE) including deep venous thrombosis (DVT) and pulmonary embolism (PE). Consequently, most guidelines recommend chemical thromboprophylaxis for 10-35 days postoperatively. However, reports on 90-days VTE rates of about 0.4% in fast-track THA and TKA with early mobilization led to suggestions of in-hospital only thromboprophylaxis in selected fast-track procedures, calling for additional follow-up studies.
Methods: Prospective cohort study from 01 December 2011-30 October 2015 on elective unilateral THA/TKA with in-hospital only thromboprophylaxis if length of stay (LOS) ≤5 days. Prospective information on comorbidity and complete follow-up on 90-days readmissions/mortality through the Danish National patient registry. Discharge- and medical records evaluated in case of VTE. Patients preoperatively treated with anticoagulants were excluded.
Results: Of 18,409 procedures, 17,562 (95.4%) had LOS ≤ 5 days, median LOS was 2 days (IQR 2-3), 6.8% readmissions and 0.2% mortality rate. Mean age was 67.4 (10.5) years, 59% women and 52% THA. 90 days VTE incidence was 0.4%. In the 847 patients with LOS >5 days, median LOS was 7 days (6-9), 13.8% had readmissions, mortality was 1.5%, and VTE incidence was 2.1%. Risk factors for VTE in the early discharge cohort (LOS ≤ 5 days) were age > 85 years with OR 3.7 (95% CI; 1.2 to 12.1, p=0.029), BMI 35 to 40 with OR 2.6 (1.0 to 6.4, p=0.045) and > 40 with OR 3.3 (1.0 to 10.5, p=0.047).
Conclusion: We found similar results as previously reported in a study of approximately 5000 patients, confirming the safety of in-hospital only thromboprophylaxis in fast-track THA and TKA with LOS ≤5 days.
Implications: Guidelines on thromboprophylaxis in fast-track THA and TKA with a LOS ≤5 days may include in-hospital only prophylaxis. The ideal LOS or risk factors necessitating prolonged

thromboprophylaxis remain uncertain.
Conflict of Interest: Nothing to disclose

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RESULTS OF TREATMENT OF DISPLACED FEMORAL NECK FRACTURES IN THE ELDERLY BY CEMENTED TOTAL HIP REPLACEMENT VERSUS DUAL MOBILITY CUP TOTAL HIP REPLACEMENT: FOCUS ON FUNCTIONAL OUTCOME AND HEALTH RELATED QUALITY OF LIFE

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Introduction: It is documented in the literature that treating femoral neck fractures using a total hip replacement provides a better long term functional outcome for active elderly patients. Dislocation remains the main complication of this approach. The development of the dual mobility cup (DMC) hip replacements maybe a solution to such controversy, providing better stability and better range of motion and functional outcomes.
Patients and methods: This study includes 62 patients with displaced femoral neck fractures, who were randomly allocated to 2 treatment groups, a DMC replacement group, and a 32 mm head THR. Posterior approach was use in all patients. The overall mean age was 67.2 years, and 48.8% were males.
Postoperative assessment was done using Harris hip score, and health related quality of life (HRQoL) was assessed using the SF-36 questionnaire.
Results: The average HHS for the DMC group at 4, 6 and 12 months were higher than mean HHS scores for the THR group. Those differences were statistically significant (p values 0.008, 0.001. and 0.000 respectively)
The range of motion at 1 year was statistically better in the DMC group as compared to the THR group. Those differences were statistically significant.
The DMC showed a statistically better effect on the HRQoL measurements as compared to the THR group. There were no dislocations in both groups.
Conclusion: DMC hip replacements provide better functional, patient reported outcomes, and range of motion than the conventional THR. Combined with its stability, DMC replacements are a useful solution in managing femoral neck fractures in active elderly patients.
Conflict of Interest: Nothing to disclose

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A COMPARISON OF MORTALITY IN REVISION HIP ARTHROPLASTY FOR PERIPROSTHETIC FRACTURE, INFECTION OR ASEPTIC LOOSENING

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Background: Reported mortality following revision hip surgery for periprosthetic fracture is comparable to neck of femur fractures. Our institution provides a regional “Periprosthetic Fracture Service”. The necessity of patient transfer can introduce delays to surgery. The aim of this study was to determine the time to surgery and mortality rate for PPF, compared to a cohort revised for infection or aseptic loosening.
Methods: Revision procedures performed for PPF, infection or aseptic loosening between January 2014 and December 2015 were identified. Comparisons were made between the three groups for baseline demographics, admission to higher-level care, length of stay, complications and mortality.
Results: There were 37 PPF, 71 infected and 221 aseptic revisions. PPF had a higher proportion of females (65% vs 39% in infections and 53% in aseptics; p=0.031) and grade 3 and 4 ASA patients (p=0.006). Median time to surgery in the PPF group was 8 days (95% CI: 6-16). Single stage procedures were performed in 84% of PPF, 42% of infections and 99% of aseptic revisions (p< 0.0001). 19% of PPF revisions required admission to HDU, with 1% in the aseptic group and none in the infection group. Median length of stay was significantly different (PPF 10; infection 14; aseptic 8 days (p< 0.0001)). The 1-year mortality rate for PPF was 0% compared to 2.8% for infection and 0.9% in the aseptic group (p=0.342).
Conclusion: Despite the PPF group having higher ASA grades and HDU admission, our 1-year mortality rate was 0% and not significantly different to infection or aseptic loosening. Further work is needed to monitor medium term outcomes and to establish the financial impact of our “Periprosthetic Fracture Service” service as it evolves.
Implications: Our low complication and 1-year mortality rate is encouraging and supports the safety

of a regional “Periprosthetic Fracture Service”.
Conflict of Interest: Prof Board is a paid consultant for DePuy Synthes, receives royalties from Springer, is Associate Editor of Hip International and is a Research Committee Member for British Orthopaedic Association. Departmental support for research from DePuy Synthes. None relate to this work.

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UNDERESTIMATION OF *STAPHYLOCOCCUS AUREUS* CARRIAGE ASSOCIATED WITH STANDARD CULTURING TECHNIQUES

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Background: Nasal carriers of *Staphylococcus aureus* (*MRSA* and *MSSA*) have an increased risk for health-care associated infections. There are currently limited screening policies for the detection of *S. aureus* in the US and UK despite WHO recommendations. This study aimed to; evaluate the diagnostic performance of molecular and culture techniques in *S. aureus* screening, determine the cause of any discrepancy between the diagnostic techniques, and model the potential effect of different diagnostic techniques on *S. aureus* detection in orthopaedic patients.
Methods: Paired nasal swabs for PCR assay and culture of *S. aureus* were collected from a study population of 273 orthopaedic outpatients due to undergo joint replacement surgery. Approval for the study was obtained from the local research ethics committee.
Results: The prevalence of *MSSA* nasal colonisation was found to be between 22.4-35.6%. The current standard direct culturing methods for detecting *S. aureus* significantly underestimated the prevalence (p=0.005), failing to identify its presence in ~1/3 of patients undergoing joint replacement surgery.
Conclusions: The use of PCR assays or pre-plating enrichment of swabs in TSB significantly improves nasal *MSSA* detection levels, which is relevant to both future research and clinical practice. These results should be taken into account when interpreting prevalence studies, evaluating interventional studies, and in the development of future screening and decolonisation strategies.
Implications: Modelling these results to national surveillance data, it was estimated that ~5000-8000 *S. aureus* surgical site infections could be prevented, saving ~$120 million-960 million annually in the US and UK combined by using alternative diagnostic methods to direct culture in pre-operative *S. aureus* screening and eradication programmes.
Conflict of Interest: Nothing to disclose

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RESTORING FEMORAL HEAD SIZE RESTORES CAPSULAR FUNCTION AFTER HIP ARTHROPLASTY - A CADAVERIC STUDY OF DUAL-MOBILITY AND RESURFACING IMPLANTS

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Introduction: The hip joint capsular ligaments (CL) passively restrain extreme range of motion (ROM) and wrap around the native femoral head to prevent subluxation and dislocation. After arthroplasty, CL function may be influenced by size of femoral head, and thus the choice of implant.
This study compared CL function after posterior capsulotomy and hip resurfacing arthroplasty (HRA, native head-size), conventional total hip arthroplasty (c-THA, 32 mm head-size), and dual mobility (DM-THA, a device with an outer bearing of near-native head-size). We hypothesized that CL function is preserved when CL repair is combined with implants with near-native head-size.
Methods: Eight fresh-frozen male cadaveric hips were skeletalised, retaining the hip capsule. CL function was quantified by measuring ROM by internally (IR) and externally rotating (ER) the hip in six functional positions, ranging from full extension with abduction to full flexion with adduction (squatting) on a dual-axis servohydraulic testing rig. Native ROM was compared to ROM after posterior capsulotomy and HRA, and then THA with a conventional and DM implant, before and after surgical CL repair.
Results: Independent of repair, IR and ER ROM increased most following c-THA, then DM-THA, then HRA ($p < 0.05$), indicating later engagement of the capsule and reduced biomechanical function with

smaller head-size. Dislocations also occurred in *squatting* for the HRA and DM-THA. However, for these two devices, capsular repair reduced ROM hypermobility in all positions ($p < 0.05$) and prevented dislocation, indicating some restoration of CL function.
Conclusions: Posterior capsulotomy prevented the CL from restraining excessive hip movements after HRA or DM-THA. The CL protective function was restored after repair, reducing excessive ROM and preventing dislocation. C-THA has a decreased head-size preventing CL engagement, irrespective of repair.
Implications: Restoring native femoral head size after arthroplasty restores capsular function, suggesting that implant design and relative size contributes to hip stability.
Conflict of Interest: Nothing to disclose

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DO PRE-OPERATIVE BLOOD TESTS PREDICT PATIENT LENGTH OF STAY IN ELECTIVE TOTAL HIP REPLACEMENT?

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Background: Enhanced recovery begins before the onset of surgery with a thorough pre-operative assessment prior to their procedure, Part of this is the blood investigations. This study aims to determine whether preoperative blood tests, normal or abnormal, have an effect on a patient's post-operative length of stay.
Study Design & Methods: A retrospective analysis of pre-operative blood tests over a 9 month period of 51 patients, 3 variables: Hb levels, WCC and the eGFR, compared to the total length of stay in hospital, post elective total hip replacement.
Results: Our data concluded that of these 51 patients, 22 (43%) of them had a pre-operative Hb below 109g/L, of them 13 (59%) were discharged late, (beyond 7 days). Five of these 13 patients (38%) required a postop blood transfusion.
Of the remaining 30 patients who had a pre-operative Hb greater than 109g/L, 22 (73%) were discharged within 4 days, the remaining 8 patients (26%) were discharged from hospital within 1 week. We found that, 17 (33%) patients had a raised pre-operative WCC, of them, 9 (53%) were discharged more >7 days after their surgery. From these 17 patients who had a raised pre-operative WCC and were discharged late, 5 (29) were treated for a post-operative UTI, and 3 patients (18%) were treated for a hospital acquired pneumonia.
Only 18 (35%) had an eGFR >90, 20 patients (38%) had an eGFR between 60-90, and 13 patients (25%) had an eGFR < 60. Of those patients with an eGFR < 60, 10 were discharged >4 days after their surgery. Six of these 10 patients (60%) were discharged >7 days post-surgery.
Conclusion: It is apparent that preoperative investigations prior to admission do have an almost predictable effect on the length of stay. Improving these variables would improve the post-operative outcome for our patients.
Conflict of Interest: Nothing to disclose

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MEASURE MY MEDICAL PROFILE (MYMOPS): CAN PATIENT SPECIFIC OUTCOME MEASURES BE USEFUL IN TOTAL HIP ARTHROPLASTY - A VALIDATION STUDY

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Introduction: Patient related outcome measures (PROMS) are routinely undertaken in patients undergoing hip arthroplasty. Oxford Hip Score (OHS) is collected pre-operation and at 6 months' post operation. MyMOPS is a patient specific outcome measure that allows patients to list their individualised symptoms and activities that are limited and is used in other medical specialities but not within orthopaedic surgery. The aim of this study was to validate the MYMOPS questionnaire for use in hip arthroplasty by comparing it to the OHS.
Methods: At a single centre, 50 patients were recruited to our prospective trial after ethical approval. A MyMOPS questionnaire and an OHS was filled in pre-operation and then at 6 months post-operatively. 6 patients filled in either form incorrectly and were excluded. The remaining 44 included 30 females and 14 males with an average age of 68.5 (range 35-90).
Results: There was significant improvement in OHS by an average of 22.8 points post-operatively. There was a similar significant improvement in all MyMOPS symptoms and activity score and this

correlated well with the improvement in OHS. There was no significant difference in improvements between the OHS and MyMOPS with significant correlation demonstrated suggesting that the MyMOPS displays good construct validity compared to the OHS ($p< 0.05$).
Discussion: MyMOPS is valid for use in hip arthroplasty patients and shows similar effects as the OHS. It is a useful adjunct as a PROM and could potentially remove the ceiling effect of the OHS especially in younger patients. It has the added advantage of helping the surgeon see what the main symptoms that patients are suffering from and what activity the patients want to return to and can help identify any unrealistic expectations. In this way, MyMOPS can help shared decision making pre-operatively between surgeons and patients and can help the consent process.
Conflict of Interest: Nothing to disclose

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LEICESTER ARTHROPLASTY REMOTE CLINIC: BEST PRACTICE VIRTUAL ARTHROPLASTY SURVEILLANCE

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Background: NICE recommends that hip arthroplasty patients have long-term follow-up. Remote clinics reduce outpatient burden. We report experience of the Leicester Arthroplasty Remote Clinic (LARC), commissioned by our CCGs.
Methods: LARC simulates clinic review with a senior hip surgeon. Patients are reviewed in clinic at 6-weeks, and subsequently through LARC at 1-, 5- and 10-years. Follow-up comprises postal questionnaire and radiographs obtained at the patient's local hospital.
Questionnaires were developed to identify common reasons for hip failure (loosening, instability). Senior clinicians reviewed all radiographs. Questionnaires and radiographs were categorised separately as Green (no concerns), Amber (concerns requiring monitoring) and Red (requiring action). Sensitivity and specificity for such events on questionnaires were plotted using ROC analysis to determine RAG thresholds.
Conflicts between questionnaires and radiographs were resolved by clinical review of all available information. Patients with green outcomes followed standard LARC follow-up. Patients with concerning features were either followed-up more frequently within LARC (amber) or brought back to clinic (red).
Results: Between 2015-18, 1714 (71.6%) patients returned questionnaires at 1-year post-op (R= 155, A= 237, G=1322). There were 96 (5.6%) conflicts raised and 27 (1.6%) patients were invited to clinic for review.
At 5-years, 1420 (64.7%) returned questionnaires, with 111 conflicts, 17 needing clinic reviews. At 10-years, 938 (55.7%) returned questionnaires, with 76 conflicts, 11 needing clinic reviews.
The standard clinic tariff is £79.00, and based on our local cost agreements, a saving of £100,673.40 was achieved after 3 years of service. LARC saved the equivalent of 46 clinics annually.
Patient feedback reports (2069) revealed 85% of patients agreed or strongly agreed with this way of looking after their hip replacement.
Conclusions: LARC permits senior clinical decision-making that improves the long-term follow-up of hip arthroplasty patients within a system that is both cost effective and preferred by patients.
Conflict of Interest: Nothing to disclose

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RISK FACTORS FOR ONSET OF DELIRIUM AFTER NECK OF FEMUR FRACTURE SURGERY: A PROSPECTIVE OBSERVATIONAL STUDY

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Background: Delirium is a common complication after surgery in the elderly that leads to increased length of stay and other adverse outcomes. The aim of this study was to better understand the exact causes of post-operative delirium in patients undergoing surgery for neck of femur (NOF) fractures.
Methods: We performed a prospective cohort study of 381 consecutive patients undergoing surgery for NOF fractures at a single institution. Baseline cognitive status and risk factors were recorded on admission. Post-operative cognitive status was assessed at regular intervals until discharge. Binary logistic regression was performed to identify independent predictors of delirium.
Results: Patients who developed post-operative delirium (n=70) were significantly older (average age 83 vs 78, $p=0.019$) and more likely to be female (79% vs 67%, $p=0.062$) than non-affected patients. The presence of delirium was associated with increased length of stay (13 vs 10 days, $p=0.001$), mortality at 30-days (10% vs 6% $p=0.24$) and 1-year (25.7% vs 15% $p=0.03$). Independent predictors

of delirium included age≥65 years (Odds Ratio=5.8), presence of anaemia (OR=2.9), hypoxia (OR=2.86), cardiac disease (OR=2.8), Chronic Obstructive Pulmonary Disease (OR=2.5), new onset electrolyte imbalance (OR=2.2) and renal failure (OR=1.9).
Conclusion: Overall analysis demonstrated an increased incidence of delirium in older females with greater comorbid conditions. It was also found to be associated with increased morbidity and mortality. We recommend clinicians put greater effort into recognising risk factors of delirium and diagnosing it in a timely manner to mitigate its effects.
Conflict of Interest: Nothing to disclose

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PRIMARY STABILITY OF A SHORT BONE-CONSERVING FEMORAL STEM: A TWO-YEAR, RANDOMISED, CONTROLLED TRIAL USING RADIOSTEREOMETRIC ANALYSIS

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Background: Short bone-conserving femoral stem implants were developed to achieve more physiological, proximal bone loading than conventional femoral stems. Concerns have arisen, however, that improved loading may be offset by lower primary stability because of the reduced potential area for bony contact. The aim of this study was to determine the primary stability of a novel short femoral stem compared with a conventional femoral stem following cementless total hip arthroplasty (THA), in a prospective, blinded, randomised, controlled trial using radiostereometric analysis.
Methods: Fifty-three patients were randomised to receive cementless THA with either a short femoral stem or a conventional femoral stem. Surgery was performed at one institution by three surgeons. 26 patients received the short stem and 23 received the conventional stem. Complete follow-up was available on 40 patients (82%). All patients received the same cementless acetabular component. The primary outcomes were dynamically inducible micromotion and migration of the femoral stems at two years. Both were measured using radiostereometric analysis, performed on radiographs taken post-operatively and at three, six, 12, 18 and 24 months. Validated geometric algorithms were used to determine the relative three-dimensional position of the prosthetic stem and host bone.
Results: At two years, there was significantly less subsidence (inferior migration) of the short femoral stem (head: 0.28mm; 95% confidence interval [CI] +/-0.17; SD 0.38; tip: 0.10mm; 95% CI +/- 0.18; SD 0.41) compared with the conventional stem (head: 0.61mm, 95% CI +/-0.26, SD 0.55, *P*=0.03; tip: 0.44mm, 95% CI +/-0.21, SD 0.43, *P*=0.02). There was no significant difference in dynamically inducible micromotion.
Conclusion: This study demonstrates that the short femoral stem has a stable and predictable migration. However, longer-term survival analysis remains important.
Implications: This study suggests that short femoral stems are a safe option in THA.
Conflict of Interest: Nothing to disclose

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CHEMICAL THROMBOPROPHYLAXIS IN PRIMARY HIP REPLACEMENT - IS IT WORTH THE BLEEDING BOTHER?' RISK STRATIFICATION IN HIP REPLACEMENT IS AS EFFECTIVE, AND SAFER, THAN DRUGS FOR ALL. RESULTS IN 6533 PATIENTS

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Background: Retrospective analysis of over 6,000 primary hip replacements in a single DGH from 1999-2016.
Methods: Patients were stratified prior to admission as high or low risk. Prior to 2012 low risk patients only had mechanical prophylaxis (Foot pumps). After 2012 patients had a selection of VTE prophylaxis including NOACs, aspirin, LMWH, warfarin and mechanical only.
Results: Foot pumps alone had a 0.56% DVT risk and a 0.23% PE risk, similar to low risk patients on aspirin prophylaxis (DVT 0.50%, PE 0.36%) after a primary hip replacement. Our total risk of DVT across all patients undergoing a primary total hip replacement was 0.45%, with a PE rate of 0.35%.
Conclusion: Risk stratification may be enough to identify patients who are at low enough risk post arthroplasty to not require any form of chemical prophylaxis.
Conflict of Interest: Nigel Rossiter is a member of the NICE VTE Committee

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INFLUENCE OF PRE-OPERATIVE WAITING TIME ON PATIENT - REPORTED OUTCOME FOLLOWING PRIMARY HIP OR KNEE ARTHROPLASTY

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Background: Total hip or knee arthroplasty are well established as procedures to improve pain and function for a majority of patients suffering from advanced osteoarthritis. Demand is increasing due to better outcomes following joint replacements. However, publically funded health systems are struggling to cope with increasing demand, leading to increased waiting time, during which patients suffer adversely.
Although there is an improvement in pain and function following arthroplasty, the outcomes are unpredictable despite focus on surgical technique, implant design, and rehabilitation. We hypothesized that waiting period influences outcomes.
Methods: A retrospective study looking at patients enrolled on the arthroplasty database and underwent hip & knee arthroplasty from January 2013 to December 2017. We calculated waiting time and fractional change in Oxford scores. The fractional change in Oxford score is calculated by subtracting preoperative Oxford score from postoperative Oxford score. Fractional Oxford score reflects the change in functional outcome following joint arthroplasty.
Results: Of the 1347 records reviewed, 1087 were eligible. Complete data set was available for 421 hip and 270 knee arthroplasty patients.
In the three years of analysis, the waiting list times have increased consistently (longest waiting time of 65.2 weeks(2015) to 143 weeks (2017)). 14%(hip) & 15%(knee)undergoing surgery within 6 months; 28%(hip) & 32%(knee) undergoing surgery at 6-12 months. 52%(hip) & 58%(knee) waited >12 months for arthroplasty. Statistical analysis showed that patients who underwent surgery within 6 months experienced the best outcomes (box plots).
Conclusion: Aiming for waiting time < 6 months provides predictable better outcome following arthroplasty.
Implications: Reducing the waiting period for patients has implications on resources, funding and prioritisation of arthroplasty. Re-designing and improving arthroplasty services capacity against this demand will provide improved outcomes for patients and reduce pressures on the health care systems from failure demand caused by the increased waiting period.
Conflict of Interest: Nothing to disclose

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THE OPAL STUDY - CHARACTERISTICS OF PATIENTS RETURNING TO WORK AFTER HIP AND KNEE REPLACEMENT

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Background: An increasing number of patients of working age are undergoing hip and knee replacements. Information about this population is limited and the advice they receive about sickness absence, recovery to usual activities and work after surgery.
Methods: Prospective cohort study of patients undergoing hip/knee replacement at four sites as part of the OPAL study. 765 people were screened of which 202 (26%) were in work in the 6 months prior to surgery. In total 154 patients completed a baseline assessment and 129 patients completed at least 1 follow-up assessment.
Results: Mean age of patients in the cohort was 60 years (range 31 to 86 years). Thirty eight percent were in full time employment, 25% part-time employment and 24% were self-employed. Patients undergoing surgery had worked for their current employer for a mean of 12.8 years. Patients continued to work until a median of 3 days before their surgery and 86% worked in their 'usual role' up until their last day. Overall 73% drove themselves to work, 40% required to drive at work and 21% worked rotating shifts. Knowledge about employer sickness policies and pay was poor (< 50%). Overall 29% of the respondents at 8 weeks had returned to work, with 61%of respondents reporting they had returned in the week 16 questionnaire.
Conclusion: A substantial proportion of patients undergoing joint replacement are of working age and most work right up to their surgery. This number will increase as we support an increasingly aged workforce. Patients work in a variety of roles with varied working patterns and workplace demands. This has implications for the development of an individualised occupational advice intervention.
Implications: This study helps us to understand the individualised workplace needs of this group and the barriers preventing return to work to be addressed by an occupational advice intervention.

Conflict of Interest: Nothing to disclose

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LONG TERM OUTCOMES OF SALVAGE TOTAL HIP ARTHROPLASTY FOR FAILED OSTEOSYNTHESIS OF FEMORAL NECK FRACTURE

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Background: The reported failure rates of osteosynthesis for neck of femur (NOF) fractures is as high as 36 to 47% at 2 years. However, the long term outcomes of salvage THAs performed for failed osteosynthesis is yet to be elucidated. The aim of this study is to report on the long term outcome of primary THAs for this cohort of patients.
Methods: Consecutive patients with THA for failed osteosynthesis for NOF managed by a single unit between January 1974 and December 2009 were included. Clinical and radiological outcomes of all 72 patients were analysed. Only patients with minimum 5 years follow-up were included. Those with less than 5 years of follow-up were reviewed for failures.
Results: The mean age at the time of THA was 56 years (range - 18-79). All patients had cemented THA. At mean follow-up of 12.9 years (range - 5 to 35.5), the major late complications included stem loosening in 4, stem fracture - 1, cup loosening - 7, deep infection - 3 and dislocations in 4. Thirteen (18.1%) hips were revised. The cumulative survival rate is 80.3% (CI: 91.6-69.1) at 10 years.
Conclusion: The outcome for patients with THA for failed osteosynthesis post NOF fracture is worse in comparison with reported revision rates of THA for acute NOF fracture. The risks of poorer outcomes following salvage THA and morbidity of failed osteosynthesis need to be factored in for NOF fracture management.
Implications: This study gives us further insight into choice of surgical treatment for NOF fracture and valuable information for informed consent.
Conflict of Interest: Nothing to disclose

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PREDICTIVE FACTORS FOR REVISION AND SURVIVORSHIP ANALYSIS OF THE CORAIL/PINNACLE 36MM METAL-ON-METAL TOTAL HIP REPLACEMENT: A RETROSPECTIVE COHORT STUDY

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Background: High failure rates have been reported for metal-on-metal (MoM) total hip replacement systems secondary to adverse reactions to metal debris. With thousands remaining in-situ, a greater understanding of component and patient predicting factors related to revision risk would help augment national and local MHRA MoM screening guidelines, and to help identify those at high risk of failure who may require intensive follow-up regimes.
Methods: Retrospective cohort study of patient demographics, component information, and revision episodes were evaluated for all 36mm MoM Corail-Pinnacle hips using survivorship analysis and Cox-regression modelling between our defined follow-up period.
Results: 1218 Corail-Pinnacle MoM THRs were implanted into 1121 patients (699:520 Female:Male) between 2005-2013. 121 patients required revision surgery.
10-year survival rate for the cohort was 83.2% (81.1-85.3). Female hips, with a predicted survival of 82.0% (79.7-84.3) had a significantly higher failure rate than male subjects, 85.1% (81.8-88.4) at 10 years (p=0.046).
Age at primary demonstrated a significant difference in all-cause revision for the cohort (p=0.001).
Implantation prior to and post-MHRA medical device alert (2006) did not show a significant difference (p=0.571), 84.0% (80.6-87.4) vs. 85.7% (83.9-87.5) respectively. Bilateral MoM hip replacements statistical evaluation could not be performed due to a low cohort number.
Cox proportional hazard modelling identified that females, (HR 1.464, p=0.047), patient age at time of primary (HR 0.982, p=0.020), coxa vara Corail stem (HR2.772, p=0.007), and high-offset Corail stem (HR 2.363, p=0.007) as significant factors influencing revision likelihood.
Conclusion: The 36mm Corail-Pinnacle MoM hip replacement has a high failure rate prompting national surveillance programmes and intensive follow-up procedures. Our study demonstrated that females, patient age at time of primary surgery and stem design variation show a statistically significant increase in revision surgery for MoM hips. Our data justifies that this micro-cohort may necessitate more rigorous surveillance.

Conflict of Interest: Mr Ben Bolland - Consultancy agreement - Teaching (DePuy institute)

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PREDICTIVE MODELLING OF LENGTH OF STAY FOR CASE-MIX ADJUSTMENT IN THE EVALUATION OF PRIMARY HIP AND KNEE ARTHROPLASTY SERVICES

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Background: Length of stay is used as a performance indicator in the evaluation of primary hip and knee arthroplasty services, but the impact of service quality and efficiency may be masked by patient characteristics such as frailty and medical co-morbidity. Case-mix adjustment is required to facilitate like-for-like comparisons between services. The aim of this study is to develop and evaluate parsimonious predictive models for length of stay following primary hip and knee arthroplasty, employing routinely-available data.
Methods: Data were analysed from consecutive patients enrolled in an enhanced-recovery primary hip and knee arthroplasty programme employing standardised pre-, intra- and post-operative care and rehabilitation protocols.
Two models were initialised for each of hip and knee arthroplasty: the first incorporating only pre-operative factors, and the second including post-operative factors. Parameter selection and tuning was performed using automated lasso penalised Cox proportional hazards regression with 10-fold cross-validation. The same cross-validation folds were used to evaluate the predictive capability of each model. The predictive capability of the linear predictor when stratified into short, medium and long-stay groups was similarly evaluated.
Results: 2705 arthroplasties (1389 knees) performed between January 2013 and April 2015 were analysed. The four penalised models retained between 11 and 18 parameters. Cross-validated R-squared values were in the range 0.11-0.30. Derived risk scores were all statistically significant with hazard ratios in the range 1.7-2.9. Stratification into risk groups raised interpretability but reduced predictive power.
Conclusions: Case-mix has a substantial influence on length of stay outcomes and should be considered in any comparison between services. We show that continuous and stratified risk scoring for length of stay based on patient characteristics is achievable and has moderate predictive power.
Implications: The models developed in this study constitute the basis for both further study and for the initiation of practice in comparable services.
Conflict of Interest: Nothing to disclose

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DISLOCATION RATE OF THA IN PATIENTS WITH NECK OF FEMUR FRACTURES: THE 5 YEAR MAJOR TRAUMA CENTRE EXPERIENCE

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Background: Total hip arthroplasty (THA) is the treatment of choice for medically fit patients sustaining neck of femur (NOF) fractures with good pre-operative function. However dislocation in THA remains a substantial clinical problem encountered with up to 20% to 50% of dislocation rates (DR) being reported in NOF fracture patients in the literature.
This study assessed whether any correlation was present in our NOF fracture patient population with DR with regards to the surgical approach utilised for THA.
Methods: A retrospective study was conducted recruiting 123 patients that underwent primary THA after a NOF fracture in our major trauma centre between 2013-2018. Demographics, type of THA, operating surgeon´s grade, surgical approach (anterolateral vs posterior), prosthesis type (acetabular cup, stem type (Exeter V40™ vs CORAIL™) and offset) and mortality were recorded. Chi-square test was utilised for statistical analysis.
Results: The median age of the cohort was 70 (28-90). The mortality rate at 1 year was 3% after the procedure.
Overall dislocation rate was 10% whilst revision rate was around 4%. Approach: Posterior (n=93) vs Anterolateral (n=30). DR was 12% vs 3% respectively (p=0.312). Type of THA: cemented (n=51) vs reverse hybrid (n=66) vs uncemented (n=6). DR was 18% vs 3% vs 17% respectively.
Type of femoral stem: CORAIL™ (n=72) vs Exeter V40™ (n=51). DR was 4% vs 18% respectively (p=0.029). Type of acetabular cup and offset provided no significant correlation to our dislocations.
Conclusion: Interestingly surgical approach had no statistically significance on our dislocation rate.

The use of cemented Exeter V40 stems were significantly associated with increased dislocation in THA compared to uncemented CORAIL stems.
Implications: The lack of statistical significance despite higher rates of dislocation with posterior approach to hip was surprising. This provides a rationale for further evaluation in a larger prospective study.
Conflict of Interest: Nothing to disclose

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HYPERCALCAEMIA IN THE MANAGEMENT OF BONE AND JOINT INFECTION: A COMPARISON OF 2 CALCIUM SULPHATE ANTIBIOTIC DELIVERY SYSTEMS

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Background: Antibiotic-eluting calcium compounds can be used to deliver antibiotics in the management of prosthetic joint infection (PJI). Described omplications include wound drainage, heterotopic ossification(HO) as well as hypercalcaemia which is potentially life threatening.
The aim of this study is to assess the incidence of hypercalcaemia and other complications between two calcium based antibiotic delivery systems.
Patients and methods: A retrospective study was performed. Thirty two patients treated with Stimulan or Cerament Calcium based antibiotic delivery system between August 2014 to January 2017 were included.
Seven patients received Cerament, 21 cases received Stimulan and one patient received both.
The volume used as well as pre- and post-operative serum calcium were recorded as well as any wound related complications and radiologic changes suggestive of heterotopic ossification. The postoperative serum adjusted Calcium were taken weekly during the initial post operative period.
Patients with overactive parathyroid disease and pre-existing renal disease were excluded.
Results: Stimulan group (n=22, Mean volume 39.2ml).
Mean pre-operative serum calcium was 2.48mmol/l. At 1 and 2 weeks post-surgery mean levels were 2.51 and 2.47mmol/l (patients receiving < 40ml), and 2.47 and 2.50mmol/l (patients receiving >40ml - 9 cases) respectively.
There was no significant difference between pre/post-operative levels at 1 (p=0.97) or 2 weeks (p=0.91) and no difference between those treated with < 40ml or >40ml of Stimulan at 1 or 2 weeks (p=0.91).
Cerament group (n=8, Mean volume 9.4ml).
Mean pre-operative serum calcium was 2.42mmol/l. Mean post-operative levels at 1 and 2 weeks post-surgery were 2.44mmol/l (p=0.92) and 2.37mmol/l (p=0.61) respectively.
One patient had prolonged wound discharge and required re operation. No HO was encountered.
Conclusion: Our results suggest that hypercalcaemia and other complications are uncommon with the use calcium based antibiotic delivery systems.
Implications: Calcium based antibiotic delivery systems are safe in the treatment of PJI.
Conflict of Interest: Nothing to disclose

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A REVIEW OF PERI-PROSTHETIC FRACTURES AROUND CEMENTED TAPER-SLIP STEMS

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Peri-prosthetic fractures (PPF) around hip replacements are commonly subdivided according to the Vancouver Classification. Fractures around femoral stems are classified according to whether the stem is well-fixed (B1), loose (B2), or there is associated loss of bone stock (B3).
Fractures around cemented polished taper-slip stems are commonly caused by rotational injury in combination with axial loading causing a spiral fracture with a component that is loose at the stem-cement interface, but where the cement-bone interface remains well fixed. These fractures are different, in both characteristics and management, from fractures around previously loose, cemented stems. They have been inconsistently categorised in the literature, being described as both B1 and B2 subtypes.
We reviewed 87 patients who presented to our unit, between 1991 and 2009, with a first episode of PPF around the femoral stem of a cemented primary total hip replacement (THR).

In 48 cases (55%) PPFs occurred around stems where cement remained well-fixed at the cement-bone interface. These patients underwent revision arthroplasty using a cement-in-cement technique. All but one patient had either clinical or radiographic evidence of fracture healing. Complications included five patients who suffered dislocations, five patients who sustained further fractures and one patient who had on-going hip pain without clear cause.
PPF is a significant complication of THR, the management of which is technically challenging, expensive and associated with significant morbidity and mortality. We endorse a modification of the original Vancouver system to include the sub-classification of B2 fractures around cemented stems into B2W (where cement is well-fixed to bone) and B2L (where the cement is loose). This sub-classification is a useful adjunct in operative decision-making. In B2W fractures revision arthroplasty using the cement-in-cement technique yields good results.
Conflict of Interest: The senior author receives royalties from Stryker Corporation, Mahwah, NJ, USA. The other two authors have no conflict of interest

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TWO STAGE EXCHANGE FOR PERIPROSTHETIC HIP INFECTION - ARE PROLONGED COURSES OF ANTIBIOTIC THERAPY NECESSARY?

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Background: The duration of systemic antibiotic therapy for periprosthetic hip infection is controversial. We report our experience of managing chronic periprosthetic infection of the hip by the two stage exchange procedure.
Methods: Patients scheduled to undergo a two stage revision for periprosthetic infection of the hip were identified from our prospective database. Medical records including operative details and microbiological data were examined.
Results: Of 428 patients with microbiologically proven periprosthetic infection, 372 (87%) underwent a two stage procedure. The mean age at the time of the first stage was 68 years (26 - 92 yrs). The mean time between stages was 6.3 months with a mean follow up after the second stage of 65 months (range 5 to 276 months).
The success rate of a single 1st stage debridement, confirmed by negative cultures at the time of second stage re-implantation was 94%. 19 patients underwent a repeat 1st stage debridement and were classed as failures of the 1st stage. 343 of 372 (92%) patients who had completed the second stage were deemed infection free at review.
The duration of systemic antibiotic treatment after both the 1st and 2nd stages was divided into < 48 hrs and >48 hours. There was no significant difference in the success of the 1st stage procedure and the outcome following the second stage in patients who received < 48 hours (48% of the patients) as opposed to >48 hours ($p = 0.98$, Chi Squared Test, Relative Risk 1.009).
Conclusion: Periprosthetic hip infection is a challenging problem and can be successfully managed with high success rates for infection eradication by a 2 stage exchange procedure, irrespective of duration of antibiotics.
Implications: Prolonged courses of systemic antibiotic are not essential for successful infection eradication. Antibiotic stewardship is extremely important when antibiotic resistance is an ever increasing problem.
Conflict of Interest: Nothing to disclose

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THE EFFECT OF FEMORAL COMPONENT SIZE ON RISK OF REVISION FOR PERI-PROSTHETIC FRACTURE FOLLOWING PRIMARY CEMENTED EXETER TOTAL HIP REPLACEMENTS: AN ANALYSIS OF 203,421 CASES USING NATIONAL JOINT REGISTRY DATA

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Background: Peri-prosthetic fractures (PPF) following total hip arthroplasty (THA) are complex to manage and associated with significant morbidity and mortality. The Exeter femoral component is the most commonly used cemented stem in the England and Wales National Joint Registry (NJR). Implantation technique dictates that the size used is equivalent to the largest broach affording femoral canal stability during trialling. The use of large femoral components in cavernous and osteoporotic femoral canals increases the modulus mismatch between implant and cortical bone. This study aims

to determine the influence of femoral stem size on the risk of revision for PPF.
Methods: Primary THAs performed for osteoarthritis using the Stryker Exeter V40 stem and recorded on the NJR were included. Patient, implant and surgical variables were analysed. Cox proportional hazards models were used to assess the influence of stem size on risk of revision.
Results: 203,421 primary THAs were included in the analysis. Of these, 322 revisions were performed for PPF and 2409 were revised for indications other than PPF. In the unadjusted model, larger stems (size ≥3) had a significantly higher risk of revision for PPF when compared to smaller stems (sizes ≤2) (hazard ratio [HR] 1.76 (95% confidence intervals 1.33-2.32). After adjustment, HR was 1.26 (0.95-1.67). For patients aged over 65 at time of THA, the unadjusted and adjusted HRs were 1.76 (1.31-2.35) and 1.33 (0.98-1.79) respectively.
For all-cause revision, the unadjusted and adjusted HR comparing larger with smaller stem sizes were 1.11 (0.99-1.24) and 1.05 (0.93-1.16) respectively.
Conclusions: For Exeter stems, larger femoral stem sizes may increase the risk of revision for PPF.
Implications: Stem size downsizing should be considered when performing Exeter THA if large (sizes ≥3) broaches are used during trailing, in order to achieve a thicker cement mantle and reduce modulus mismatch, especially in older patients.
Conflict of Interest: Two of the authors are paid consultants to Stryker

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PROSPECTIVE COHORT STUDY OF 200 PATIENTS UNDERGOING CEMENTED EXETER TOTAL HIP REPLACEMENT WITH A 32MM HEAD WITH A HIGHLY CROSSED LINKED POLYETHYLENE ACETABULUM: DOES AGE INFLUENCE FUNCTIONAL OUTCOME, ACTIVITY, MIGRATION OR BONE MINERAL DENSITY?

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Background: Primary aim was to compare migration and bone mineral density in patients undergoing a cemented total hip replacement (THR) according to age. Secondary aims were to assess functional outcome and activity after THR according to age.
Patients and methods: A powered prospective cohort study was conducted. 200 patients undergoing a cement Exeter THR with a highly cross-linked polyethylene acetabulum were recruited. Patients were recruited into three age groups: < 65 years (n=65, 65 to 74 years (n=68) and 75 years and older (n=67) and assessed at 3 (n=145), 12 (n=140) and 24 (n=135) months. The Harris Hip score, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Hip disability and osteoarthritis outcome score (HOOS), Lower Extremity Activity Scale (LEAS), EuroQol 5 dimensional (EQ5D), short form(SF-)36 scores and patient satisfaction were used to assess functional outcome. The timed get up-and-go (TUG) and activPAL™ monitor (energy expelled and time lying/standing/stepping) were used to assess activity. Radiographic assessment consisted of Ein Bild Röntgen Analyse (EBRA) and bone mineral density (BMD) for Gruen, DeLee and Charnely zones.
Results: There were 115 females and 85 males with a mean age of 69.9 (range 42 to 92) years. There was no significant difference according to age group for HHS ($p>0.05$), WOMAC [pain ($p>0.1$), function ($p>0.25$) and stiffness ($p>0.15$)], HOOS ($p>0.08$), EQ5D ($p>0.38$), SF-36 ($p>0.12$), patient satisfaction ($p>0.42$), activPAL™ monitor [energy expelled ($p>0.08$), time lying($p>0.4$)/standing(>0.27)/stepping(>0.06)], or change in EBRA ($p< 0.48$). Younger patients had significantly greater LEAS score ($p< 0.02$) and a greater BMD in DeLee and Charnley zone 1 ($p< 0.01$).
Conclusions: Age does not influence functional outcome, objective patient activity or early migration, however subjective patient activity level (LEAS) and BMD in DeLee and Charnley zone 1 are influenced by age.
Implications: Differences in BMD may relate to known acetabular failure rates according to age.
Conflict of Interest: Nothing to disclose

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METAL ON METAL HIP REPLACEMENT - HOW ARE YOUNGER PATIENTS DOING?

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Introduction: Metal on Metal (MoM) hip arthroplasty saw a new era of popularity with development of its second generation bearing surfaces, in the first decade of this century. However, significant

concerns due to metal debris related complications lead to stop and surveillance of this practice. We aimed to determine the survival of MoM hip replacement in younger population. We also studied the rate of revision related to adverse reaction to metal debris (ARMD) along with reviewing clinical and radiological progress of MoM hip arthroplasty in younger age (< 55yrs) group.
Patients and methods: This is a retrospective cohort study of patients 55yrs old or younger, who had metal on metal (MoM) hip arthroplasties for osteoarthritis. We had 101 procedures performed on 82 patients with mean followup of 10 years. All patients were reviewed as per MHRA guidelines in planned follow up clinics. Data analyses were performed using SPSS.
Results: Survival of implant in our younger cohort was 88.1%, with revision for any cause as endpoint. Most of the patients were happy with outcome of their hip replacements as they were able to perform activities of daily living and work without compromise. Mean oxford hip score was 43.
Altogether, there were 12 revisions and 9 were for metallosis and associated symptoms. Mean time to revision was 7 years. Other analysis revealed mean acetabular cup inclination angle 49 degrees but no significant correlation was found between this angle and serum metal ion levels. Serum Chromium and Cobalt levels were significantly higher in revision group.
Discussion: MoM hip arthroplasty prime popularity time has gone due to concerns about higher revision rates. In younger population, in spite of higher revision rates, surviving implants give very good outcome in terms of patient satisfaction. Most of the patients report a desired outcome of 'forgotten hip'.
Conflict of Interest: Nothing to disclose

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REDUCING THE NEED FOR PRE-OPERATIVE GROUP AND SCREEN TESTING IN ELECTIVE PRIMARY HIP ARTHROPLASTY - AN EVIDENCE-BASED APPROACH

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Introduction: Routine group & screen (G&S) blood testing is commonly performed before primary hip arthroplasty. Here we aimed to establish the current transfusion rate following hip arthroplasty, evaluate the cost of routine G&S and clarify whether this is indicated.
Patients/materials and methods: We reviewed 500 consecutive primary hip arthroplasties at a single trust. Alongside patient demographics, we recorded the type of procedure, drug history, pre- and post-operative haemoglobin (Hb) levels, number and location of G&S samples and whether or not transfusion was required. Using this data we developed an evidence-based G&S policy, which was validated against a separate cohort of 63 patients.
Results: Within the initial cohort, the mean pre- and post-operative Hb levels were 136 and 113 g/L, with a mean Hb drop of 23.7g/L. In total 1251 pre-operative G&S samples were sent, costing £42/patient. Forty patients (8%) required transfusion - eight (1.6%) on the day of operation. Implant type and antiplatelet / anticoagulant medication were not significant predictors of transfusion. Female gender was a significant risk factor as were increasing age (R2 0.51) and a lower pre-operative Hb (R2 0.77). Based on this analysis, a proposed strategy of G&S only for patients over 80 years old or with a pre-operative Hb of < 120g/L was devised and applied to the second cohort. Ten patients met the criteria for G&S testing, of whom six required transfusion. No patients required transfusion who would not have undergone G&S testing. The policy would have reduced G&S testing by 85%.
Discussion: This transfusion rate is significantly lower than that previously published, making blanket G&S unnecessary. We have developed an evidence-based strategy to reduce the use of pre-operative G&S whilst ensuring that patients at high risk of transfusion are able to receive this treatment in a timely manner.
Conflict of Interest: Nothing to disclose

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EFFECT OF OUTSOURCING ELECTIVE PRIMARY ARTHROPLASTY

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Background: Outsourcing elective surgery has become increasingly commonplace to meet increasing demand from a growing & aging population. Patients meeting specific criteria are offered an alternative care option, to address waiting time targets. There is concern that outsourcing was influencing the nature of residual workload that was unsuitable for treatment elsewhere. The alternative provider´s strict criteria, offered treatment to fit, straightforward patients, leading to the impression that our unit is operating on more complex patients orthopaedic problems, ASA and Body Mass Index (BMI). By

losing a disproportionate number of straightforward patients our department´s outcomes, productivity and training opportunities could be adversely affect
We compared BMI and ASA of our cohort ´preoutsourcing´ (2014) with post outsourcing periods (2015 and 2016) and correlated it´s effect on anaesthetic time, operative time and length of inpatient stay.
Methods: Retrospective analysis of prospectively collected data of primary hip / knee arthroplasties between July & December for 2014 , 2015 and 2016. ANOVA test , Tukey Honest Significant Difference(HSD) and Pearson's correlation used.
Results: Total of 726 primary arthroplasties were performed with an almost 50 % reduction post outsourcing. Post-outsourcing, BMI and ASA were significantly worse with a ANOVA of p=0.001 and HSD p=0.003. Length of stay increased from 5.4 days in 2014 to 6.2 days in 2015 ANOVA p< 0.001 but decreased in 2016. BMI significantly affected operating time (Pearson's r =0.12, p< 0.05) and anaesthetic time (Pearson's r =0.19, p< 0.05). ASA significantly affected length of hospital stay, p< 0.01 and operation time, p=0.007 but no effect on anaesthetic time
Conclusion(s): We are operating on more complex patients due to the current outsourcing setup.
Implications: Shortterm anaesthetic and operation time, inpatient stay and training opportunity were affected. Longterm individual surgeon unit outcomes (complications,patient satisfaction) could be adversely affected
Conflict of Interest: Nothing to disclose

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ASEPTIC PROXIMAL LOOSENING OF FULLY HYDROXYAPATITE-COATED FEMORAL STEMS IN TOTAL HIP ARTHROPLASTY: WHAT'S TO BLAME, PROXIMAL FEMORAL ANATOMY OR SURGICAL TECHNIQUE?
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Osteointegration of an uncemented femoral stem depends on good-press-fit fixation with minimal micro-motion, allowing bony ingrowth to achieve mechanical stability. Fixation surfaces provide transitional stress transfer from the proximal femur to the diaphysis. We describe aseptic loosening of fully coated femoral stems in patients with specific proximal femoral anatomy when inserted with sub-optimal surgical technique.
A retrospective longitudinal nonrandomised observational cohort study was undertaken
Two Musculoskeletal Radiologists and one Orthopedic surgeon retrospectively evaluated all relevant hip imaging (radiographic, cross-sectional and nuclear medicine tomographic imaging) in patients who underwent fully-coated uncemented THAs from 2007-2016 in our tertiary referral center for primary and revision hip replacement surgery.
Patients with pain post arthroplasty were further investigated with clinical history, physical examination, serological analysis, plain radiographs, and SPECT-CT. Correlation between the findings on serial imaging was scrutinized. Multivariate analysis was carried out to weigh the factors relating to this phenomenon.
1100 patients underwent uncemented primary THA between 2007-2016. The phenomenon was found in 33 patients (3%) in our series. Multivariate analysis was concordant with literature and showed the presence of a 'Dorr A' type proximal femur associated with proximal aseptic loosening.Smaller sized stems inserted in varus did not show this phenomenon, in case matched groups (performed by the same group of surgeons).In patients where the proximal-distal mismatch was corrected by reaming the isthmus distally, loosening was not observed over time.All 33 patients remained symptomatic on follow-up and had revision surgery, within 4 years.
Knowledge of this characteristic entity is important for surgeons, as it allows them to appreciate the need for appropriate implant selection, depending on the underlying proximal femoral anatomy. Preoperative radiological assessment of the inherent morphology of the bones forming the hip joint assists the surgeon in modifying the surgical technique, potentially further minimising this mode of failure.
Conflict of Interest: Nothing to disclose

2 Knee (including infection)

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RATES OF ARTHROSCOPIC KNEE SURGERY ARE DECLINING IN ENGLAND - RESULTS FROM A REVIEW OF THE NATIONAL HOSPITAL EPISODE STATISTICS

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Background: Recent clinical trial evidence has challenged the effectiveness of arthroscopic knee surgery for the management of degenerative knee disease. The impact of this evidence on clinical practice is unknown. The purpose of this study was to determine trends and variation in the rate of knee arthroscopy performed from 1997-2017.
Methods: National hospital episode statistic (HES) data on all knee arthroscopy procedures performed in National Health Service (NHS) hospitals in England between 1997/98 and 2016/17 was acquired from NHS Digital. Office for National Statistics (ONS) population data was used to determine the age and gender standardised rates of surgery. Geographic variation was analysed by NHS Clinical Commissioning Group (CCG).
Results: Through 1997-2017, 2,134,995 knee arthroscopies were performed. Nationally, the age and gender standardised rate of knee arthroscopy increased from a low of 159/100,000 population in 1997/98 to peak at 245/100,000 from 2008-2011 before declining steadily to 182/100,000 in 2016/17. The rate of arthroscopic partial meniscectomy (APM) increased steadily from 51/100,000 in 1997/98 to 147/100,000 through 2010-2014, before declining to 121/100,000 in 2016/17. In the over 60 age group, 478,632 knee arthroscopies were performed and the rate increased from 131/100,000 in 1997/98 to 278/100,000 in 2008-2011 before declining to 167/100,000 in 2016/17. In this age group, APM increased from 36/100,000 in 1997/98 to 185/100,000 through 2010-2014, declining to 134/100,000 in 2016/17. Geographically in 2016-17, ten CCGs performed more than 300 APMs per 100,000, whilst twenty-seven CCGs performed less than 30/100,000
Conclusions: National data suggests that rates of arthroscopic knee surgery have declined considerably from previous peak levels, indicating a change in practice in response to published trial evidence. Nevertheless, considerable regional variation persists and rates are higher in England than those reported in some other countries. The 'appropriate' rate of arthroscopic knee surgery for the population is, however, unknown.
Conflict of Interest: Andrew Judge has received consultancy fees, lecture fees and honoraria from Servier, UK Renal Registry, Oxford Craniofacial Unit, IDIAP Jordi Gol and Freshfields Bruckhaus Deringer, is a member of the Data Safety and Monitoring Board (which involved receipt of fees) from Anthera Pharmaceuticals, and received consortium research grants from Roche.

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ASSESSMENT AND MANAGEMENT OF LEAKY WOUNDS FOLLOWING PROSTHETIC JOINT REPLACEMENTS: A RETROSPECTIVE STUDY OF PROSPECTIVE SURVEILLANCE

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Background: Persistent wound discharge following joint replacement is a known complication. The incidence of persistent discharge from the wound ranges from 5% - 28% (Gaine et al). There are no guidelines for the management of persistent discharge from these wounds. Leaky wounds often lead to treatment dilemma, prolonged hospital stay and delayed return to activity (Gaine et al). Also, there is difficulty in differentiating non-infected wound discharge from an infected wound.
Aim: Our aim was to investigate the causes of leaky wounds and natural history.
Methods: The data collected prospectively on joint replacements from October 2014 to August 2015 including the infection data. Our sample size was 1811.
Inclusion criteria: All primary hip and knee replacements.
Exclusion criteria: All revision surgeries,late wound leakages and Re-admissions.
All statistical tests performed using SPSS (version 20). Frequencies were used to analyse ten demographic data, descriptive statistics were used for categorical variables, and Mann Whitney U test was used for continuous variables to study their correlation . The level of significance was set at < 0.05.
Results: Incidence of leaky wounds was 9.5%.
There was no significant difference in incidence of leaky wounds by joint type and gender (p 0.9, p 0.7). Diabetes had no significant correlation with leaky wounds (p 0.1). Steroid and anticoagulants use had a significant correlation with leaky wounds (p 0.007). BMI had a significant correlation with wound leakage, p 0.005 (MWU). Blood loss had no significant association (p 0.6). Insertion of drain made no difference (p 0.7). Finally, there was significant correlation between incidence of SSI and leaky wounds (p 0.006)
Conclusions: BMI, Anticoagulant use and Steroid use have a positive correlation with leaky

wounds.Leaky wound associated with a 3.5% of deep and superficial infection.
We have proposed a pathway for management of the leaky wounds to adress the treatment dilemma.
Conflict of Interest: Nothing to disclose

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PREOPERATIVE CENTRAL SENSITIZATION OF PAIN IN KNEE OSTEOARTHRITIS PATIENTS PREDICTS CHRONIC POSTOPERATIVE PAIN 6 MONTHS FOLLOWING TOTAL KNEE REPLACEMENT SURGERY. A PROSPECTIVE FUNCTIONAL BRAIN MRI STUDY

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Temporal summation of pain (TSP) is the perception of increasing augmented pain evoked by repetitive noxious stimuli and a measure of central sensitization that can predict chronic pain after TKR. This prospective study aimed to assess the neural correlation of TSP using functional brain MRI (fMRI) to predict which patients develop chronic pain after TKR.
28 knee OA patients and 17 healthy volunteers underwent a fMRI scan. The study was powered based on published fMRI estimates. Five runs of 10 x 1 second stimuli (TSP) during fMRI were achieved using cuff inflation applied on the calf muscle ipsilateral to the most affected knee or the left side in healthy volunteers. The pain intensity increase during repeated stimulations was assessed on a numerical rating scale. Brain differential activation comparing the 1st vs. 10th stimulus (TSP) was assessed. All subjects underwent a knee MRI analysed using the MRI Osteoarthritis Knee Score and a psychological assessment with all tests repeated 6 months post TKR.
46% of OA patients had evidence of preoperative facilitated TSP indicative of central sensitization showing increased neural brain activity during fMRI in the S2 region with a significant reduction in activity in the default mode-network regions compared to normal TSP OA patients and healthy volunteers. Facilitated TSP patients showed significantly higher MOAKS synovitis scores compared to normal TSP OA patients and healthy volunteers. 89.2% of patients returned for the 6 months follow up assessment.
17 patients were classified as responders (68%) to TKR surgery with 8 non-responders (32%). Non-responders to TKR surgery showed continued facilitated TSP based on the cuff TSP scores and continued neural brain activation within the S2 region on fMRI.
Preoperative identification of OA patients with central sensitization pain, and perioperative use of pharmacological agents to modify this may improve outcomes for patients undergoing TKR surgery.
Conflict of Interest: Nothing to disclose

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ROBOTIC-ARM ASSISTED TOTAL KNEE ARTHROPLASTY IMPROVES EARLY FUNCTIONAL RECOVERY AND TIME TO HOSPITAL DISCHARGE COMPARED TO CONVENTIONAL JIG-BASED TOTAL KNEE ARTHROPLASTY: A PROSPECTIVE COHORT STUDY

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Objective: Robotic-arm assisted surgery improves accuracy of bone resection and implant positioning in total knee arthroplasty (TKA) but it is unknown how this translates to early rehabilitation and hospital discharge. The objective of this study was to compare early postoperative functional outcomes and time to hospital discharge between conventional jig-based TKA and robotic-arm assisted TKA.
Methods: This prospective cohort study included 40 consecutive patients undergoing conventional jig-based TKA followed by 40 consecutive patients receiving robotic-arm assisted TKA. All surgical procedures were performed by a single-surgeon using the medial parapatellar approach with identical implant designs and standardised postoperative inpatient rehabilitation. Inpatient functional outcomes and time to hospital discharge were collected in all study patients by independent observers. Complications were recorded for 30 days following surgery.
Results: There were no differences in baseline characteristics between patients undergoing conventional jig-based TKA and robotic-arm assisted TKA with respect to age (p=0-32), gender (p=0.50), body mass index (p=0.17), ASA score (p=0.88), and preoperative haemoglobin level (p=0.82). Robotic-arm assisted TKA was associated with reduced postoperative pain (P< 0.001), decreased analgesia requirements (p< 0.001), reduced intraoperative blood loss (p< 0.001), shorter time to straight leg raise (p< 0.001), decreased number of physiotherapy sessions (p< 0.001), and improved maximum knee flexion at discharge (p< 0.001) compared to conventional jig-based TKA. Median time to hospital discharge in robotic-arm assisted TKA was 77 hours (IQR, 74-81) compared to

105 hours (IQR, 98-126 hours) in conventional jig-based TKA (p< 0.001). There was no difference in postoperative complications between the treatment groups within the 30 days follow-up period.
Conclusion: Robotic-arm assisted TKA is associated with decreased pain, improved early functional recovery, and reduced time to hospital discharge compared to conventional jig-based TKA.
Clinical relevance: Robotic-arm assisted surgery improves postoperative rehabilitation and time to hospital discharge in patients undergoing TKA.
Conflict of Interest: Nothing to disclose

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IS ROBOTIC-ARM ASSISTED UNICOMPARTMENTAL KNEE ARTHROPLASTY ASSOCIATED WITH EARLY RESTORATION OF FUNCTION AND SHORTER HOSPITAL STAY?

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Background: Robotic-arm assisted surgery improves accuracy of implant positioning in unicompartmental knee arthroplasty (UKA) but the impact of this technology on postoperative rehabilitation and hospital discharge is unknown. The objective of this study was to compare early postoperative functional outcomes and hospital discharge between conventional jig-based UKA and robotic-arm assisted UKA.
Methods: This prospective cohort study included 120 patients with symptomatic medial compartment knee osteoarthritis undergoing primary UKA performed by a single-surgeon. This included 60 consecutive patients undergoing conventional jig-based UKA followed by 60 consecutive patients receiving robotic-arm assisted UKA. All surgical procedures were performed using the standard medial parapatellar approach for UKA, and all patients underwent the same postoperative rehabilitation programme. Time to attainment of early functional outcomes, hospital discharge, and complications during the 30 days follow-up period were recorded by independent observers.
Results: Robotic-arm assisted UKA was associated with reduced postoperative pain (P< 0.001), decreased opiate analgesia requirements (p< 0.001), shorter time to straight leg raise (p< 0.001), decreased number of physiotherapy sessions (p< 0.001), and increased maximum knee flexion at discharge (p< 0.001) compared to conventional jig-based UKA. There was no difference between robotic-arm assisted UKA and conventional jig-based UKA relating to operating time (64.2 ± 8.8 mins vs 62.0 ± 6.4 mins respectively, p=0.56). Mean time to hospital discharge was reduced in robotic UKA (42.5 ± 5.9 hours vs 71.1 ± 14.6 hours respectively, p< 0.001) compared to conventional UKA. There was no difference in postoperative complications between the two groups during the 30 days follow-up period.
Conclusion: Robotic-arm assisted surgery helped to further improve inpatient rehabilitation and decrease time to hospital discharge compared to patients undergoing conventional jig-based techniques for UKA.
Conflict of Interest: Nothing to disclose

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IATROGENIC BONE AND SOFT TISSUE TRAUMA IN ROBOTIC-ARM ASSISTED TOTAL KNEE ARTHROPLASTY COMPARED TO CONVENTIONAL JIG-BASED TOTAL KNEE ARTHROPLASTY: A PROSPECTIVE COHORT STUDY AND VALIDATION OF A NEW CLASSIFICATION SYSTEM

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Background: The objective of this study was to compare macroscopic bone and soft tissue injury between robotic-arm assisted total knee arthroplasty (RA-TKA) and conventional jig-based total knee arthroplasty (CJ-TKA), and create a validated classification system for reporting iatrogenic periarticular soft tissue and bone injury following TKA.
Methods: This study included 30 consecutive CJ-TKAs followed by 30 consecutive RA-TKAs performed by a single-surgeon. Intraoperative photographs of the femur, tibia, and periarticular soft tissues were taken prior to implantation of prostheses. Using these outcomes, a macroscopic soft tissue injury (MASTI) classification system was developed to grade iatrogenic soft tissue and bone injuries. Inter- and intra-observer validity of the proposed classification system was assessed.
Results: Patients undergoing RA-TKA had reduced medial soft tissue injury in both passively correctible (p=0.048) and non-correctible varus deformities (p=0.020), more pristine femoral (p< 0.001) and tibial bone cuts (P=0.005), and improved MASTI scores (p< 0.001) compared to CJ-TKA. There was high inter-observer (ICC 0.92 [95% CI: 0.85-0.97], p< 0.001) and intra-observer agreeement (ICC 0.95 [95% CI: 0.78- 0.98], p< 0.001) of the proposed MASTI classification system.

Conclusion: There is reduced periarticular soft tissue injury and bone trauma in patients undergoing RA-TKA compared to CJ-TKA. The proposed MASTI classification system is a reproducible grading system for describing the degree of bone and soft tissue injury during TKA.
Clinical relevance: Robotic-arm assisted TKA was associated with reduced bone and soft tissue injury compared to conventional jig-based TKA. The MASTI classification accurately and reproducibly describes the extent of soft tissue injury in TKA.
Conflict of Interest: Nothing to disclose

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ROBOTIC-ASSISTED TOTAL KNEE ARTHROPLASTY MAINTAINS POSTERIOR CONDYLAR OFFSET WITH GREATER FEMORAL COMPONENT FLEXION, SMALLER COMPONENT SIZE AND BETTER EARLY FUNCTIONAL RESULTS

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Background: Restoring native posterior condylar offset ratio (PCOR) is important for optimizing stability, range of motion, and functional outcomes after total knee arthroplasty (TKA). Robotic-assisted surgery improves accuracy of implant positioning but it is unknown how this affects the postoperative PCRO compared to conventional jig-based TKA. We hypothesized that preoperative computerized tomography (CT) planning and intraoperative adjustments to femoral bone resection improve the accuracy of native PCOR restoration compared to conventional jig-based TKA.
Methods: A surgeon's first 31 robotic-assisted TKAs were compared with the immediate preceding 47 conventional TKAs. Pre-operative and post-operative posterior condylar offset and tibial slope were assessed using lateral plain radiographs. Femoral component flexion was compared between both groups. In-hospital functional performance was compared between groups.
Results: There were no demographic differences between the groups. There was no difference in post-operative PCOR between conventional and robotic-assisted TKAs (0.5±0.04 versus 0.5±0.04). PCOR was restored in robotic assisted TKAs but not conventional TKA (P=0.03). Robotic-assisted TKA femoral components were more flexed compared to conventional TKA femoral components (10.3°±4.5 versus 5.3°±3.5; P < 0.001). Femoral components were smaller relative to pre-operative AP diameter in the robotic-assisted group compared with the conventional group (P=0.03). There was no difference in post-operative slope measure of error between groups (P=0.13). Patients undergoing robotic-assisted TKAs went home earlier, performed straight-leg raise sooner, required less therapy and had greater flexion at discharge (P< 0.001).
Conclusion: Robotic-assisted total knee arthroplasty maintains posterior condylar offset with greater femoral component flexion, smaller component size and better immediate post-operative functional results.
Conflict of Interest: Fares Haddad is a paid speaker, consultant and receives royalties and reseach support from Stryker. F Rowan, J Pietrzak, M Donaldson and B Kayani have no disclosures

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IS TOPICAL VANCOMYCIN AN OPTION? A RANDOMIZED CONTROLLED TRIAL TO DETERMINE THE SAFETY OF TOPICAL USE OF VANCOMYCIN POWDER IN PREVENTING POST-OPERATIVE INFECTIONS IN TOTAL KNEE ARTHROPLASTY (TKA)

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Background: Topically applied vancomycin powder has been used to decrease surgical site infection rates in spinal surgeries; however, randomized controlled trials in total joint arthroplasty are lacking. Application of vancomycin powder topically in the surgical site has theoretical benefit including high local concentration. In this study, we aimed to determine whether intra-operative topical antibiotics are safe as IV antibiotics in preventing post-surgical site infections.
Method: The trial was a randomized controlled, double blind, non-inferiority study. All patients received pre-operative IV antibiotics (cefazolin or vancomycin) within 60 minutes of skin incision. The control group received two doses of post-operative IV antibiotics (two grams cefazolin or one gram vancomycin if cefazolin allergy). In the treatment group, the orthopaedic surgeon applied one gram vancomycin powder (500 mg applied directly on prosthesis and 500 mg applied above the closed joint capsule). The incidence of acute surgical site infection was defined as positive deep cultures within 42

days of procedure. All patients with evidence of infection underwent joint aspiration for culture.
Results: After one year, 80 patients had received the topical vancomycin treatment and 85 patients had received the standard treatment. In the topical vancomycin group versus the controlled group, the average age was 64 vs 66, average BMI was 35.7 vs 33.4, number of males 33 vs 29, number of females 47 vs 56, diabetic patients 16 vs 13, and deep infections detected three vs zero. A chi square test showed a difference of 3.75%, 95% CI is -1.6017 to 10.5702, Chi-squared 3.076, DF 1, P = 0.0795.
Conclusion(s): This study demonstrated a strong trend toward inferiority of topical vancomycin in comparison to the use of IV antibiotics post-operatively in preventing deep wound infections in TKA.
Implications: The authors would caution against the sole use of intra-operative topical vancomycin in TKA at this time.
Conflict of Interest: Nothing to disclose

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ADVERSE OUTCOMES FOLLOWING ARTHROSCOPIC PARTIAL MENISCECTOMY: A STUDY OF 700,000 PROCEDURES USING THE NATIONAL HOSPITAL EPISODE STATISTICS DATABASE FOR ENGLAND
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Background: Recent clinical trial evidence has challenged the effectiveness of arthroscopic partial meniscectomy (APM) in some patient groups. Given concerns about the potential overuse of this procedure, it is important to determine the true risk of serious complications occurring following this surgery.
Methods: National hospital episode statistics (HES) data on all knee arthroscopy procedures performed in National Health Service (NHS) hospitals in England between 1997/98 and 2016/17 was acquired from NHS Digital. Complications occurring in the 90-day period following the index procedure were identified from the Classification of Surgical Operations and Procedures (OPCS-4) codes, International Statistical Classification of Diseases and Related Health Problems (ICD-10) diagnosis fields, and Office for National Statistics (ONS) mortality data. Logistic regression modelling was performed to identify predictors of complications.
Results: Through 1997-2017, 1,088,782 APMs were performed. After excluding cases with concurrent procedures, 699,965 isolated APMs were analysed. Within 90 days, pulmonary embolus (PE) occurred in 1:1282 cases (0.078%; 95% confidence interval 0.072-0.085), myocardial infarction (MI) in 1:2509 cases (0.040%; 0.035-0.045), stroke in 1:3365 cases (0.030%; 0.026-0.034), and death (in or out of hospital) occurred in 1:3226 cases (0.031%; 0.027-0.035). Further surgery was performed for infection in 1:742 cases (0.135%; 0.126-0.144). The overall rate of re-operation for any indication within 90 days was 1:165 (0.606%; 0.588-0.624). The overall rate of serious complications (PE, MI, stroke, infection requiring surgery, death) was 1:327 (0.306%; 0.293-0.319). Male sex, increasing age, and greater Charlson co-morbidity index was associated with an increased risk of serious complications.
Conclusions: These data suggest that although complications occur rarely, APM is not an entirely benign procedure. Given up to 2 million APMs are performed worldwide each year, the current focus on refined treatment indications is justified to reduce the number of complications that may occur following potentially unnecessary procedures.
Conflict of Interest: Andrew Judge has received consultancy fees, lecture fees and honoraria from Servier, UK Renal Registry, Oxford Craniofacial Unit, IDIAP Jordi Gol and Freshfields Bruckhaus Deringer, is a member of the Data Safety and Monitoring Board (which involved receipt of fees) from Anthera Pharmaceuticals, and received consortium research grants from Roche.

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FUNCTIONAL OUTCOMES FOLLOWING HIGH TIBIAL OSTEOTOMY
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Introduction: The United Kingdom Knee Osteotomy Registry (UKKOR) is an emerging registry created to provide high quality, patient-centred, outcome data to guide the treatment of osteoarthritis of the knee. High tibial osteotomy (HTO) transfers the weight bearing axis to part of the knee less affected to reduce pain.

Aim: Primary: To assess the degree of improvement in patient reported outcome measures (PROMs) following HTO for osteoarthritis.
Secondary: To asses if activity specific PROMs improve following HTO. To assess if age, smoking or body mass index (BMI) has an influence.
Methods: This is an observational study of patients undergoing HTO for unicompartmental osteoarthritis. Data is collected prospectively through UKKOR. PROMs data was analysed using a one-way ANOVA test with a Bonferroni correction to adjust for multiple comparisons.
Results: The database compiled on 1 May 2017 included 1615 entries. After duplications and incomplete records were eliminated, 569 remained. There were 403 male knees and 166 female knees. Mean age 48 years old (Range = 18 to 74). Five hundred sixty-six entries were complete for KOOS, while 551 were completed for OKS, OKS-APQ, EQ5D and EQ-VAS.
At one year, KOOS score improved significantly by 144.8 points (95% CI 114.3 to 168.3). At two years the mean score improved by 150.7 points (95% CI 98.35 to 203.1). OKS improved at one (12.14, 95% CI 10.10 to 14.18) and two-years (11.86, 95% CI 8.09 to 15.64). There is a significant improvement in OKS-APQ at one (11.62, 95% CI 10.05 to 13.19) and two-years (14.19, 95% CI 11.32 to 17.06) post-HTO. EQ5D and EQ-VAS improved. Age, smoking status and BMI do not have an effect.
Conclusions: HTO improves PROMs clinically and statistically at one- and two-years postoperatively compared with pre-operative scores. Activity specific components also improve significantly. Age, smoking and BMI did not influence outcome.
Conflict of Interest: Nothing to disclose

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CHEMICAL THROMBOPROPHYLAXIS IN PRIMARY KNEE REPLACEMENT - IS IT WORTH THE BLEEDING BOTHER?' RISK STRATIFICATION IN KNEE REPLACEMENT IS AS EFFECTIVE, AND SAFER, THAN DRUGS FOR ALL. RESULTS IN 6851 PATIENTS

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Background: Retrospective analysis of over 6,000 primary knee replacements in a single DGH from 1999-2016.
Methods: Patients were stratified prior to admission as high or low risk. Prior to 2012 low risk patients only had mechanical prophylaxis (Foot pumps). After 2012 patients had a selection of VTE prophylaxis including NOACs, aspirin, LMWH, warfarin and mechanical only.
Results: Foot pumps alone had a 0.81% DVT risk and a 0.57% PE risk, similar to low risk patients on aspirin prophylaxis (DVT 0.42%, PE 0.57%) after a primary knee replacement. Our total risk of DVT across all patients undergoing a primary total knee replacement was 0.51%, with a PE rate of 0.33%.
Conclusion: Risk stratification may be enough to identify patients who are at low enough risk post arthroplasty to not require any form of chemical prophylaxis.
Conflict of Interest: Nigel Rossiter is on the VTE committee for NICE

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THE BIOMECHANICAL EFFECTS OF ALLOGRAFT WEDGES USED FOR LARGE CORRECTIONS DURING HIGH TIBIAL OSTEOTOMY

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Objectives: While large corrections of medial opening wedge high tibial osteotomy (MOWHTO) (>10°) are associated with greater incidences of intraoperative lateral hinge fracture and reduced bone-implant stability, the insertion of an allograft wedge into the osteotomy gap has been shown to lead to satisfactory time-to-union. The purpose of this study was to investigate the biomechanical stability that an allograft wedge gives to a MOWHTO.
Methods: Ten artificial tibiae underwent 12 mm biplanar MOWHTO. Five tibiae had an allograft wedge inserted into the osteotomy gap prior to plate fixation (allograft group). The osteotomy gaps in the remaining five tibiae were left unfilled (control group). All osteotomies were fixed using the Tomofix (Depuy-Synthes) plate. Specimens from each group underwent either static compression testing or cyclical fatigue testing until failure of the osteotomy construct. Peak force, valgus malrotation, number of cycles, displacement and stiffness around the tibial head were measured.
Results: Intraoperative hinge fractures occurred in all specimens. Under static compression, the allograft group withstood higher peak forces (6.01 kN) compared with the control group (5.12 kN). Valgus malrotation of the tibial head was lower in the allograft group (2.22˚ Allograft Group; 2.85˚

Control Group); and stiffness was generally higher when an allograft was used, suggesting that allografts provide greater stability to the bone-implant construct than no graft.
Conclusion: The use of an allograft wedge during MOWHTO appears beneficial for larger corrections and in cases of intraoperative hinge fracture, due to added construct stability compared with MOWHTO without a graft.
Conflict of Interest: Nothing to disclose

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A COMPARISON OF PATIENT REPORTED OUTCOME MEASURES FOLLOWING TOTAL KNEE REPLACEMENT WITH EITHER THE DEPUY SYNTHES ATTUNE™ OR DEPUY SYNTHES PFC™ TOTAL KNEE REPLACEMENT SYSTEMS: A SINGLE BLINDED RANDOMISED CONTROLLED TRIAL

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Background: Progress in implant design is often with the intention of improving patient outcomes. However, supporting evidence for newer implants is limited to small patient cohort safety data without direct comparisons to current established prostheses. Our aim was to perform a randomised, blinded controlled trial comparing patient outcomes between the newly released Attune™ and the established PFC™ prostheses (DePuy Synthes™).
Methods: 150 patients were randomised to TKR with either the PFC™ CR or the Attune™ CR implants. Clinical and PROMS data were collected prospectively including Oxford Knee Score (OKS), Oxford APQ, EQ5D-5L, Pain VAS and Knee Range of Movement (ROM). Data was collected pre-operatively and at 6 weeks, 12 weeks and 1 year post surgery.
Results: 76 patients were randomised to receiving the Attune™ TKR and 74 to the PFC™ TKR. 3 patients withdrew from the study leaving 147 patients for analysis. There were no significant differences between the demographics of both groups (Grade of surgeon $p = 0.171$, BMI $p= 0.5$, ASA $p = 0.56$).
ANOVA tests were performed to assess the impact of time of assessment and treatment effect on the OKS, OKS APQ and Knee ROM. Although there was a significant improvement with time in all three outcome measures across the study period, the effect of implant type was not significant at any time point (OKS $p = 0.824$, APQ $p = 0.67$, ROM $p = 0.840$).
Conclusion: The results of this study have not identified any significant difference in the functional outcomes between the Attune™ and the PFC™ Total Knee Replacement systems. We did not observe any early implant related failures in our cohort.
Implications: Patient outcomes following TKR are multi-factorial and this study did not reveal any association between a new implant design and improved patient outcomes.
Conflict of Interest: Professor T Board and Mr A Gambhir provide educational and consultancy work to DePuy Synthes.

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RECONSTRUCTION OF THE RUPTURED EXTENSOR MECHANISM OF THE KNEE USING A POLYTAPE: A RETROSPECTIVE OUTCOME STUDY

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Background: Rupture of extensor apparatus of knee is an uncommon injury with serious implications of prolonged rehabilitation and postoperative functional recovery specifically extensor lag and limited range of motion. Polytape from Neoligaments is synthetic non-absorbable polyester ethylene terephthalate. It includes an open weave mesh technology, designed to act as scaffold for soft tissue ingrowth and neoligament formation. The aim of our study is to evaluate the outcome of extensor mechanism reconstruction using Polytape.
Methods: The study includes retrospective analysis of 49 knees in 47 patients who underwent extensor mechanism reconstruction using Polytape (30 x 800 mm) between 2008 and 2017. All patients underwent dedicated rehabilitation programme as per recommended protocol by neoligaments for 12 weeks after surgery. Patients were evaluated by interview, physical examination, knee scoring system including Lysholm, Knee Society, Knee Function Score and Kujala score.
Results: Of 47 patients (Male 35/female 12), 37 patients were available for final follow up; Four patients died due to unrelated causes and six patients lost to follow up. Among 37 patients, 20 underwent patellar tendon repair (4TKR/16native) and 17 had quadriceps tendon repair (all native). Mean age of patient was 59.6 years (29-86). Average duration of follow up was 48 months (6-101

months). At final follow up functional scores including Lysholm score, Knee society score, Knee function score and Kujala patella score showed statistically significant improvement compared to preoperative scores with 38.79 & 82.61, 45.25 & 86.02, 45.71 & 88.84 and 36.25 & 78.40; respectively($p < 0.05$). One patient underwent revision repair for re-rupture patellar tendon, one had reoperation for lateral patellar release, one developed soft tissue lump at quadriceps insertion site diagnosed as calcific deposits on ultrasound.
Conclusion: Polytape provides good functional outcome following extensor mechanism injury, with success rate of >90% enabling early rehabilitation and early return to normal function.
Conflict of Interest: Nothing to disclose

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A PROSPECTIVE COMPARATIVE STUDY BETWEEN PFO PROXIMAL FIBULAR OSTEOTOMY PLUS STEM CELL THERAPY OF KNEE JOINT VERSUS PROXIMAL FIBULAR OSTEOTOMY ALONE IN TREATMENT PROTOCOL OF KNEE JOINT OSTEOARTHRITIS GRADE II, III

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Methods: From January 2016 to January 2018, 100 patients with knee joint osteoarthritis grade II, III. Classified into two group after exclusion-inclusion criteria of knee joint OA. Group A, 50 patients who underwent proximal fibular osteotomy plus Stem cell therapy in the knee osteoarthritis grade II, III. Group B, 50 patients underwent PFO alone without usage stem cell therapy inside knee joint. Both of methods were followed up radiographically to obtained preoperative & postoperative, analyses the alignment of weight-bearing of whole lower extremity and ratio of the knee joint space (medial/lateral compartment). Both of method Knee joint was assessed preoperative & postoperative using (Womac Scoring Index, Lequesne´s Index Scoring analysis, and knee ambulation activities were evaluated using the American Knee Society score) preoperatively and postoperatively.
Results: pain relief was observed in almost all 100 patients with knee joint osteoarthritis grade II, III for both groups, Most patients improvement in walking postoperatively. The weight-bearing radiographs for both limbs showed increase in medial knee joint space postoperatively, plus correction of alignment were observed in the whole lower extremity radiographs for both group patients. **In both groups, A and B significant reduction with improvement in the mean of both Modified Lequesne´s and Modified WOMAC scores, also** knee ambulation activities were evaluated using the American Knee Society score, preoperatively and postoperatively. F**rom baseline there were significant statistical, clinical plus functional outcome improvements at 12, 24 months for group A superior to group B in the three scoring index (P-value < 0.0001.**
Conclusions: This study confirm improvement in knee joint Osteoarthritis using the effectiveness of proximal fibular osteotomy Plus Stem cell therapy knee joint are superior to PFO alone for pain relief, improvement with correction of medial joint space, plus function outcome with decrease stiffness rate in patients with knee osteoarthritis grade II, III.
Conflict of Interest: Effectiveness of proximal fibular osteotomy Plus Stem cell therapy knee joint versus PFO alone in treatment protocol of knee joint OA Grade II, III as a new surgery for pain relief, improvement plus correction of medial joint space, with improvement function outcome in patients with knee osteoarthritis grade II, III.

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UNICOMPARTMENTAL KNEE REPLACEMENT USAGE IN ENGLAND: AN ANALYSIS OF THE NJR SURGEON AND HOSPITAL PROFILE DATA

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Background: Unicompartmental knee replacement (UKR) usage reported by the NJR remains stable at 9% of all primary arthroplasties. Recent literature suggests that 40% of knees may be candidates for UKR and that surgeons with usage >20% have lower revision rates. We were interested in the variability of usage by surgeons and hospitals.
Methods: We calculated the UKR usage over the past 3 years for each surgeon and hospital performing knee arthroplasty in England using the NJR website. A questionnaire was sent to high volume TKR surgeons who did < 5UKRs.
Results: The usage of UKR by individuals ranged from 0 in a practice with over 2000 TKRs, to 83%. Only 12% of ´knee specialists´ achieve 20% usage but this compares with just 5% of lower limb arthroplasty surgeons. UKR usage in Oxford is 55% but in Colchester there were 2127 TKRs registered but < 5 UKRs. There appeared to be regional trends with just 3% and 4% usage in the North East and North West respectively, going up to 21% in the South Central region. Many high

volume TKR surgeons expressed a wish to attend a UKR training course. Fear of becoming an NJR outlier was given as a reason to avoid UKRs.
Conclusion: We are doing fewer UKRs in England than the literature suggests we should be, but there is a huge variation between individual surgeons and hospitals with regional trends.
Implications: There should be more dedicated UKR training as in many regions SpRs will have no exposure to UKR surgery. We welcome a change to the NJR outlier reporting system.
Conflict of Interest: Nothing to disclose

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PRESSURES AT THE BONE-CEMENT INTERFACE. A CADAVERIC STUDY OF KNEE ARTHROPLASTY CEMENTATION
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Background: Knee arthroplasty is an increasingly popular operation with more than 88,000 primary total knee replacements recorded in the UK National Joint Registry during 2016. Cement is the most widely used fixation method (84.9%) but multiple different techniques are currently being used in clinical practice, with little specialist consensus or evidence-basis as to the most appropriate technique.
With attempts to enhance recovery, tourniquet-less surgery is becoming more popular. This technique, however, raises concerns of potential 'lamination' at the bone-cement interface (BCI) with arteriolar bleeding preventing cement inter-digitation. This study aims to assess the pressure-time profile at the BCI.
Methods: Preliminary simulation was performed on plastic “sawbones” to standardise cementation technique and validate pressure evaluation instrumentation. After this, cadaveric testing was performed on 4 fresh-frozen cadavers (8 knees) with flat pressure-transducers at pre-determined points on the femur and tibia. After cementation, implantation and impaction of prostheses, pressurisation was performed by extending the knee either to 0˚ (4 knees) or 30˚ flexion (4 knees).
Results: Insertion and impaction of both femoral and tibial components produced only momentary pressure spikes. After insertion of the tibial polyethylene spacer and extension, however, pressures rose rapidly. The highest pressures were seen anteriorly with mean tibial pressures exceeding mean femoral pressures (65kPa versus 61kPa respectively). Mean pressures were greater in full extension than at 30˚ flexion. As the knee remained static and the cement set, pressures gradually decreased. Pressures at the BCI were consistently above accepted arteriolar bleeding pressures (35mmHg, ~5kPa).
Conclusions: It can be concluded that the risk of BCI bleeding preventing inter-digitation is not substantiated in tourniquet-less knee arthroplasty as long as maintained pressurisation is utilised. Full extension creates higher mean pressures at the BCI than 30˚ flexion.
Implications: Cementation in tourniquet-less knee arthroplasty produce enough pressure at BCI to allow adequate cement inter-digitation.
Conflict of Interest: Nothing to disclose

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SIMULATED PATELLO-FEMORAL KINEMATICS CORRELATE WITH PATIENT REPORTED OUTCOMES FOLLOWING TOTAL KNEE ARTHROPLASTY
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Introduction and aims: Component alignment in Total Knee Arthroplasty has been shown to impact on postoperative PROMS though it fails to fully explain patient variation in outcomes. The resultant patellofemoral kinematics that occur may explain some of this variation. Patient specific simulations of the knee allow the kinematics of the TKA to be measured directly and these may correlate with outcome.
Method: 193 patients who underwent TKA had a post-operative CT scan. The scan was segmented, landmarked and registered to 3D implant geometry. This was inputted into a simulation validated by an Oxford Knee Rig. Patients were followed up 12 months after their surgery and their Knee Osteoarthritis Outcomes Scores (KOOS) were collected. Recursive partitioning was performed to differentiate between patients who report functional impairment whilst stair climbing and rising from

sitting.
Results: When dichotomising maximum patella compressive force at 90° of flexion, patients with a patella compressive force in the simulation of between 1400N and 1615N had a mild or greater impairment when descending stairs and rising from sitting in 20% and 24% of patients, whereas those with compressive forces outside this group had an impairment in 46% and 42%, and this difference was significant (p=0.050) for the descending stairs group.
Similar results were found for the tibio-femoral rotation at 45° flexion, with the subgroup of between 0.17° and 4.43° internal rotation in the tibia having difficulty in descending stairs in 27% of patients and rising from sitting in 29% of patients compared to 50% (p=0.004) and 45% (p=0.048) for the outliers.
Conclusions: Statistically significant correlations between PROM's and simulated patello-femoral joint kinematics were observed. Further work is required to validate these findings, and assess their potential benefits in patient specific pre-surgical planning.
Conflict of Interest: Founder/employed by 360 Knee Systems

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MID-TERM OUTCOMES OF COMBINED ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION AND MEDIAL UNICOMPARTMENTAL KNEE REPLACEMENT
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Background: Oxford unicompartmental knee replacement (UKR) requires a functionally intact anterior cruciate ligament (ACL) and bone-on-bone medial osteoarthritis. Occasionally patients meet the indications but with a previously reconstructed ACL or are ACL deficient, and can be treated with combined UKR and ACL reconstruction (ACLR). The aim of this study was to describe midterm outcomes of this combined procedure and compare this to the outcomes of UKR with an intact ACL.
Methods: We identified knees with staged or simultaneous ACL reconstruction and medial UKR from a prospectively followed UKR cohort and report the mean Oxford Knee Score (OKS), mean Tegner activity score and Kaplan-Meier survival estimates. We matched these to UKR with ACLs.
Results: Seventy-six consecutive UKR and ACLR were identified with average age of 53 (range 36 to 71) and mean follow up of 6 years (1-15). There was significant improvement in OKS and Tegner score following surgery. At most recent follow up, OKS was 41.0 (SD 8), and Tegner score 3.6 (SD 1). There were three revisions occurring at a mean of 5 years post operatively; one due to deep infection in a diabetic patient, and two due to lateral disease progression. The 5, 10 and 15 year survival estimates were 97.0% (95% CI 93-100), 92.1% (CI 83-100), and 92.1% (CI 83-100). There was no difference in OKS or Tegner score compared to UKR with intact ACLs.
Conclusion: These results demonstrate good midterm function and survival of selected patients who have undergone ACLR and medial UKR. In addition, their function was similar to UKR with intact ACLs.
Implications: ACL reconstruction and combined or sequential medial UKR is safe and effective in selected ACL deficient knees, who tend to be young and active.
Conflict of Interest: One or more of the authors has received benefits for personal or professional use from a commercial party, Zimmer Biomet, related directly to the subject of this article. Benefits have also been directed to a University research fund with which one or more of the authors are associated.

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FUNCTIONAL OUTCOME AND REVISION RATE ARE INDEPENDENT OF LEG ALIGNMENT FOLLOWING MEDIAL OXFORD UKR
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Background: The surgical aim of medial Oxford unicompartmental knee replacement (UKR) is to accurately restore normal ligament tension in the knee, thereby restoring normal kinematics. This results in a return to pre-arthritic alignment, which is frequently varus. The aim of this study was to investigate the relationship between post-operative limb alignment and post-operative function and implant revision.
Methods: We used a consecutive, prospective cohort of 1000 cemented Oxford medial UKR with a mean ten year follow up. We grouped the knees according to their mechanical alignment as marked varus (about 10°), mild varus (about 5°), neutral and valgus. Mean Oxford Knee Score (OKS) was calculated at five and ten years. Revision risk was quantified with component-time incidence rates,

and tested with a log-rank test.
Results: Post-operative alignment was available for 891 (89%) UKR. Sixty-seven knees (7%) were in marked varus, 308 (35%) in mild varus, 508 (57%) in neutral, and 8 (1%) in valgus. The number in valgus (8) was too small for further analysis. From marked varus to neutral, mean OKS at five years were 42 (SD 7), 41 (8), and 41 (8), and at ten years 42 (7), 41 (8), and 39 (9). These differences were not significant. Revision incidence rates per 100 component years from marked varus to neutral were 0.49 (95% CI 0.2 to 1.5), 0.36 (CI 0.2 to 0.7), and 0.54 (CI 0.4 to 0.8) (p=0.53).
Conclusion: Postoperative varus mechanical alignment of about 10° was present in 7%, and of about 5° in 35%. There were no significant differences between alignment groups in terms of functional outcome or revision rate.
Implications: This data supports the surgical technique for the Oxford UKR, which aims to restore ligament tension and therefore pre-arthritic alignment rather than neutral mechanical alignment.
Conflict of Interest: One or more of the authors has received benefits for personal or professional use from a commercial party, Zimmer Biomet, related directly or indirectly to the subject of this article. Benefits have also been directed to a University research fund with which one or more of the authors are associated.

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RADIOGRAPHIC EVALUATION OF REVISED UNICOMPARTMENTAL KNEE REPLACEMENT IN THE NATIONAL JOINT REGISTRY
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Background: The reported revision rate of unicompartmental knee replacement (UKR) is much higher in national registries than large cohort studies. This study aimed to understand why the UKR revision rate in the National Joint Registry (NJR) is high.
Methods: We reviewed pre-primary, post-primary, and pre-revision anteroposterior and lateral radiographs of 107 failed Oxford UKR registered with the NJR between 2006 and 2010.
Results: The recommended indications were satisfied in 70%, with 29% not demonstrating bone-on-bone arthritis. Significant technical errors were seen in 59%. Pre-revision radiographs were mal-aligned, and therefore potentially uninterpretable, in 53%. No reason for revision was seen in 67%. Reasons for revision were disease progression (10%), tibial component loosening (9%), dislocation of the bearing (7%), infection (6%) femoral component loosening (2%), and peri-prosthetic fracture (2% - one femur, one tibia). Revision possibly took place due to gross component malalignment in one knee (1%) and for bearing impinging on cement in one knee (1%).
Conclusion: Only 20% of the revised UKR were implanted for the recommended indications, using appropriate surgical technique and had a mechanical problem necessitating revision. The reasons for the inappropriate revisions include inappropriate patient selection for primary surgery, technical errors with the operation, and inadequate radiographs.
Implications: The majority of UKR revisions reported by the NJR could be avoided if surgeons adhered to the recommended indications, used appropriate surgical techniques and only did a revision if there was a mechanical problem. This could possibly be achieved by better education.
Conflict of Interest: One or more of the authors has received benefits for personal or professional use from a commercial party, Zimmer Biomet, related directly or indirectly to the subject of this article. Benefits have also been directed to a University research fund with which one or more of the authors are associated.

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AN AGE-STRATIFIED, PROPENSITY MATCHED COMPARISON OF TOTAL AND MEDIAL UNICOMPARTMENTAL KNEE REPLACEMENT
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Background: There is controversy about the relative merit of medial unicompartmental and total knee replacement (UKR and TKR). This is primarily because most comparisons are unmatched and UKR tends to be done in younger patients. The aim of this study was to compare functional outcomes by age-strata in a matched cohort.
Methods: We identified two separate, large, prospective cohort studies (multi-centre TKR, single

centre UKR). We propensity score matched by age-strata (< 60 years at operation, 60 to < 75, and 75+) 2,252 TKRs with 1000 UKRs on weight, sex and pre-operative Oxford Knee Score (OKS). Median OKS was calculated at five and ten years by age-strata, and groups compared with Mann-Whitney-U tests.
Results: The groups were well matched. At five and ten years respectively 794 and 374 cases were matched equally between TKR and UKR. The results varied by time of follow-up, and are reported TKR vs UKR. The median OKS at five years for age < 60 was 37 vs 44 (n=166, p< 0.01), 60 to < 75: 41 vs 44 (n=350, p< 0.01), and 75+: 38 vs 43 (n=278, p< 0.01). The median OKS at ten years for age < 60 was 33 vs 42 (n=86, p=0.01), 60 to < 75: 38 vs 42 (n=178, p< 0.01), and 75+: 39 vs 42 (n=110, p=0.07).
Conclusion: UKR had better OKS than TKR in all age groups at both five and ten years. The differences were highly statistically significant except at ten years in those older than 75 at time of operation, who would by then be over 85. The differences in OKS were most marked in the youngest patients, and amounted to about 8 OKS points.
Implications: This study supports the use of UKR rather than TKR, in appropriate patients, in all age groups but particularly the young.
Conflict of Interest: One or more of the authors has received benefits for personal or professional use from a commercial party, Zimmer Biomet, related directly or indirectly to the subject of this article. Benefits have also been directed to a University research fund with which one or more of the authors are associated.

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COMPARISON OF ADDUCTOR CANAL BLOCK AND IPACK BLOCK (INTERSPACE BETWEEN THE POPLITEAL ARTERY AND THE CAPSULE OF THE POSTERIOR KNEE) WITH ADDUCTOR CANAL BLOCK ALONE AFTER TOTAL KNEE ARTHROPLASTY: A PROSPECTIVE CONTROL TRIAL ON PAIN AND KNEE FUNCTION IN IMMEDIATE POSTOPERATIVE PERIOD

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Background: Varying peripheral nerve blockade techniques including sciatic and femoral nerve blocks and adductor canal block (ACB) have been described for postoperative pain relief. Although ACB provides analgesia to peri-patellar and intra-articular aspect of knee, it doesn't relieve the invariably severe posterior knee pain. The recent technique of ultrasound-guided local anesthetic infiltration of the interspace between popliteal artery and the capsule of posterior knee (IPACK) has shown to provide significant posterior knee analgesia. We postulated that the combination of ACB+IPACK will provide better pain relief and improved knee function than ACB alone.
Methods: A prospective study was conducted from September 2016 to March 2017 in our institution in 120 patients undergoing unilateral total knee arthroplasty under spinal anaesthesia. The initial 60 consecutive patients received ACB+IPACK (Group 1) and the subsequent 60 patients received ACB alone (Group 2). Visual analogue scale (VAS) for pain was recorded at 8 hours postoperatively, postoperative days (POD) 1 and 2. As secondary outcome measures, POD2 range of movement (ROM) and ambulation distance (number of steps walked on POD3) were recorded.
Results: Sequential VAS scores 8 hours postoperatively, on POD 1 and 2 showed significant improvements (p< 0.005) in Group 1 vs Group 2. The mean POD2 ROM in Groups 1 and 2 were 71.8° and 62.2° respectively (p< 0.05). Similarly, ambulation distance was better in Group 2.
Conclusion: ACB+IPACK is a promising technique that offers improved pain management in the immediate post-operative period without effecting the motor function resulting in better ROM and ambulation compared to ACB alone.
Implications: Appropriate peri-operative pain management has been shown to result in faster recovery and rehabilitation which translates into superior functional outcomes in post-TKA patients. Concurrent application of ACB with IPACK has demonstrated excellent pain control and thereby, improved patient satisfaction and care.
Conflict of Interest: Nothing to disclose

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SYNOVASURE ALPHA-DEFENSIN IS UNRELIABLE IN THE DIAGNOSIS OF LOWER LIMB PERIPROSTHETIC JOINT INFECTION

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Background: Periprosthetic joint infection (PJI) is a major complication of total joint arthroplasty. It is

of particular concern due to effects on patient morbidity and economic healthcare burden. Establishing a prompt diagnosis is essential but often challenging as the clinical presentation of PJI varies. Currently no gold standard test is available for the detection of PJI. Synovasure, an alpha-defensin lateral flow assay has shown promise in the intraoperative detection of PJI. The purpose of this study was to evaluate the diagnostic accuracy of Synovasure in detecting or excluding PJI.
Methods: Patients undergoing revision hip or knee arthroplasty were retrospectively reviewed in a single tertiary revision arthroplasty centre between 2014 and 2017. Synovasure was performed on patients with a chronically painful prosthesis undergoing joint aspiration for diagnosis or during revision surgery. 37 patients were identified comprising 19 total hip arthroplasties and 18 total knee arthroplasties. Synovasure test results were compared to laboratory tissue sample analysis sent intraoperatively.
Results: The synovasure test achieved an overall sensitivity and specificity of 36% and 77% respectively. The overall positive and negative predictive values were 40% and 74% respectively. For total hip arthroplasties, synovasure displayed a sensitivity of 43% and specificity of 75%, with a positive predictive value of 50% and negative predictive value of 69%. For total knee arthroplasties, synovasure displayed a sensitivity of 25% and specificity of 79% with a positive predictive value of 25% and negative predictive value of 79% respectively.
Conclusions: This study illustrates a limited ability of Synovasure to reliably detect or exclude PJI during lower limb revision arthroplasty.
Implications: Based on this study, synovasure is unreliable in the diagnosis of intraoperative PJI and other diagnostic criteria as outlined by the Musculoskeletal infection society (MSIS) should be used in preference to guide the clinician to the presence of PJI.
Conflict of Interest: Nothing to disclose

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MID FLEXION INSTABILITY: AN INTRA-OPERATIVE KINEMATIC STUDY COMPARING THE SINGLE-RADIUS AND MULTI-RADIUS TOTAL KNEE REPLACEMENT

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Introduction: Pain free motion and stability of the knee joint are of prime importance in total knee arthroplasty (TKA). Design rationale can affect stability of the knee after TKA. Mid-flexion (medio-lateral) instability may be related to the design of the femoral component being either a single radius or multi-radius curvature.
Objective: The aim of this study is to quantify medio-lateral laxity during flexion after TKA using either single-radius prosthesis (SRP) or a multi-radius prosthesis (MRP).
Methods: Intra-operative kinematic measurements were performed on a consecutive series of 191 patients using a computer-based navigation system. The SRP utilised was the Triathlon TKA (Stryker, USA) and the MRP was the PFC TKA (Depuy Synthes, USA). Patients with a significant pre-operative deformity caused by severe soft tissue imbalance and those with incomplete records were excluded. Medio lateral stability was assessed after implantation by applying maximal varus-valgus stress throughout the range of flexion (0-90 degrees). Measurements were quantified at 0°, 30°, 45°, 60° and 90° of flexion. Statistical analysis was conducted using ANOVA and Pearson Correlation Coefficient on SPSS (IBM, USA) with significance set at $p< 0.05$.
Results: Ninety-nine patients underwent TKA with a MRP and 92 patients with a SRP. There is statistically significant increased movement in the varus-valgus plane of the MRP as the knee is moved through flexion ($p< 0.05$) which was not demonstrated by the SRP ($p=0.792$). At 0° of flexion, there is no significant difference in the amount of varus-valgus movement in the SRP and MRP ($p=0.438$). However, at each flexion point thereafter, there was a statistically significant difference in the amount of movement in this plane between the two prosthesis designs ($p< 0.05$).
Conclusion: Our study demonstrates that TKA femoral design (MRP/SRP) is a significant factor influencing mid-flexion laxity. This may influence the choice of implant when performing TKA.
Conflict of Interest: Nothing to disclose

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PATIENT REPORTED OUTCOMES FOLLOWING PATELLOFEMORAL ARTHROPLASTY WITH AND WITHOUT PATELLA RESURFACING; A RETROSPECTIVE SINGLE CENTRE STUDY

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Background: Isolated patellofemoral osteoarthritis (OA) occurs in around 10% of patients with symptomatic knee OA, with afflicted individuals typically presenting at young ages (< 55 years) and

whose cases can be difficult to manage. In recent years, promising mid-term results with second generation patellofemoral prostheses has renewed interest in this treatment modality.
Methods: The aims of this study were to evaluate patient reported outcomes (PROMs) both before and after patellofemoral arthroplasty and compare outcomes with patients who had undergone trochlea replacement only, versus those who also underwent patella resurfacing.
Results: In total, 63 patients were identified who had undergone patellofemoral joint replacement (PFJR) with and without patella resurfacing. Mean post-operative follow up across both groups was 3.4 years. Of those who underwent trochlea replacement only, mean WOMAC and KOOS-PF scores improved post-operatively by 10.6 points (p=0.02) and 16.8 points (p=0.02) respectively. Of the group who had patella resurfacing as part of their PFJR, mean WOMAC and KOOS-PF scores improved post-operatively by 31.5 points (p=0.006) and 16.8 points (p=0.006) respectively. Analysis of WOMAC and KOOS-PF scores for both groups pre-operatively showed groups were comparable prior to respective operative treatment (p=0.81; p=0.83 respectively). Analysis of post-operative WOMAC and KOOS-PF scores revealed no difference in post-operative outcomes between treatment groups (p=0.18; p=0.24 respectively).
Conclusions: This study is the first to report PROMs following PFJR both with and without patella resurfacing and indicates that both treatments are associated with significant improvements in PROMs post-operatively; however, patella resurfacing offers no additional improvement in PROMs compared with trochlea replacement only.
Implications: This study questions the clinical benefit of routine patella replacement as part of routine PFJR arthroplasty and indicates patient reported outcomes are no better than for patients who have trochlea replacement only.
Conflict of Interest: Nothing to disclose

3 Foot and ankle

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KINEMATIC ANALYSIS OF COMBINED SUTURE-BUTTON AND INTERNAL BRACE CONSTRUCTS FOR ANKLE SYNDESMOSIS INJURIES
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Background: Syndesmosis injuries are common with up to 25% of all ankle injuries being reported to involve an associated syndesmosis injury. These injuries are typically treated with cortical screw fixation or suture-button implants when indicated. The purpose of this study was to evaluate the ability of an internal brace to add sagittal plane translational and transverse plane rotational constraint to suture-button constructs with syndesmosis injuries. We hypothesized that the internal brace oriented in parallel with the fibers of an injured AITFL in addition to a suture-button construct would achieve physiological motion and stability at the syndesmosis through increased rotational and translational constraint of the fibula.
Methods: Fresh frozen cadaver ankles were stressed in external rotation using a custom-made ankle rig. Each ankle had simultaneous recording of US, 6 DOF kinematics of fibula and tibia, and torque as the ankle was stressed by an examiner.
Results: Only the internal brace + 2x suture-buttons and internal brace + 1x suture-button constructs were found to be significantly different than the injured state (P=.0003, P=.002) with mean external rotation of the fibula. There were several other significant differences found in other planes of motion.
Conclusion: Overall, the most important finding of this study was the addition of an internal brace to suture-button constructs provided a mechanism to increase external rotational constraint of the fibula. This study provides a mechanistic understanding of how the combined suture-button and internal brace construct provides an anatomically similar reconstruction of constraints found in the native ankle. However, none of the constructs examined in this study were able to fully restore physiologic motion.
Implications: Standard cortical screw and suture-button fixation constructs have been thoroughly studied biomechanically and clinically, but the introduction of an internal brace for fixation has yet to be studied in the context of syndesmosis injuries.
Conflict of Interest: Donation in Kind Grant by Arthrex for supplies for the study without salary or benefits. Dr. Stewart received <$3000 in speaking fees from Arthrex but no pay directly associated with the work submitted.

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FIRST MTP JOINT FUSION USING CUP AND CONE REAMERS WITH CANNULATED SCREWS: A RETROSPECTIVE STUDY OF CLINICAL AND COST EFFECTIVENESS

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Background: Fusion of first metatarsophalangeal joint (MTPJ) is the gold standard surgery for significant Hallux Rigidus. A number of different techniques for first MTPJ fusion are described in literature. We describe our technique of first MTPJ fusion using combination of Cup and Cone reamers for joint surface preparation and two crossed cannulated screws for fixation. To our knowledge this is the single largest series using this technique of first MTPJ Fusion.
Objectives: Our aim was evaluate the clinical and cost effectiveness of this technique.
Methods: This is a retrospective review of 166 consecutive first MTPJ fusion in 147 patients performed using cup and cone reamers along with two crossed cannulated screw fixation. All procedures were performed by/under direct supervision of the senior author (MB). The demographic data and comorbidities of the patients were collected from digital records and radiographs were evaluated by two independent co-authors(SQ,MA) to document fusion status. The statistical analysis were performed using SPSS version 20. We have used PROCESS(EQUATOR) guidelines for reporting our results.
Results: Radiological non-union was seen in 6.6%(11/166) cases However, only four cases of the non-union were clinically symptomatic and were revised using bone graft and locking plate. The was a statistically significant difference in union rates among males and females ($p < 0.001$) . However, diabetes(p value 0.2), inflammatory arthritis(p value 0.2), steroids(p value 0.4), immunosuppressant (p value 0.54), smoking(p value 0.5) and hallux valgus (p value 0.5) do not have a significant impact on the union.
Conclusions: The union rate of first MTPJ fusion using cup and cone reamers plus cannulated screws is comparable to other techniques with the advantage of it being simple and less expensive as compared to the use of a plate.
Conflict of Interest: Nothing to disclose

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DIAGNOSTIC VALIDATION OF DYNAMIC ULTRASOUND EVALUATION OF SUPINATION-EXTERNAL ROTATION ANKLE INJURIES

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Background: Ankle syndesmosis injuries are common and range in severity from subclinical to grossly unstable. Definitive diagnosis of these injuries can be made with radiographs if the injury is severe enough, but often is missed when severity or image quality is low. CT and MRI can provide early definitive diagnosis regardless of severity, but are costly and introduce the patient to radiation when CT is used. Ultrasound diagnosis may circumvent many of these disadvantages by being cheap, efficient, and able to detect subtle injuries without excessive radiation exposure. This study evaluates the ability of ultrasound to detect subtle SER ankle syndesmosis injuries with a dynamic external rotational stress test.
Methods: Nine all male fresh frozen specimen where secured to an ankle rig and stress tested to 10 Nm of external rotational torque with ultrasound monitoring at the tibiofibular clear space. The ankles were subjected to syndesmosis ligament sectioning and repeat stress measurements of the tibiofibular clear space at peak torque. Measurements were repeated 3 times and averaged and analyzed using repeated one-way ANOVA.
Ankle States Examined:
1. Intact State
2. 75% of AITFL Cut
3. 100% of AITFL Cut
4. Fibula FX - Cut 8 cm proximal
5. 75% PITFL Cut
6. 100% PITFL Cut

Results: Dynamic external rotation stress evaluation using ultrasound was able to detect a significant difference between the uninjured ankle tibiofibular clear space of 4.5 mm and the injured ankle with 100% of anterior inferior tibiofibular ligament cut 6.0 mm (P=.017). Additionally, the method was able

to detect significant differences between the uninjured ankle and all other injured states.
Conclusion: Dynamic external rotational stress evaluation using ultrasound was able to detect stage 1 Lauge-Hansen SER injuries with statistical significance and corroborates criteria for diagnosing a syndesmosis injury at ≥ 6.0 mm of tibiofibular clear space widening.
Conflict of Interest: Nothing to disclose

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IS REGIONAL ANKLE BLOCK NEEDED IN CONJUNCTION TO GENERAL ANAESTHESIA FOR FIRST RAY SURGERY? A RANDOMISED CONTROLLED TRIAL OF ULTRASOUND GUIDED ANKLE BLOCK VERSUS BLIND LOCAL INFILTRATION
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Aims: The objective of this study was to evaluate whether surgeon-delivered local anaesthetic infiltration around the first ray (metatarsal block without ultrasound guidance) was as effective as an ultrasound guided ankle block in providing post-operative analgesia after osseous first ray surgery performed under general anaesthetic.
Methods: 50 patients were recruited to a single surgeon and anaesthetist double-blinded randomised controlled trial at a single-centre.
Results: Forty-eight patients completed the study: 25 in the ankle block treatment arm and 23 in the metatarsal block arm. The demographics were comparable between groups. There was no statistical difference in visual analogue pain scores at two, six and 24 hours following the procedure between the two groups. Metatarsal block groups had a faster return of normal sensation but there was no difference in time to safe mobilisation.
Conclusion: This study demonstrates the efficacy of a surgeon delivered metatarsal block is comparable to an ultrasound guided ankle block, without the involved time, complexity, risks and skill required by the latter. Therefore, the authors would recommend the use of a metatarsal block with general anaesthesia in patients undergoing osseous first ray surgery.
Conflict of Interest: Nothing to disclose

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INVESTIGATION OF THE STRESS-STRAIN STATE OF THE FOOT MODEL BEFORE AND AFTER SURGICAL TREATMENT BY DIFFERENT METHODS
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Purpose: To compare the stress-strain state (SSS) of the bone elements of the foot in normal, and with flatfoot deformity after surgery using a variety of methods.
Materials and methods: Finite-element model of the normal and flatfoot were constructed. Identified 12 points on the foot, which determined changes.
Results: In normal foot is determined that the intensity of stress has a value ranging from 0.1 to 1.7 MPa, flatfoot - bearing surface of calcaneus from normal value 4.9MPa to 7.2 MPa and talo-calcaneal joint, 0.6 - normal value to 6.9 MPa, the talus bone the highest stress concentration is from 1.0 MPa to 13.5 MPa.
Flatfoot model, arthroereisis surgery leads to higher magnitudes of stress in the calcaneus, vary from 4.2 MPa in flatfoot deformity to 8.0 MPa in the case of arthroereisis with a conical implant and to 7.1 MPa with a cylindrical implant. The choice of material for the manufacture of implants does not matter of stress distribution in the bones of the foot.
Investigation of the SSS of arthrorisis using correction screw has the highest maximum voltage 4.2 to 9.1 in the case of setting the screw in the calcaneus, but only two control points around screw, the stress values equal to indices of non-deformation model, and the volume of surgery in this method is the most minimally invasive. Method of calcaneus osteotomy gives the most uniform stress distribution. When using corrective calcaneus-cuboid arthrodesis, there is a zone of increased stress around the tuberosity of the calcaneus - from 7.2 to 7.9. In other checkpoints, the stress level of this model same like with osteotomy of the calcaneus.
Summary: All options of surgical correction of flatfoot deformity lead to the normalization of stress-strain state, but the best is the option of using corrective osteotomy of the calcaneus.
Conflict of Interest: Nothing to disclose

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THE GEKO TM DEVICE (A NEUROMUSCULAR ELECTRO-STIMULATION DEVICE) REDUCES

PRE-OPERATIVE OEDEMA AND TIME TO READINESS FOR THEATRE IN PATIENTS REQUIRING OPEN REDUCTION INTERNAL FIXATION FOR ACUTE ANKLE FRACTURE

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Background: The development of oedema can delay surgery in patients with acute ankle fractures. Interventions that expedite swelling reduction have potentially significant clinical and economic benefits. This case-control study aimed to assess the safety and patient acceptability of the geko™ neuromuscular electrostimulation in patients with ankle fractures awaiting surgery and collect comparative data on 'readiness for theatre' against a matched historical control group.
Methods: Prospective recruitment of 20 patients admitted to a major trauma centre for fixation of an ankle fracture. All patients received the geko™ device (Intervention arm) applied above their plaster backslab. These patients were then matched to a historical cohort of surgically treated ankle fractures (Control arm) for comparison. The time until the oedema had settled to a level permitting surgery ('readiness for surgery') was recorded for each arm of the study. In addition, patient tolerability and any adverse reactions to the geko™ were recorded.
Results: The intervention and control groups were matched for age, gender, fracture type and associated initial dislocation/subluxation. Mean time until the oedema had been reduced to a level permitting surgery ('readiness for theatre') was 1.66 days in the geko™ group versus 3.66 days in the control group ($p=0.001$). Overall 60% of patients were ready for theatre following 2 days of treatment by the geko™ device compared to just 27% in the control arm ($p< 0.01$). Independent Health economic modeling suggests a saving per patient of £569 base on a 2-day reduction in hospital stay.
Conclusions: The geko™ is safe and well tolerated. It is easy to apply, it can be worn continuously, and it does not restrict patients to their bed space.
Implications: The geko™ is effective in reducing ankle oedema and accelerating readiness for theatre and may therefore allow earlier surgery and reduced length of stay in this patient group.
Conflict of Interest: Nothing to disclose

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ARE ANTIBIOTIC IMPREGNATED CALCIUM SULPHATE BEADS EFFECTIVE IN TREATING DIABETIC FOOT ULCERS?

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Background: Diabetic foot ulcers are common and difficult to treat. Calcium sulphate has been used as a bioabsorbable carrier for antibiotic delivery with success in treating osteomyelitis. A recent case series demonstrated success in treating 12 patients with calcaneal osteomyelitis with time to healing mean 4 months, however there was no control group for comparison. We aimed to determine if antibiotic impregnated calcium sulphate beads were effective in treating diabetic foot ulcers.
Methods: A consecutive retrospective cohort study of 50 patients undergoing foot ulcer debridement for deep ulcers penetrating to bone. Patients were all managed by a multidisciplinary team including a foot and ankle surgeon, a specialist nurse, an occupational therapist and a consultant physician specialising in diabetes and endocrinology. Patients were excluded if they had a simple amputation of the toe, proximal to the ulcer through normal tissue and if operative and microbiology findings were not consistent with osteomyelitis. Patients were analysed comparing one group having simple debridement (group A) and another having debridement and implantation of calcium sulphate impregnated with vancomycin and gentamycin (group B).
Results: After excluding 8 patients, 42 eligible patients remained. 29 in group A and 13 in group B. In group A the mean time to healing was 5.8 months (2 to 9 months), and in group B it was 5.5 months (2 to 13 months). There was no significant difference in ulcer healing, time to healing, reoperation rate, length of stay or mortality between the two groups ($P>0.05$).
Conclusions: Ulcer healing in patients treated with antibiotic impregnated calcium sulphate beads was not significantly improved. Healing rates in both groups were similar to the recent literature.
Implications: Simple debridement alone may be as effective as supplementation with local antibiotics in a bioabsorbable carrier.
Conflict of Interest: Nothing to disclose

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MULLER-WEISS DISEASE: A SPECTRUM OF OPERATIVE MANAGEMENT

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Introduction: Muller-Weiss Disease (MWD) is spontaneous idiopathic avascular necrosis of the navicular, resulting in the counter-intuitive plano-varus or so-called reverse flat foot. We report a single surgeon series of 17 consecutive patients who underwent surgery for symptomatic deformity secondary to MWD. These patients had previously failed conservative management. The aim of surgery was to fuse the arthritic joints and correct the deformity. We report on the outcome of surgical management in this group of patients and the lessons learnt.
Methods: In this retrospective study, we staged disease severity according to the Maceira classification. The pre-operative and post-operative functional outcomes were assessed using the American Foot and Ankle Society Scores (AOFAS). The deformity corrections were measured from weight bearing radiographs before and after surgery. We used a combination of both autologous bone graft obtained locally with synthetic graft to encourage fusion of the joints. The mid-foot joint fusions were fixed with a modern low-profile plate with locking screws.
Results: Ten (10) cases were treated with isolated talo-navicular joint (TNJ) fusion, and this included 2 cases where an additional os calcis osteotomy was performed to correct the hindfoot deformity. In 4 cases, the medial column (talo-navicular-cuneiform joint) was fused. Three (3) cases had a medial incision double fusion (TNJ and subtalar joint) performed. The deformity correction was achieved in all cases as per clinical assessment and confirmed radiographically. One patient developed a superficial infection and one patient needed further surgery to remove a loose implant. The AOFAS scores showed an average improvement of 38.5 points. Average time to fusion was 12 weeks. 15 patients were satisfied or very satisfied with the outcome of their surgery.
Conclusion: Our results demonstrate that deformity correction and fusion of arthritic joints using both autologous and synthetic bone graft is key to achieving a satisfactory outcome.
Conflict of Interest: Nothing to disclose

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THE PLANTAR SUPPORT OF THE NAVICULAR CUNIEFORM JOINT - A MAJOR COMPONENT OF THE MEDIAL LONGITUDINAL ARCH

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Introduction: Weight bearing radiographic analysis of pes planus deformities show, with varying degree of severity, a break in Mearys line, uncovering of the talar head and in increase in talar first metatarsal angle. Work by Alsousou (BOFAS 2016) has shown the break in Mearys line to occur not only at the talanavicular joint (2/3rds of cases) but also at the navicular cuneiform joint (1/3rd of cases) distal to the spring ligament and reported tibialis posterior insertion.
There is currently no anatomical studies analysing the medial longitudinal arch distal to the spring ligament insertion. We aimed to examine this area and assess the anatomy.
Methods: We examined 10 cadaveric lower limbs that had been preserved for dissection at the Human Anatomy and Resource Centre at Liverpool University in a solution of formaldehyde. The lower limbs were carefully dissected to identify the plantar aspect of the medial longitudinal arch.
Results: In all specimens, the tibialis posterior tendon inserted into the plantar medial aspect of the navicular with separate slips to the intermediate and lateral cuneiform. Interestingly, following insertion on the navicular a tendon like structure extends from this navicular insertion point to the medial cuneiform. This structure is statically inserted between the navicular and medial cuneiform allowing the pull of tibialis posterior to act on the navicular and medial cuneiform in tandem. A separate smaller plantar ligament is also present between the navicular and medial cuneiform.
Conclusion: The tibialis posterior tendon inserts into the navicular and continues onto medial cuneiform to provide a static restraint between two bony insertions, thus supporting the distal aspect of the medial longitudinal arch.
Conflict of Interest: Nothing to disclose

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DIABETIC FOOT PRESERVATION - EXCELLENT OUTCOMES OF DIABETIC FOOT ULCERATION AND OSTEOMYELITIS TREATED WITH ANTIBIOTIC LOADED STIMULAN

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Background: Osteomyelitis can be limb and life threatening with devastating consequences. There is a role for medical and surgical management. Antibiotics can be locally delivered using methyl

methacrylate or impregnated absorbable gauze. Calcium sulphate-based antibiotic therapy allows high concentration local delivery of a combination of antibiotics. Diabetic patients are predisposed to infection with varied and complex microbial load.
Methods: To assess the outcomes of patients with diabetic foot ulceration and established osteomyelitis treated with antibiotic loaded Stimulan.
Prospective data collection of patients treated with debridement; bone preserving surgery and antibiotic loaded Stimulan for osteomyelitis of the foot treated by 2 orthopaedic consultants at Wirral University Teaching Hospital Trust between March 2014 and December 2016. Clinic documentation, MDT outcome and imaging were reviewed.
Results: 70 patients treated. 7 patients managed with vancomycin 1g in Stimulan and 63 with vancomycin and gentamicin 240mg. 53/70 forefoot, 13/70 hindfoot and 4/70 midfoot.
A multitude of organisms were identified including staphylococcus aureus, citrobacter, pseudomonas, haemolytic streptococcus, e. coli and enterococcus.
All patients were discussed at MDT. Patients received augmentin and the antibiotics were changed based on microbiology results.
87% (61/70) had no further surgery within 12 months. 13% (9/70) patients went on to have further surgery linked to their initial procedure.
Follow up 12 months - 36 months.
Conclusion: In our experience, bone preserving surgery and antibiotic loaded Stimulan provides safe and effective local delivery of high concentration antibiotics in the presence of osteomyelitis reducing the need for amputation in a compliant patient with excellent outcomes over 1 year. This is the largest series in the literature with excellent outcomes.
Conflict of Interest: Nothing to disclose

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FIRST METATARSOPHALANGEAL JOINT ARTHRODESIS USING AN INTRA-OSSEOUS POST AND LAG SCREW WITH IMMEDIATE BEARING OF WEIGHT

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Background: There are multiple devices capable of stabilising the MTP joint to facilitate arthrodesis but the ideal implant should be easy to use, provide reproducible and high quality results, and ideally enable early rehabilitation so that patients can return to function quickly whilst lessening soft tissue irritation so as to avoid secondary surgeries and dissatisfaction. We prospectively evaluated the combination of the IO-Fix (Extremity Medical, NJ, USA) device which consists of an intra-osseous post and lag screw that offers these features with full bearing of weight after surgery.
Methods: 67 feet in 65 patients were treated over 31 months for either hallux rigidus, hallux valgus, or rheumatoid arthritis. After excluding patients lost to follow-up, undergoing revision arthrodesis, or concomitant first ray procedures, there were 54 feet in 52 patients available with a minimum 12 month follow-up with clinical and radiographic outcomes. All patients were treated using a similar operative technique with immediate bearing of weight in a rigid soled shoe.
Results: The mean MOXFQ score improved from 46.4 (range 18 - 64) before surgery to 30.2 (range 0 - 54) at 6 months after surgery ($p=0.02$), and 18.4 (range 0 - 36) ($p< 0.001$) at latest follow-up. Arthrodesis across the MTP joint was achieved in 52 feet (96%), at a mean of 61 days (range 39-201). Non-union was observed in two feet; superficial wound infections in two feet; and metalwork impingement in three feet.
Conclusions: In the largest reported series to date, the IO-Fix device achieved a union rate of 96% across the MTP joint when coupled with immediate bearing of weight. Significant improvements were seen in patient reported outcomes with low complication rates.
Implications: An intra-osseous post and lag screw construct combined with immediate bearing of weight can be safely and effectively used to fuse the MTP joint.
Conflict of Interest: One of the authors is a paid consultant for Lavender Medical

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DVT PROPHYLAXIS IN FOOT AND ANKLE SURGERY - COMPLETION OF FULL AUDIT CYCLE

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Deep venous thrombosis (DVT) is widely considered to be a precursor of pulmonary embolus and a risk factor for post-thrombotic syndrome and pulmonary hypertension . Risk factors are procedure specific and patient specific. Main controversy in Foot and ankle surgery is with the former. Current evidence is poor or non existent for majority of procedures.

Aims: To audit the incidence of DVT following foot and ankle procedures, to implement the recommendations and re-audit to look for improvement.
Method: Retrospective study of all Foot and ankle procedures with 403 patients in first and second audit. Type of procedure, weight bearing status, period of immobilisation, type of DVT prophylaxis given and incidence of DVT/PE were looked from casenotes. BOFAS guidelines were taken as standard.
Results: In first audit out of a total of 329 patients, 47 had ankle ORIF and 42 received chemical prophylaxis until removal of cast. Achilles tendon repairs, Ankle arthrodesis and Calcaneal ORIF received 100% chemical prophylaxis. Scarfe/Akins- 13/51 patients received chemical prophylaxis. MTP/PIP/DIP fusions, ankle arthroscopies, removal of metal work, Morton´s neuroma excision did not receive any prophylaxis. One patient died of PE following wound debridement procedure. Pre-op assessment was recommended to look into patient specific risk factors and implemented.
Second Audit - One out of 74 patient developed DVT and PE bilaterally following Morton´s neuroma excision. This patient received mechanical prophylaxis for two weeks post op and allowed to fully weight bear. Patient was a smoker and strong family history of Factor v Leiden deficiency.
Conclusion: Foot and ankle procedures are low risk procedures. Strong importance should be given to patient specific risk factors and consider family history. Thorough pre op assessment should be done for patient specific risk factors and DVT prophylaxis may be considered for those groups irrespective of the type of procedure performed.
Conflict of Interest: Nothing to disclose

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OUTCOMES FOR OPEN FASCIOTOMY IN CHRONIC EXERTIONAL COMPARTMENT SYNDROME IN A MIXED PATIENT GROUP
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Background: Chronic exertional compartment syndrome (CECS) is an infrequently encountered clinical condition for which non operative management is often ineffective, and for which compartment fasciotomy may be offered. The evidence base upon which compartment fasciotomy is recommended is heterogenous and often related to the young athletic population. We report PROMs scores and complications data for a substantial case series of open fasciotomies comprising a patient group of mixed ages and physical fitness.
Method: Using a locally maintained database, we retrospectively identified all patients who had undergone fasciotomy for CECS at our institution since the database was initiated in 2014. Prospectively collected PROMs scores (the Manchester-Oxford Foot and Ankle Questionnaire "MOXFQ") were reviewed and collated, and the medical records were reviewed to record details of complications.
Results: Thirty-two patients underwent a total of 52 open fasciotomy procedures. (M:F 3:1. 16 bilateral, mean age 39.6 years). 96% of procedures were performed by one surgeon. Pre-op mean MOXFQ index score was 48.8, and dropped to 22.9 at 6months post op, and 19.4 at 12month/final follow up. 40% of procedures involved either a minor (72%) or major (28%) post operative complication. The most commonly encountered complications were wound complications (12%) including delayed wound healing and infection, and superficial peroneal nerve symptoms (7%). 38% of our recorded complications resolved completely over time.
Conclusion: We report a considerably higher rate of complications in our mixed patient group when compared to previously reported young athletic groups. Despite this, PROMs scores suggest that patients undergoing this procedure do enjoy a significant improvement in their symptoms. The rate of superficial peroneal nerve injury seen in a group undergoing open fasciotomy with full visualisation of all neuro-vascular structures by a surgeon experienced in the condition should present a note of caution for those surgeons using mini-incisions or endoscopically assisted techniques.
Conflict of Interest: Nothing to disclose

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INSOLE USE IN FOOT AND ANKLE CLINICS - AN EVALUATION OF COMPLIANCE AND COST
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Background: The prescription of bespoke and 'off-the-shelf' (OTS) insoles for foot and ankle pathology is common but compliance is variable. The aim of this evaluation was to assess the patient-reported indication for their insoles and to evaluate the associated compliance and costs in order to

rationalise their prescription in the out-patient department.
Methods: Over a five-month period, self-reported questionnaires were given to all follow-up clinic patients. Data about indication for use, type of insole and compliance were collected prospectively. Compliance was defined as either: use of insoles most and all the time or usage greater than one month prior to the clinic review.
Results: Of the 229 completed questionnaires, the average age was 53 years with a male to female ratio of approximately 1:2.
By frequency of use, prescriptions for bunions (50%) and cushioning (64%) were the least compliant compared with neuroma/forefoot pain (69%), heel pain/ plantar fasciitis (75%), flat foot (80%). By duration of use insoles for cushioning (27%) were least used.
128 responses indicated type of insole; 103 were bespoke and 25 OTS. 32% of the bespoke group were poorly compliant and 50% using OTS. The commonest reasons for poor compliance was poorly fitting insoles, worsening of symptoms or ineffectiveness.
Total expenditure on insoles was £5,414 for the 128 patients who reported type the of insole prescribed. The cost of unused insoles in the same group was £1496.
Conclusion: There is variable compliance with insoles regardless of whether they are OTS or bespoke. Those offered for bunions or requiring cushioning were least compliant.
Implications: In view of the variable compliance, the potential for worsening symptoms and subsequent costs, healthcare professionals must be able to justify the benefits of prescribing insoles prior to doing so. In a healthcare system with finite resources cost-effectiveness is essential.
Conflict of Interest: Nothing to disclose

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RESULTS OF ANKLE ARTHRODESIS IN A REGIONAL FOOT AND ANKLE UNIT A CASE SERIES
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Background: We present a case series evaluating the results of ankle arthrodesis in our unit between January 2013 and July 2015. We have previously shown comparison of open versus arthroscopic fusion between 2008 and 2013 demonstrating fusion rates of 96% arthroscopically compared to 86% open and present further results.
Methods: Data including operation notes, clinic notes and radiographs was retrospectively collected on all patients who had undergone primary tibio-talar arthrodesis in our department between January 2013 and July 2015. Data included arthroscopic or open surgery, type of fixation, post operative protocol across different surgeons, union rates, and other complications.
Results: A total of 68 patients were included (43M, 25F) with a mean age of 57.8 (26-82). Of these patients 48 had arthroscopic fusion compared to 20 undergoing open fusion. Of the arthroscopic group 42 patients achieved union (87.5%) compared with 17 in the open group (85%). Chi square test did not show a significant difference between the 2 groups (p 0.78). Comparing fixation types 43 patients were fixed with 2 screws, 15 with 3 screws and 1 fixed with a plate. The union rate with 3 screws was slightly higher than with 2 (93.7v84.3 p 0.33). There were two wound infections in the open group compared to zero in the arthroscopic group (p 0.03).
Conclusion: Arthroscopic fusion continues to show good union rate and significantly lower wound complications.
Implications: We now perform more ankle fusions arthroscopically in our unit since our previous data (71% v 47%).
Conflict of Interest: Nothing to disclose

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COMPLIANCE WITH BOAST 12 IN A TYPICAL DISTRICT GENERAL HOSPITAL
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Background: The British Orthopaedic Association Standards for Trauma (BOAST) were expanded in August 2016 to include ankle fractures.
Objectives: We have performed a prospective study to look at how these are being followed in a typical district general hospital setting.
Study design and methods: 41 patients had their notes reviewed in three separate months between October 2016 and October 2017. Compliance with the standards was then assessed from management in the emergency department through to theatre and then follow up in fracture clinic. There was particular focus on the documentation of skin integrity, neurovascular status and reduction of the ankle in initial management. Surgically the weight bearing status post operatively was looked at

and how often the documentation of the syndesmosis was recorded in the operation note. Clinic appointments were reviewed to ensure all were seen within six weeks of surgery.
Results: Skin integrity was documented in 50% of cases, neurovascular status on arrival in 73% then in 39% post reduction, patient co-moribidities was recorded in 94% and a satisfactory mortise reduction prior to transfer from the emergency department in 23% of cases. 61% of patients had an ORIF with 48hours, with 52% of syndesmosis integrity having been recorded and 7% were allowed to weight bear immediately post operatively. 100% were seen within six weeks of surgery in clinic.
Conclusions: This study shows there are still many areas for improvement in the care of patients with ankle fractures, where we are falling short of the standards in many areas. In particular there appears to still be a reluctance to weight bear patients immediately post operatively. Education is required amongst admitting personnel in both the emergency department and among orthopaedic clinicians to ensure the standards are met for all patients.
Conflict of Interest: Nothing to disclose

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ANKLE ARTHRODESIS - THE INFLUENCE OF LIFE STYLE RISK FACTORS, PREOPERATIVE DEFORMITY AND FUSION TECHNIQUE ON UNION RATE AND TIME TO UNION

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Background: Both open (OAA) and arthroscopic ankle arthrodesis (AAA) are established procedures for end stage ankle arthritis. Purpose of this study is to investigate if union rate and time to union is affected by pre-op deformity, patientrelated factors or technique of fusion.
Methods: One hundred and twenty four Ankle Arthrodesis (AAA-97; OAA-27) procedures were performed by fellowship trained foot and ankle surgeons in a single institute between January 2005 and December2015. Data was collected on patient demographics, pre-op deformity, life style risk factors such as smoking, alcohol, BMI and diabetes. Based on preoperative deformity, patients were divided into two groups (Group 1 < 15 degrees and Group 2 ≥15 degrees). Union rate, time to union, length of hospital stay was recorded. Statistical analysis was performed using GraphPad software.Level of significance was set at $p< 0.05$.
Results: Mean age of patients was 60 (range 20-82) years with male to female ratio 3:1. Fusion rate was 93% in AAA and 89% in OAA (p=0.4). Mean time to union was 13.7 in AAA and 12.5 weeks in OAA (p=0.3). Seven patients in AAA and 3 in OAA required further procedures. Average hospital stay was 2.6 days in AAA and 3.8 days in OAA (p=0.003). Sub-group analysis of influence of preoperative deformity showed no difference in union rates of AAA versus OAA. Logistic regression analysis for correlation of union rate with smoking, alcoholism, Diabetes, BMI showed no difference.
Conclusion: Although both AAA and OAA showed good union rates, hospital stay was significantly shorter in AAA. Lifestyle factors and larger deformity did not adversely affect union rates in AAA. There was no difference in time to union between OAA and AAA.
Implication: Our study shows that AAA is reproducible method of treating end stage ankle arthritis irrespective of preoperative deformity and life style risk factors.
Conflict of Interest: Nothing to disclose

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THE USE OF PERCUTANEOUS SCREW FIXATION WITHOUT FRACTURE SITE PREPARATION IN THE TREATMENT OF 5TH METATARSAL BASE NON-UNION

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Introduction: Non-union following a proximal fifth metatarsal can cause considerable pain with high morbidity with loss of work. Although many authors advocate early surgical management of zone 3 injuries (Jones fracture), zone 1 and 2 fractures are generally expected to heal with conservative management. Uncommonly, zone 1 and 2 fractures can develop non-unions. The aim of this study was to evaluate the efficacy of closed intramedullary screw fixation for non-unions of the 5th metatarsal base.
Methods: We performed a prospective study involving all 5th metatarsal base delayed and non-unions treated in our department over 2 years. Only minimally displaced (< 2mm) adult fractures were considered for this study. The fracture pattern categorised using the Dameron classification (zone 1 - styloid process, zone 2- meta-diaphyseal area, zone 3 - proximal diaphysis). All fractures were fixed percutaneously without preparation of the old fracture site. Zone 1 and 2 injuries were fixed using a Barouk screw and zone 3 with an intramedullary 4mm screw percutaneously under radiographic guidance.

Results: 15 consecutive patients were included in this study. All had a minimum of 6 month clinical follow-up. The average time from injury to treatment was 5.4 months (range 3-12 months). There were no smokers in this patient cohort. There were 10 zone 1 injuries, 2 zone 2 injuries and 3 zone 3 injuries. All patients achieved union by 3 months post screw fixation, with 14 out of 15 achieving union by 6 weeks. All patients had resolution of symptoms. There were no complications.
Conclusions: We conclude that percutaneous fixation of 5th metatarsal base non-unions, without fracture site preparation, achieves excellent results. We believe that the screw alters the strain of the fracture, thus promoting fibrous to osseous conversion and therefore union.
Conflict of Interest: Nothing to disclose

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THE LATERAL LISFRANC LIGAMENT - A STRUCTRE OF GREAT IMPORTANCE IN MIDFOOT INJURIES
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Introduction: The anatomy of the Lisfranc complex is well understood. In contrast, the lateral tarsometatarsal ligamentous structures are under investigated. Our study aimed to identify the plantar ligamentous structures of the lateral tarsometatarsal joints and their significance in transverse metatarsal arch injuries.
Methods: We examined 10 cadaveric lower limbs that had been preserved for dissection at the Human Anatomy and Resource Centre at Liverpool University in a solution of formaldehyde. The lower limbs were carefully dissected to identify the ligamentous structures of the plantar aspect of the transverse metatarsal arch.
Results: In all specimens, the long plantar ligament blended with a transverse metatarsal ligament (Lateral Lisfranc Ligament) spanning from the 2nd to the 5th metatarsal. This transverse metatarsal ligament formed the basis of the roof and distal aspect of the peroneus longus canal. The separate long plantar ligament formed the floor of the peroneus longus canal. In addition, separate intermetarsal ligaments were identifiable connecting each metatarsal. The long plantar ligament provides a connection through the transverse metatarsal ligament, connecting the transverse and longitudinal arches of the foot.
Conclusion: The plantar ligamentous structures of the lateral tarsometatarsal joints are a combination of individual intermetatarsal ligaments and a transverse metatarsal ligament. This explains the homogenous nature of a divergent tarsometatarsal joint injury and why middle and lateral columns move as one. It also has clinical significance in the observation that in some cases lateral column instability can be overcome when the middle column is stabilised.
Conflict of Interest: Nothing to disclose

4 Spines

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HOW COMMON IS CAUDA EQUINA SYNDROME AMONGST CHILDREN WITH BOWEL/BLADDER INCONTINENCE AND BACK PAIN?
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Introduction: Cauda equina syndrome (CES) represents compression of the lower spinal nerves. If the diagnosis is missed, permanent nerve damage leads to lifelong faecal, urinary and sexual dysfunction. Magnetic resonance imaging (MRI) is the investigation of choice in CES and urgent surgical decompression is indicated. It is perceived that CES is rare and even more so amongst children. The incidence of CES amongst children has not been assessed yet. To estimate the yield of true positive cases detected with MRI scans amongst children aged 0-15 years.
Methods: We retrospectively reviewed all children who were referred to a DGH as potential CES and their MRI scan outcome. Data were obtained from the case notes and final MRI scan report.
Results: Between August 2012-July2017, 295 MRI scans of the lumbar spine were undertaken in children (0-15 years). Fifteen (5.1%) cases were referred with symptoms and signs suggestive of CES including back pain with bilateral sciatica and bowel/bladder dysfunction. The mean age was 10.4 (SD3.6) years with M: F= 5:10. None of these patients had positive MRI scan with Cauda Equna compression. Furthermore, 14 children (4.7%) were found to have lumbar disc prolapse. The mean

age was 13.3 (SD3.3) years and M: F=4:10. None of them presented with features of CES. Their main complaint was acute or chronic back pain with unilateral leg pain. None of these cases were operated for CES.
Conclusions: It is unlikely for children to have Cauda Equina compression although rare case reports are documented. We also report the occurrence of disc pathology in children that are uncommon but not rare.
Implications: We recommend that children with back pain and sciatica should undergo routine MRI to exclude disc pathology. However, a consultant should evaluate children with features of CES before the decision for an urgent scan is recommended.
Conflict of Interest: Nothing to disclose

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CT SCANS TO EXCLUDE SPINE FRACTURES IN CHILDREN AFTER NEGATIVE RADIOGRAPHS LEAD TO INCREASE IN FUTURE CANCER RISK

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Introduction: National Institute for Health and Care Excellence (NICE) guidelines suggest CT scanning for children that fulfils the criteria of significant mechanism or focal spinal pathology. Resulting radiation might subsequently increase the risk of cancer. We evaluated spinal CT scans undertaken in a district general hospital (DGH) amongst children (0-17 years) for trauma and assessed the number of radiographs and CT scans they each received at presentation.
Methods: Spinal CT scans in children from August 2015 to July 2017 were reviewed retrospectively. Data were obtained from the formal radiology reports and case notes. The radiation exposure and risk of cancer were estimated.
Results: Thirty-five children had spine CT scans and 757 spine radiographs were undertaken. Nine (25%) children had their spines scanned as a part of trauma series due to a severe mechanism of injury. Twenty-eight patients (80%) patients had spine radiographs before CT scans. Two patients (6%) had abnormalities in their radiographs prior to CT scans and the rest were obtained to exclude injuries with negative radiographs. The mean radiation dose from CT scan was 20.3 (SD: 11.3) mSV. The relative risk of missing a spine fracture in a child with a normal radiograph was not statistically significant (RR1.14 95% CI 0.3 to 4.3 and P=0.8) and the NNT for detecting a spine fracture with a normal radiograph with further CT scan was 56. The mean lifetime additional cancer risk with CT scan in this group was 0.37%. A significant (P< 0.0001) positive correlation between the radiation dose and increased cancer risk was found.
Conclusion: It is unusual to detect a fracture after negative radiographs even in children undergoing a trauma series for a significant mechanism of injury in non-polytrauma centres.
Implications: Children with isolated spine tenderness and negative radiographs might be considered for alternative non-irradiating assessments or investigations.
Conflict of Interest: Nothing to disclose

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CAN SPINAL SURGERY BE SAVED FROM LITIGATION: A REVIEW OF ALL NHS NEGLIGENCE CLAIMS 2013-2016 UNDER GETTING IT RIGHT FIRST TIME (GIRFT)

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Background: The risk for litigation in spinal surgery is greater than ever, and continues to increase. The associated costs are now so severe as to prompt withdrawal of private indemnity by the UKs largest provider. The aim of this review is to identify and analyse current trends in spinal litigation, with a view to aiding awareness and developing strategies to improve practice and reduce costs.
Methods: NHS Litigation Authority data regarding all claims involving spinal surgery between April 2013-2016 was obtained by request. This included claim status, clinical details, and cost breakdown. A predetermined protocol was used to classify claims. Conclusions were developed with the senior author.
Results: 574 claims were identified, with a potential cost of £280m.
Legal costs accounted for 51% of costs incurred during the period. 92% of this was to the defence. The most common factors identified were; undergoing a surgical procedure (337 claims, 59%),

judgement and timing (333 claims, 58%), pain (322 claims, 56%), interpretation of clinical picture (308 claims, 54%) and unsatisfactory outcome to surgery (278 claims, 48%). The most common acute pathology was cauda equine syndrome (CES) (57 claims, 38%), which accounted for £68m projected cost. 17 claims (13%) identified failures regarding MRI. 10 claims (8%) detail issues in referral or transfer.
Conclusions: Ongoing litigation represents a significant cost, regardless of outcome. Collaboration with NHS Resolution is essential to learn from case history. Robust consenting procedures such as the 'three-legged stool' model should be fully integrated to ensure realistic patient expectations. A standardised hub and spoke model is recommended for CES, whereby MRI is obtained locally and urgently upon suspected diagnosis. Where out-of-hours reporting is unavailable, images are reviewed centrally. Emergent transfer occurs upon confirmed diagnosis.
Implications: Implementation through GIRFT will improve patient care and reduce the cost of litigation.
Conflict of Interest: Nothing to disclose

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FIRST PRESENTATION OF ADOLESCENT IDIOPATHIC SCOLIOSIS - GROWING EVIDENCE FOR SCHOOL PREVENTION PROGRAMME
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Introduction: A recent RCT by Weinstein et al gives solid evidence of bracing for scoliosis treatment if started at appropriate skeletal age and curve magnitude. Currently the UK national screening committee does not recommend screening for adolescent idiopathic scoliosis (AIS). In two tertiary spinal centres serving two different but large geographical areas, we investigated whether skeletal maturity and the magnitude of curve severity in children on first presentation permitted bracing to affect the natural history, and thus the potential impact that introducing a school prevention programme (SPP) may have.
Methods: Retrospective case review of all new children referred over a 2-year period (2015-16) two tertiary spinal units, noting age at presentation, aetiology, curve magnitude, Risser grade, and intention to treat on first consultation. Four groups of patients with scoliosis were identified: early onset idiopathic, syndromic, AIS within SRS bracing criteria, AIS beyond SRS bracing criteria.
Results: Of 488 cases identified, 286 were diagnosed with scoliosis (Cobb angle >10°), 66% (n=189) were female. There were 26 with early onset scoliosis with a mean Cobb angle of 37.7° and 37 patients in the syndromic group and with a mean Cobb of 44° respectively and 223 with AIS with a mean Cobb angle of 45.4°.
We identified 57 patients with AIS and Risser grade 0-2 of which 14.4% (n=32) were within bracing range, and 11.2% (n=25) were beyond bracing magnitude (Cobb angle >40°) .
112 patients with AIS (50.2%) had a curve magnitude greater than 40° at first presentation.
Conclusion: Only 14.4% of first presentation AIS in two tertiary centres were eligable for bracing (7.6%) or early observation (6.7%) according to the SRS criteria . Bracing and VBT offer two options if detected early. Earlier detection of children is required and this study supports reintroduction of SPP.
Conflict of Interest: Nothing to disclose

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TRENDS IN UNDERTAKING CEMENT AUGMENTATION FOR VERTEBRAL BODY FRACTURES AMONGST SURGEONS IN ENGLAND & WALES OVER THE LAST DECADE
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Introduction: Cement augmentation is an accepted treatment for vertebral compression fractures to alleviate fracture-related pain and prevent deformity. The efficacy of these techniques was questioned in few randomised controlled trial (RCT) published almost a decade ago. We assessed if publication of data refuting the advantages following vertebral body fractures led to change in practice in England & Wales.
Methods: Hospital episode statistics (HES) database was searched for cement augmentation techniques including vertebroplasties (VT) and balloon kyphoplasties (BKP) undertaken in National Health Service (NHS) hospitals in England & Wales from 2006 to 2017. The results were analysed using standard statistical techniques to estimate the trends before and after 2010 when the RCT on

cement augmentations were published.
Results: There were 10465 VTs and 5820 BKPs over the last 10 years. The mean number of VTs undertaken before 2010 was 729 (SD 253.5) and that for BKP was 359(SD300.6). After 2010, the average number of cement augmentations performed included 1056 (SD 61.58) VTs and 624 (SD 57.72) BKPs. There was no significant correlation in number of VTs (r= -0.8; P=0.2) and BKPs (r= 0.4; P=0.6).
Discussion: There is a steady rise in the cement augmentation procedures in England & Wales over the last decade. There are more VTs performed overall compared to BKPs. This might be related to similar outcome of the two procedures with additional surgical time, possible complications and costs associated with BKPs. We failed to detect any significant change of practice amongst surgeons associated with the publication of the RCTs and we cannot fully explain this.
Conclusion: It is expected that surgeons will be guided by latest evidence whilst performing any procedure on their patients. We failed to detect any change in trend of cement augmentation before and after the publication of level 1 evidence in vertebral body fractures.
Conflict of Interest: Nothing to disclose

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NON SPINAL SCORING SYSTEMS AS PREDICTORS OF MORTALITY IN ELDERLY PATIENTS WITH FRACTURES OF THE ODONTOID PEG
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Introduction: Fractures of the Odontoid are associated with mortality rates of up to 37.5%, akin to fractures of the hip. The Nottingham Hip Fracture Score (NHFS) provides a percentage estimate risk of mortality. The Sernbo score was originally designed to decide on surgical management of patients with intracapsular hip fractures. More recently it has been utilised as a predictor of mortality. Unlike hip fractures there are no scoring systems specific to fractures of the Odontoid which may aid the identification or statification of higher risk patients and guide multidisciplinary management.
Methods: A retrospective study was performed of patients presenting with fractures of the Odontoid at two institutions over a ten year period. Data collected included sex, age, previous medical history, residence, mobility status, blood test results on admission, abbreviated mental test score (AMTS), presence of other injuries and presence of neurological deficit. Fractures were classified using Computed Tomography. Most patients were treated in a hard collar. Univariate and multivariate analysis was used to identify significant predictors of mortality.
Results: Ninety patients were identified. The average age was 83. Overall mortality was 16.8% at 30 days and 36% at 1 year. Univariate analysis revealed the presence of other injuries, higher NHFS and lower SERNBO score were significantly associated with mortality at both 30 days and 1 year. Neurological deficit was only associated with mortality at 30 days. A multivariate analysis revealed the NHFS score and the presence of other non spinal injuries to be the only independent predictors of mortality at 30 days and 1 year. The presence of neurological deficit and other spinal injuries were an independent predictor of 30 day mortality.
Conclusions: The NHFS may be a useful tool to identify high risk patients with fractures of the Odontoid. This can ultimately help to guide multidisplinary management.
Conflict of Interest: Nothing to disclose

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PREDICTING THE NEED FOR SURGICAL INTERVENTION IN PATIENTS WITH SPONDYLODISCITIS - THE BRIGHTON SPONDYLODISCITIS SCORE (BSDS)
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Introduction: Spondylodiscitis represents a condition with significant heterogeneity. A significant proportion of patients are managed without surgical intervention, but there remains a group where surgery is mandated.The aim of our study was to create a scoring system to guide clinicians as to which patients with spondylodiscitis may require surgery.
Methods: A retrospective analysis of patients presenting to our institution with a diagnosis of spondylodiscitis between 2005 and 2014 was performed. Data for 35 variables, characterised as potential risk factors for requiring surgical treatment of spondylodiscitis, was collected. Logistic regression analysis was performed to evaluate the predictability of each. A prediction model was

constructed and the model was externally validated using a second series of patients from 2014-2015 meeting the same standards as the first population. The predicted odds were calculated for every patient in the data set. Receiver operating characteristics (ROC) curves were created and the area under curve (AUC) was determined.
Results: 65 patients were identified with 21 requiring surgery. Six predictors: distant site infection, medical co-morbidities, the immunocompromised patient, MRI findings, anatomical location and neurology were found to be the most consistent risk factors for surgical intervention. An internally validated scoring system with an AUC of 0.83 with an AIC of 115.2 was developed. External validation using a further 20 patients showed an AUC of 0.71 at 95% confidence interval of 0.50-0.88.
Conclusions: A new validated scoring system has been developed which can help guide clinicians as to when surgical intervention may be required. Further prospective analyses are required to further validate the model.
Conflict of Interest: Nothing to disclose

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INSTRUMENTATION FOR SPINAL STENOSIS IN ACHONDROPLASIA: A SYSTEMATIC REVIEW

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Introduction: Achondroplasia is the commonest form of dwarfism. The spine has significant structural changes, with a reduced interpedicular distance, leading to spinal stenosis and cord compression. There is currently no gold standard for management of these patients, therefore we aim to conduct a systematic review of the literature to identify optimal surgical management.
Methods: A systematic search of PubMed, Embase, Cochrane Library, AMED and CINAHL was undertaken to identify all studies that evaluate outcomes in surgical management of spinal stenosis in patients with achondroplasia.
Results: 11 studies were included, encompassing 383 patients. The average age of patients was 30.8 years with a range of 6 to 64 years. 10 of the procedures were performed in the cervical region, with 466 in the thoracolumbar region. 9 of the 11 studies used decompression only, with the other 2 using a mixture of both treatment options.
The intra-operative durotomy rate was 20.2%. Other peri-operative complications were present in 18.3%. Improvement in symptoms was seen in 78% with 34.7% requiring reoperation when followed up long term. One study focused on noninstrumented management of paediatric patients and had a 100% rate of further reoperation.
Conclusion: These results show good initial symptom improvement, with relatively high rates of recurrence and reoperation. There is also a not insignificant rate of perioperative complications. In paediatric patients use of instrumentation to avoid development of future kyphosis appears to be supported by the literature.
However these are low numbered studies in varied patient populations and it is difficult to base practice on these results. We recommend commencement of a spinal registry for these patients to ensure optimal management is identified.
Conflict of Interest: Nothing to disclose

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"A 6 MONTHS RETROSPECTIVE SURVEY OF BSR DATA OF A REGIONAL SPINE CENTRE TO EVALUATE PATIENT AND STAFF COMPLIANCE REGARDING DATA ENTRY"

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Introduction: British spine registry (BSR) is a UK national registry started in 2012 and is commissioned by British Association of Spine Surgeons (BASS). Data is entered by clinicians and patient submit their outcome data electronically by email. The purpose of undertaking this survey was to evaluate our own and patient's compliance in using BSR.
Methodology: We retrospectively looked at spinal surgeries performed by T&O consultants at St George's Hospital between 1st of Feb 2017 and 31st July 2017.
Aim was to identify number of patients on whom email was submitted and their PROM data. 1st February 2017 was taken as start of survey as BSR was used on regular basis since February 2017. A 6 months period allowed 6 weeks and 6 months PROM to be included in the survey.
Results: 117 (n) spinal surgeries were performed. 82.90% (97) patient had their data entered in BSR. 52 patients were males and 65 females. The mean age was 46.75 years (range 12 years - 85 years). 53.84% (63) patients had their email address in BSR. Baseline PROM was available on 28 patients. At 6 weeks 25.64% (30) patients had submitted EQ-5D data, while VAS and ODI was submitted by 29

and 13 patients respectively.
At 6 months EQ-5D, VAS and ODI data was available on 13.67%, 14.52% and 8.54% respectively.
26 patients underwent scoliosis corrective surgery, 50% (13) patients had SRS-22 submitted at 6 weeks and 25% (7) had submitted at 6 months.
Off all patients 11.96% (14) patient had submitted satisfaction data.
Conclusion: Our early results show satisfactory compliance of 83% regarding BSR utilisation. Since this is our first pilot project we hope to see improvements as survey continues.
Future work should look at national trends and in identifying mitigating factors in data input.
Conflict of Interest: Nothing to disclose

5 Shoulder and Elbow

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BLOOD TRANSFUSION RATES FOLLOWING SHOULDER ARTHROPLASTY IN A HIGH VOLUME UK CENTRE AND ANALYSIS OF RISK FACTORS ASSOCIATED WITH TRANSFUSION

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Aims: To determine the blood transfusion rates following shoulder arthroplasty and to establish risk factors associated with increased risk of transfusion.
Materials and methods: All shoulder arthroplasty cases performed between January 2012 - March 2017 in a tertiary upper limb unit were identified. Patients who received peri-operative tranexamic acid were excluded. Retrospective review of case notes was completed to identify transfusion rate and risk factors. Univariate and multi-variate analysis was performed to analyse the association between risk factors and transfusion rate.
Results: 537 shoulder arthroplasties performed in 474 patients were included. Peri- or post-operative transfusion was required in 21 cases (3.9%). Univariate analysis suggested significant association with age ($p=0.005$), female sex (0.015), pre-operative haemoglobin / haematocrit ($p< 0.001$), peri-operative drop in haemoglobin ($p< 0.001$) ASA grade ($p< 0.001$) and transfusion rate. Only peri-operative drop in haemoglobin ($p< 0.001$) and ASA grade ($p=0.039$) retained significance on multi-variable analysis.
Conclusions: The blood transfusion rate following shoulder arthoplasty was 3.9%. Greater peri-operative drop in haemoglobin and higher ASA grade were associated with increased risk of transfusion on multivariate analysis.
Conflict of Interest: No authors have any conflicts of interest to declare

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LATARJET PROCEDURE FOR ANTERIOR SHOULDER INSTABILITY - A STUDY OF SURVIVORSHIP, COMPLICATIONS AND FUNCTIONAL OUTCOMES IN 205 SHOULDERS

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Background: The Latarjet procedure is utilised in the presence of massive glenoid bone loss, an engaging Hill-Sachs lesion and following failure of a previous surgical stabilisation. However, there is limited information regarding overall satisfaction and long-term treatment outcomes in these patients. This study aims to compare the survivorship and functional outcomes of primary and revision Latarjet procedures.
Methods: All patients treated with the Latarjet procedure for recurrent anterior shoulder instability at a tertiary orthopaedic centre during the period 2006-2015 were included in this study. Prospectively collected functional scores were obtained using the Western Ontario Shoulder Instability Index (WOSI) and Quick Disabilities of the Arm, Shoulder and Hand (QuickDASH) scores. Survival analyses were performed using Kaplan-Meier curves and multiple linear regression modelling was utilised to identify predictors of functional outcome ($p < 0.05$).
Results: 205 shoulders (198 patients) were followed from presentation to discharge (Mean follow-up 5.2 years; average age 27.9 years). 60 patients had experienced failure of a previous surgical stabilisation requiring revision to the Latarjet procedure.
There were two recurrences in a cohort of 205 shoulders (0.98%). Eight shoulders underwent further surgery for non-instability complications (3.9%). There were no significant differences in the clinical or functional outcome of primary and revision cases. 90% of patients were satisfied with their shoulder following surgery. Ongoing subjective instability without frank dislocation was significantly associated

with poorer Quick DASH and WOSI scores ($p < 0.0001$ and $p = 0.0024$, respectively).
Conclusion(s): The Latarjet procedure successfully prevents recurrent anterior instability and is associated with high levels of patient satisfaction. The overall risk of operative complication is low and the need for revision is rare. Patient-reported functional outcomes suggest no difference between primary and revision procedures.
Implications: The Latarjet procedure can provide long-term shoulder stability and failure of a previous stabilisation does not impair outcome.
Conflict of Interest: Nothing to disclose

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EARLY HISTOLOGICAL AND IMMUNOHISTOCHEMICAL EVALUATION OF TWO COMMERCIALLY AVAILABLE BIOLOGICAL AUGMENTATION PATCHES AFTER ROTATOR CUFF REPAIR
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Background: The primary aim of this study was to assess the early (4 week) tissue response of the native tendon after augmentation with cadaveric dermal allograft or a porcine dermal xenograft in comparison to a control (no patch augmentation).
Methods: Patients underwent a conventional rotator cuff repair via a mini-open approach. Patients had either a human dermal allograft or porcine dermal xenograft patch applied in an onlay technique. A control group of patients that did not receive any patch augmentation was used for comparison. A sample of the supraspinatus tendon was excised at the time of surgery. At 4 weeks after surgery an ultrasound-guided biopsy of the repair was performed. Histology and immunohistochemistry was performed on all samples. Patch augmentation groups were compared to the control group using a Mann Whitney U test was performed where appropriate.
Results: The allograft group (n=4) demonstrated significant extracellular matrix (ECM) disruption compared to the control group. The xenograft group (n=3) demonstrated more ECM disruption than the allograft group. There was no difference in foreign body giant cell count or vascularity. Cellularity decreased in the allograft and xenograft groups compared to control. One patient in the xenograft group had a dramatic increase in cellularity, characterised by extensive infiltration of cells immunopositive for IRF5, CD68, and CD206 markers, suggesting the tissue response involved pro-inflammatory phagocytic macrophages. No significant differences in the expression of CD4, CD45, CD68, CD206, BMP7, IRF5, and TGFb were seen between the groups.
Conclusion: This is the first study in humans to assess early tissue response to augmentation with human and porcine derived ECM patches. Significant tissue disruption was observed on histological evaluation demonstrating a potentially deleterious effect of xenograft and allograft patches on the underlying supraspinatus tendon. One patient had a significant and adverse immune response.
Conflict of Interest: Nothing to disclose

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ONGOING ACROMIOCLAVICULAR JOINT PAIN AFTER EXCISION ARTHROPLASTY. IS FURTHER SURGERY EFFECTIVE?
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Background: Little published evidence exists on the incidence of ongoing acromioclavicular joint (ACJ) pain and no published outcomes for revision surgery. This study aimed to establish the incidence and outcomes of revision acromioclavicular joint excision surgery.
Methods: Consecutive retrospective cohort of arthroscopic and open ACJ excision. Patients identified from a prospectively collected database. Inclusion criteria: all ACJ excisions between 2001 and 2015. Exclusion criteria: previous surgery for ACJ instability or those having ACJ excision as part of a shoulder hemiarthroplasty. Data extracted: postoperative diagnosis of frozen shoulder and subsequent treatment, revision surgery. A satisfaction survey and Oxford Shoulder Score (OSS) via letter was sent for revision cases.
Results: 1283 Consecutive cases of primary ACJ excision over 14 years (988 with subacromial decompression (SAD), 235 with rotator cuff repair (RCR), 60 open). Revision rate 3.7% with SAD, 2.1% with RCR, 1.7% with open surgery. Frozen shoulder rate 3.5% with SAD, 4.9% with RCR, 3.2% with open surgery. Revision surgery occurred a mean 14.2 months since primary surgery (SD7.6). Mean OSS improved from 18 (SD8.1) before primary surgery to 31.7 (SD13.6) after revision surgery ($P=0.02$). Mean follow up was 16.6 months (SD13.7). Survey of revision cases at a mean 6 years post

revision surgery (SD2.3) with 77% successful follow up response found 65% of patients felt improved, 77% would have their surgery again and 69% of patients satisfied.
Conclusion: We present the largest series of ACJ excision and the only outcomes of revision ACJ excision in the published literature. We found a low incidence of revision ACJ excision and frozen shoulder. Outcomes from revision surgery were good with significantly improved OSS, and good satisfaction scores.
Implications: Revision ACJ excision for ongoing pain is appropriate in patients with residual bony spur due to inadequate resection or new heterotrophic bone growth with good outcomes.
Conflict of Interest: Nothing to disclose

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OUTCOMES FOR A CEMENTED, PEGGED, AND ALL-POLYETHYLENE GLENOID COMPONENT IN TOTAL SHOULDER ARTHROPLASTY

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Background: A pegged, all-polyethylene glenoid implant used as part of an anatomical total shoulder arthroplasty has been in use within our department since 2009; however, no clinical outcome data are available for this prosthesis apart from the designer surgeon series.
Methods: Over a 7-year period, data were collected for 62 patients (48 women, 14 men) treated consecutively with the Zimmer Anatomical Shoulder system utilising a pegged, all-polyethylene glenoid component (Zimmer, Warsaw, IN, USA).
Results: The final analysis included 62 shoulders. The median age was 72 years (range, 44-87 years), and the median follow-up was 3.6 years (range, 2.0-7.8 years). The median Constant Score was 62 points (range, 12-85 points), and the median Oxford Shoulder Score was 42 points (range, 10-48 points). 36 patients (59%) had evidence of radiolucency around the glenoid pegs at the latest postoperative follow-up. Three patients (4.9%) demonstrated evidence of definite loosening (both Lazarus grade 4). Evidence of loosening had no significant effect on the Constant Score (P = .754), Oxford Shoulder Score (P = .188), nor visual analogue score for pain (P = .078). Three patients (4.2%) required revision, none of which were secondary to glenoid loosening.
Conclusions: This is the first report from a non-designer centre for the outcomes for this prosthesis to date. The high incidence of radiolucency reported does not seem to affect clinical outcome significantly and revision rates remain similar to the designer centre.
Conflict of Interest: Nothing to disclose

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DIABETIC PATIENTS HAVE GREATER THAN FOURFOLD RISK OF COMPLICATIONS FROM ARTHROSCOPIC ROTATOR CUFF SURGERY THAN NON-DIABETIC PATIENTS

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Background: Large population-based studies have demonstrated increased prevalence of rotator cuff disease and arthroscopic cuff repair amongst diabetics. However, there is a paucity of data regarding the impact of diabetes on the outcomes of rotator cuff repair surgery. We therefore planned to investigate the impact of diabetes mellitus on the complication rate of arthroscopic rotator cuff repair at our unit.
Methods: We undertook retrospective notes review of a consecutive series of arthroscopic rotator cuff repairs performed at a single centre during 2013-2014. Data regarding demographics, diabetes status, and complications defined as infection requiring antibiotics or return to theatre, frozen shoulder, re-tear of the repaired tendon, or repeated/revision surgery were collected and analysed as the primary outcome.
Results: The search yielded 212 arthroscopic cuff repairs at a mean follow-up of 46.7 months (range 34-67 months) of which 27 (12.7%) were diabetic. Diabetic patients were significantly more likely to suffer complications including infection (11% vs 0.5%, p= 0.007), frozen shoulder (18.5% vs 5.4%, p=0.02), re-tear (33% vs 1.9%, p=0.003), and reoperation (29% vs 13.5%, p=0.02). These equated to statistically significant odds ratios of 23, 3.97, 2.82, and 3.7 respectively. The proportion of diabetic patients experiencing at least one complication was markedly greater (51.9% vs 20%, p< 0.001, odds ratio 4.3).
Conclusions: This study suggests that diabetic patients are over 4 times more likely to experience complications from arthroscopic rotator cuff repair, including greater than threefold risk of frozen shoulder and reoperation/revision surgery and more than double the risk of rotator cuff re-tear.
Implications: This marked increase in complication rates amongst diabetic patients will have impacts

on surgical decision making in this cohort, but also allow the risk to be communicated clearly when counselling these patients about prospective surgery to allow fully informed consent.
Conflict of Interest: Nothing to disclose

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INCIDENCE AND FACTORS AFFECTING BLOOD TRANSFUSION IN SHOULDER ARTHROPLASTY
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Background: Shoulder arthroplasty is now increasingly performed for fractures of the proximal humerus apart from shoulder arthritis and cuff tear arthropathy. Blood transfusion is not uncommon in patients undergoing shoulder arthroplasty. The incidence of blood transfusion is reported to vary from 0% to 38% in the literature. We report the incidence and factors affecting blood transfusion in shoulder arthroplasty in our institution.
Patients and methods: A retrospective review of patients who underwent shoulder arthroplasty from 2010 to 2017 was performed. All patients who underwent anatomical, reverse and stemless shoulder replacement were included. We also included patients who underwent shoulder replacement for fractures of the proximal humerus. The risk factors analysed were age, gender, pre-operative haemoglobin, anticoagulation therapy, indication and type of surgical procedure.
Results: With a mean age of 71.6 (41 to 89) years there were 168 patients. Females were predominant. There were 61 total shoulder arthroplasties, 13 hemiarthroplasty, 80 reverse shoulder arthroplasty and 14 revision arthroplasty. The overall transfusion rate was 4.16% (7 of 168). Of the seven patients who received blood transfusion, five patients had reverse shoulder arthroplasty, one had hemiarthroplasty and one had revision total shoulder arthroplasty. The mean pre-operative haemoglobin of patients who received transfusion was 10.5g/dL. Pre-operative haemoglobin was the only significant factor ($p < 0.001$) affecting blood transfusion.
Conclusion: The incidence of blood transfusion is around 4% after shoulder arthroplasty. Low pre-operative haemoglobin of less than 10.5g/dL appears to be a significant risk factor in these patients.
Conflict of Interest: Nothing to disclose

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LATISSIMUS DORSI FLAP BREAST RECONSTRUCTION LEADS TO SIGNIFICANT SHOULDER FUNCTIONAL MORBIDITY
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Background: Mastectomy and breast reconstruction is a commonly adopted treatment approach for breast cancer. The latissimus dorsi (LD) muscle flap, with or without an implant, has been a workhorse flap for post mastectomy breast reconstruction. The extent to which removal of this muscle would affect shoulder movement, has been a matter of debate in literature.
Objectives: To assess, analyse and report the incidence of shoulder related morbidity in patients with latissimus dorsi flap for breast reconstruction.
Materials and methods: This is a retrospective cohort review of patients who had LD flap reconstruction following mastectomy. We identified 88 patients operated between 2007 and 2014, three had bilateral procedures. We also collected validated subjective scores in the form of Quick DASH and Oxford Shoulder Scores.
Data was collected by validated questionnaires and reviewing case notes. Descriptive analyses were presented as frequencies and percentages for categorical variables. Pearson's Chi Square test was used for categorical data analysis. Statistical analyses were performed by using SPSS version 24, for Mac.
Results: Our study include 83 patients with a mean age of 53years (min-max: 30-76). There was a similar distribution of laterality (49% and 47% respectively) with 4% bilateral procedures. It is a younger cohort with mean age of 52 years.
At final followup, patient reported outcome scores were good with mean values of 17.5 (CI = 4.8) for QuickDASH and 41.5 (CI = 1.9) for Oxford shoulder score.
In our cohort, 10% patients had shoulder function compromise following latissimus dorsi flap reconstruction, but there was no significant difference in OSS ($p=0.010$) or Quick DASH ($p=0.232$) scores from rest of the patients.

Conclusions: latissimus dorsi flap reconstruction following mastectomy is a commonly performed procedure, which can lead to significant shoulder functional morbidity. This complication should be part of the consent process.
Conflict of Interest: Nothing to disclose

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MEDIUM TERM OUTCOMES OF FULL THICKNESS DERMAL GRAFT FOR MASSIVE ROTATOR CUFF TEARS
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Introduction: The management of massive, unreconstructable rotator cuff tears remains controversial. The Graft Jacket® provides an augment to fill the defect left by the massive cuff tear, avoiding the requirement for shoulder arthroplasty in an otherwise non-arthritic shoulder. This has been shown to be beneficial, but is costly (Wright Medical Graft Jacket® Standard 5x5cm, £1140). The NHS tissue bank is a rich source of materials including full thickness dermal grafts, which are notably cheaper (Human dermis thick £500). We aim to review the outcomes of patients undergoing open rotator cuff repair using a full thickness dermal graft in our centre.
Methods: Case notes were reviewed and pre-op and post-op patient reported outcomes scores obtained prospectively for all patients receiving a dermal graft for rotator cuff repair, between June 2015 and June 2017.
Results: 23 shoulders from 19 patients were included. 13 patients were male, the mean age was 65.5 years (range 43-79 years). 3 had previously had failed primary cuff repair. 19 shoulders were available for follow up. The mean follow up period was 16.8 months (7-30 months). Post-operatively mean forward flexion of the affected shoulder was 145^0 ($90\text{-}180^0$), abduction 147^0 ($90\text{-}180^0$) and external rotation 40^0 ($20\text{-}60^0$). Mean post-op Constant, UCLA and ASES shoulder scores were 86 (63-98), 28 (15-33) and 84 (50-95) respectively. Mean improvement these scores were 54 (38-64), 14 (6-18) and 41 (22-48) respectively. One patient has sustained a re-tear at 13 months and is awaiting revision surgery. The same patient is happy with the contralateral dermal graft repair. No other intra-operative or post-operative complications were seen.
Conclusions: Full thickness dermal graft from the NHS tissue bank seem to give good short to mid-term outcomes for the management of massive rotator cuff tears. Outcomes are comparable to those seen with Graft Jacket™ but at a reduced cost.
Conflict of Interest: Nothing to disclose

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AVASCULAR NECROSIS AFTER PHILOS PLATE FIXATION OF PROXIMAL HUMERUS FRACTURES
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Background: Avascular necrosis of the humeral head is a complication of proximal humeral fracture fixation that results in significant morbidity. Uncertainty exists as to the risk factors that predispose patients to developing AVN, and a clearer understanding would enable to us to better decide on how to manage these injuries.
Objectives: The aim of this study was to evaluate risk factors for the development of humeral head necrosis after surgical fixation with PHILOS plates for proximal humeral fractures.
Study design and methods: This study included patients (n=1118) treated for proximal humeral fractures by means of open reduction and internal fixation (ORIF) using the Philos plate at a single centre between January 2008 and December 2015. Follow-up monitoring included radiographic examination until discharge. Radiographs taken in the antero-posterior and scapula-Y projection were evaluated by the two senior authors to ascertain whether humeral head necrosis had occurred.
Results: A total of 118 patients (49 males, 69 females) were available for radiological check-up. Mean age was 53.8 years (range: 27-84 years). There were 18 cases of AVN. The time to surgery did not influence the risk for AVN, nor did the configuration of the screws in the head. Four-part fractures, and those with comminution were more likely to develop AVN. The proportion of smokers was higher in the AVN group compared to the non-AVN group.
Conclusions: The older the patient, the more carefully one must consider deciding between conservative and operative treatments, especially in four-part comminuted fractures. If surgical treatment is performed, consideration should be given to arthroplasty over fixation. Heavy smokers must be informed preoperatively of the increased risk for AVN after ORIF.
Conflict of Interest: Nothing to disclose

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DOES PRE-OPERATIVE NEUROPATHIC PAIN AFFECT OUTCOME IN PATIENTS UNDERGOING ARTHROSCOPIC SUBACROMIAL DECOMPRESSION?

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Background: Arthroscopic subacromial decompression is an increasingly common treatment for subacromial impingement. It has previously been shown to have poorer outcomes in patients with depression, however it has not been determined whether its effectiveness is reduced in patients with pre-operative neuropathic shoulder pain.
Methods: 95 consecutive patients undergoing ASD were recruited. These patients completed an oxford shoulder score(OSS), visual analogue pain score(VAS), Hospital anxiety and depression score(HADS) and a painDETECT score pre-operatively and 6 months post-operatively. Pre-operative and post-operative scores were compared.
Results: 60 patients completed 6-months follow-up. As per preoperative painDETECT scoring, pain was classified as nociceptive for 33(A), unclear for 16(B) and neuropathic for 11(C).
All groups demonstrated a significant improvement in OSS(A 26.1 vs 34.7; $p< 0.001$, B 21.9 vs 34.1; $p< 0.001$, C 12.8 vs 25.6; $p< 0.002$) and VAS(A 55.2 vs 31.3; $p< 0.001$, B 69.7 vs 31.3; $p< 0.001$; C 83.5 vs 51.0; $p< 0.003$). PainDETECT significantly improved for unclear (15.4 vs 8.2; $p< 0.001$) and neuropathic (23.5 vs 16.9; $p< 0.03$) patients. No significant changes in HADS-D were identified.
Preoperatively significant differences were only noted in OSS($p< 0.001$) and VAS($p< 0.01$) between nociceptive and neuropathic patients.
Postoperatively significant differences were only noted in OSS between nociceptive and neuropathic patients($p< 0.05$). Correlation of preoperative painDETECT score to postoperative OSS revealed a significant negative correlation ($p< 0.003$).
Conclusion: ASD improved pain scores in all groups. Patients with neuropathic pain had worse pre-operative scores than patients with nociceptive painDETECT scores, however still showed a significant improvement postoperatvely.
Implications: This suggests that ASD does improve pain even in patients with neuropathic pain and is therefore a worthwhile procedure for these patients, however they may not have such a significant improvement as those with nociceptive pain and this should be discussed with patients pre-operatively.
Conflict of Interest: Nothing to disclose

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INDICATIONS, OUTCOMES AND COMPLICATIONS OF LATERAL ULNAR COLLATERAL LIGAMENT RECONSTRUCTION OF THE ELBOW FOR CHRONIC POSTEROLATERAL ROTATORY INSTABILITY: A SYSTEMATIC REVIEW

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Background: Posterolateral rotatory instability (PLRI) of the elbow can lead to pain, recurrent dislocations and in the worst case scenario, disability. This systematic review reports the indications, outcomes and complication rates of lateral ulnar collateral ligament (LUCL) reconstruction for chronic PLRI.
Methods: A systematic review was performed following PRISMA guidelines. 17 studies including 168 patients with an isolated LUCL reconstruction for chronic PLRI were included. Patients with concurrent medial collateral ligament reconstruction were excluded. The primary outcome measures were demographics, indication for surgery, surgical technique, functional outcomes and complications.
Results: Chronic PLRI commonly occurred following a previous traumatic injury (n=152). Of these, there were 119 "simple" (no fracture) instabilities and 33 "complex" (associated fracture) instabilities. In 11 patients, PLRI was iatrogenic. Aetiology was unknown in 5 patients.
Grafts used were autograft (n=102, 60%), allograft (n=18, 11%), synthetic graft (n=15, 9%) and unknown (n=33, 20%).
The most common surgical technique was a "Docking Procedure" or a modification of this (n=145, 86%). Other techniques included suture anchors (n=18, 11%), non-anatomic (n=1, 0.6%) and unknown (n= 4, 2%).
39 complications in 33 patients (20%) were reported. The most frequent complication was recurrent instability (n=21, 15%). No other major complications were reported. The rate of recurrent instability was significantly higher in revision LUCL reconstructions (15/140 primary reconstructions versus 6/15 revision reconstructions, p=0.0068).

The mean Mayo Elbow Performance Scores and qDASH scores were 87.5 (range 40-100) and 18.8 (range 0-77) respectively. 134/144 (93%) patients with range of motion measured regained a functional arc >100 degrees.
Conclusion: LUCL reconstruction for chronic PLRI proved a reliable method of reconstruction, save for the moderate rate of recurrent instability (which is highest in revision reconstructions).
Implications: The summary of literature is helpful for pre-operative patient counselling. Well-organised prospective studies to compare reconstruction techniques would enhance the current literature base.
Conflict of Interest: Nothing to disclose

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REVERSE POLARITY TOTAL SHOULDER REPLACEMENT: A DAY CASE PROCEDURE

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Background: Reverse Shoulder Replacement (RSR) are increasingly carried out for painful shoulder conditions with rotator cuff deficiency. Reported average length of stay varies from 1 to 2.5 days. As part of a local 'Transforming for Excellence' initiative, a quality improvement project was undertaken to assess the efficacy, safety and outcomes of performing the operation as a day case procedure.
Method: A pilot study closely monitoring and auditing post-operative pain scores was carried out. Highest pain scores recorded on a scale of 0-4 in the first 24hrs post operatively ranged from 0 to 2 with mode of 0. Following this appropriate patients were triaged for day case RSR. Eligibility for day case was assessed based on comorbidities, preoperative function and social circumstances. Selected patients were provided with a procedure specific information leaflet. All procedures were performed by a single surgeon; under general anaesthetic and an inter-scalene block. Patients were discharged home on an oral opioid analgesia protocol. Outcome measures were recorded using Oxford Shoulder Score (OSS) pre-operatively and at 6 weeks, 6 months and 12 months. Patient records were assessed retrospectively for re-admissions or complications.
Results: From 2015 to 2017, 18 RSR were triaged for day case surgery. None of the planned day cases had to be admitted overnight. Mean patient age was 74 years (Range 59 to 84 years), with 5 males and 13 females. There were no re-admissions, immediate post operative complications or significant adverse effects. OSS increased from a mean of 16 (Range 4-30) pre-operatively to a mean of 28 (Range 7-33) at 6 months post operatively.
Conclusion: RSR can be safely carried out as a day case procedure in carefully selected patients.
Implications: This could lead to significant cost and bed occupancy savings with good patient satisfaction.
Conflict of Interest: Nothing to disclose

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´CORONAL STABILIZATION AND BRACING OF DISPLACED CAPITELLUM FRACTURES´: A SIMPLE KIRCHNER WIRE STAPLING TECHNIQUE

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A prospective study was done using Kirschner (K) wires to internally fix capitellum fractures and its results were analysed.
Since 1989, unstable displaced 17 capitellum fractures were anatomically reduced and internally fixed by inserting K wires in coronal plane from the capitellum into trochlea. The lateral end of wires were bent in form of a staple behind the fracture plane and anchored into the lateral humeral condyle with pre-drilled holes. Additional screws were used in 2 cases to stabilise the lateral pillar comminution. The capitellum was exposed with a limited lateral elbow approach between anconeus and extensor carpi ulnaris. The deeper dissection was limited anterior to lateral collateral ligament (LCL) . The capitellum fragment was reposition under the radial head and anatomically reduced by full flexion of elbow and then internally fixed. Total 17 patients (7 males and 10 females) with average ages 34.8 years(14 to 75) had fractures, Type I: (Hans Steinthal #) 12, Type II: (Kocher Lorez #) 1, and Type III: (Broberg and Morrey #) 4. Post-operatively the patients were mobilised immediately.
Patients were assessed clinically and radiologically. Average followup was 31.7 (18-35) months. Capitellum fractures healed in all the patients. Mayo elbow score was excellent in 12, good in 4, and fair in 1 patient. Average elbow ROM was 5 to 132 degrees, pronation 84.5 (79-90) degrees and

supination 88 (85-91) degrees. Complications seen were wire pain in 4 patients, loosening of wires in 2 which required early removal. We did not see any infection, non-union or avascular necrosis in the time scale we studied.
We found a simple manoeuvre of hyper-flexion of elbow reduced the capitellum anatomically, and K wires stapling technique to be very easy and stable. A limited exposure of capitellum helped to restore immediate stable elbow with good function.
Conflict of Interest: Nothing to disclose

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´SCAPULOHUMERAL MANOEUVRE FOR SHOULDER DISLOCATION´
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A prospective study was done to analyse the results of ´Scapulo-humeral manoeuvre (SHM) to reduce the shoulder dislocation.
27 patients with shoulder dislocations were treated by ´Scapulo-humeral manoeuvre´ in Airedale NHS trust (20) and other NHS hospitals (7). 12 males and 15 females were treated in casualty under sedation and one under GA in operation theatre.
Scapulo-Humeral Manoeuvre
The affected arm was held by an assistant along the side of the patient´s body keeping elbow in 90 degree flexion with gentle traction. The operator stabilised the scapula keeping one hand (palm) on the acromion and the other hand holding the upper end of humerus between thumb and fingers or palm. The shoulder was reduced by the operator gently pulling the head of the humerus laterally while the other hand pushing the scapula medially and rotating it so as to direct the glenoid and the head of humerus towards each other. The shoulders usually reduced easily with a click. The patients were immobilised in collar and cuff for 3 weeks and then mobilized with physiotherapy and were followed up for 12 weeks.
26 patients had anterior dislocations and 1 patient had a inferior dislocation. 3 patients had history of previous dislocations. One Pregnant lady (38 weeks) with recurrent dislocation had to be reduced under local anaesthesia. 4 patients had previous other methods failed for reduction. SHM was attempted primarily in 23 patients. There were no complications, but the method failed in one muscular patient which reduced spontaneously under GA. Average time required for the manoeuvre was 30 to 45 seconds.
Conflict of Interest: Nothing to disclose

6 Hands

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COLLAGENASE *CLOSTREDIUM HISTOLYTICUM* INJECTION IN THE TREATMENT OF DUPUYTREN'S CONTRACTURE, CONCURRENT & IN RECURRENCE FINGERS TREATMENT, EARLY COMPLICATIONS AND FIVE YEARS FOLLOW UP WITH PATIENT REPORTED OUTCOME MEASURES
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Study: This is a prospective double blind, placebo controlled trial. Collagenase Clostridium Histolyticum was effective and well tolerated used in a well palpable cords of Dupuytren's Contracture. Concurrent fingers treatment with early complications have been reported. Patients reported outcome measures have been obtained.
Materials and method: 170 fingers were treated in 148 patients. Deformity of more than 30° at metacarpo phalangeal joints and more than 20° at proximal interphalangeal joints with well palpable cord were selected in this study. Finger straightening procedure was undertaken at 24-72 hours post injection. Prospectively evaluated for early complications, extent of correction, residual deformity and recurrence rate at an average follow up of 5 years. Concurrent fingers & Recurrence of contracture were treated without serious side effects.
Results: Full correction was achieved in 148 fingers (87%). Residual flexion deformity noted in mainly in PIPJ with flexion 80° or more. At 5 years follow up, the recurrence rate was noted in Metacarpophalangeal Joints in 9(5%)fingers and Proximal Inter Phalangeal Joints in 17(10%) fingers.

Patient reported outcome measures have been collected and expressed high degree of satisfaction.
Conclusion: Most local complications resolved within two weeks of the injection. Isolated MPJ deformity is more likely to be corrected fully. Isolated Proximal Interphalangeal Joints and combined Proximal Interplalangeal Joints and Metacarpo Phalangeal Joints contractures are mostly end up in residual flexion. Concurrent finger treatment & Recurrence Contractures treatment were uneventful.
Conflict of Interest: Nothing to disclose

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CARPAL TUNNEL DECOMPRESSION IN PATIENTS WITH NEGATIVE NERVE CONDUCTION STUDIES - A PROSPECTIVE STUDY OF OUTCOMES

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Purpose: A selection of patients display typical clinical features of Carpal Tunnel Syndrome despite normal Nerve Conduction Studies (NCS). This study aims to compare the patient reported outcomes one year after carpal tunnel decompression (CTD) for patients with normal and abnormal NCS.
Methods: A retrospective analysis of a prospectively collected database of patients who underwent CTD after NCS was performed. QuickDASH was recorded pre-operatively and one year post-operative. Linear regression was used to assess the effect of normal and abnormal NCS on preoperative and postoperative QuickDASH.
Results: 576 patients were included in the study, of which 19 had normal preoperative NCS. Preoperative QuickDASH score were comparable in the normal NCS (mean 58.3 ± SD 14.8 vs 54.6 ± SD 19.5, p=0.8). However there were significant differences between the normal NCS and abnormal NCS groups in the QuickDASH at one year (34.9 ± SD 28.3 vs 20.7 ± SD 22.5, P=0.007) and change in QuickDASH postoperatively (23.5 vs 33.9, p=0.007).
Conclusions: Patients with normal NCS have comparable preoperative disability scores compared to those with abnormal NCS. Although they sustain a significant improvement in QuickDASH at one year, this is significantly less than those with abnormal NCS.
Conflict of Interest: Nothing to disclose

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RETRIEVAL ANALYSIS OF 30 NEUFLEX METACARPOPHALANGEAL SILICONE IMPLANTS

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Background: The use of silicone implants dominates metacarpophalangeal (MP) joint arthroplasty. The NeuFlex implant was introduced to overcome known issues with other silicone implants, such as the Swanson and Sutter, particularly fracture.
Methods: Explanted NeuFlex MP joint prostheses were retrieved as part of an-ongoing implant retrieval programme. Following revision MP joint surgery for pain or instability the implants were cleaned and sent for assessment. The explants were photographed. The position of fracture, if any, was noted. Patient demographics were recorded.
Results: Thirty NeuFlex MP explants were available. Seven (23%) were not fractured. Eleven explants (37%) had fractured at the hinge; nine (30%) had fractured at the junction of the distal stem and hinge; and three (10%) had fractured at both the hinge and distal stem. NeuFlex MP joint explants ranged in size from 0 to 40. The age of the patient at revision ranged from 43 to 81 (median 58) years. Time in vivo ranged from 6 to 120 (median 58.5) months. All but two implants were obtained from rheumatoid joints, the remainder had osteoarthritis. Discolouration of some explants had occurred; other explants appeared to show no colour change.
Conclusion(s): The majority (77%) of NeuFlex explants had fractured. Nine (30%) NeuFlex explants had fractured at the junction of the distal stem and hinge, the typical position seen with Swanson and Sutter/Avanta MP joint explants. Eleven (37%) fractured across the hinge; this has not previously been reported although has been seen in in vitro testing. Intriguingly, 3 (10%) NeuFlex explants suffered fractures both at the hinge and at the junction of the distal stem and hinge which has also never been reported previously.
Implications: Fracture at the hinge is a common finding with explanted NeuFlex MP joint prostheses; it may represent a particular vulnerability for this implant.
Conflict of Interest: Nothing to disclose

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AN INNOVATIVE AND STABLE METHOD OF CLOSED REDUCTION AND PERCUTANEOUS PINNING FOR ALL FRACTURES OF DISTAL END RADIUS

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Background: Objective of my study was to create a stable mode of CMR& PINNING for #DER and I had achieved this through a series of modifications in the configuration and technique in more than 700 cases for the last 19 years.
Methods: It is a prospective study of 200 cases over a period of 4 years from 2013 to 2016. Age -18 to 84 and grouped into three groups. Closed reduction done by traction & counter-traction. With the help of a “self developed k-wire jig” two triangles are created in the triangular shaped bone by crossing 6k-wires in 2 planes without skin incision by stabilizing the DRUJ.There will be at least 2 k-wires in each inter-fragmentary fixation. The role of K-wire is similar to steel rods in cement concreting by which it prevents metaphysial collapse and maintain the radial height and negative ulnar variance. The 2 k-wires passing through an intact ulna to the radial styloid act as a fulcrum against the deforming force.The implant is removed within 6 to 8 weeks and full range of movement achieved in 3 months.
Results: The results are evaluated on the basis of Green and O'Brien modified by Cooney by analyzing pain,functional status,range of movement,grip strength.Over all result comes to 93%.
Conclusions: All the wires are introduced without any skin incision and the ends of them were placed in the sub-cutaneous plane.The usual complications of conventional pinning and other surgical methods like pin loosening, pin track infection, mal-union, tendon injury and RSD are eliminated and has the advantage of return to mild form of office/personal work including writing from the 2nd post op day onwards and return of the full range of movement within 3 months of injury and full grip strength within 6 months,which were not possible in the other methods.
Conflict of Interest: Nothing to disclose

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A SYSTEMATIC REVIEW OF MECHANICAL STABILIZATION BY SCREW FIXATION WITHOUT BONE GRAFTING IN THE MANAGEMENT OF SCAPHOID NON-UNION IN ADULTS

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Background: Sixty percent of all carpal fractures affect the scaphoid bone, with an incidence of 4.3/10,000/year. Non-union of the scaphoid is due to the tenuous blood supply to the proximal pole and defined as a non-healed fracture 6 months after injury. Well-established scaphoid non-union is usually treated surgically using bone graft. We aimed to determine the effectiveness of mechanical stabilization using screw fixation without bone graft for the treatment of scaphoid non-union.
Methods: Five databases were searched from inception to October 2017: Medline-Ovid, Web of Science, Pubmed, ScienceDirect, and Cochrane Library. All clinical trials that examined the functional and/or radiological outcomes of screw fixation without bone grafting to treat scaphoid non-union (> 6 months) in adults were included.
Results: 837 articles were retained of which 6 case series, describing 90 patients who had undergone scaphoid non-union fixation without bone grafting, were included. Favourable functional outcomes were described in 5 studies used validated functional outcome measures. Improved range of movements of the wrist joint was reported in 5 studies with mean flexion of 67.9° and extension of 61.9°. Eighty four out of 90 (93%) participants reported to have complete union, with average healing time of 3.8 months.
Conclusion: The included studies demonstrated favourable functional outcomes, improve range of motion and high union rate (93%) by using screw fixation without bone grafting in the treatment of scaphoid non-union in adults. However, these results should be interpreted with caution because of the inherent limitations of the included studies.
Implications: More rigorous clinical trials are required to assess the effectiveness of mechanical stabilisation in the management of scaphoid non-union.
Conflict of Interest: Nothing to disclose

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PROSPECTIVE COMPARATIVE ANALYSIS STUDY BETWEEN MINIMAL INVASIVE SURGERY VERSUS TRADITIONAL SURGICAL DECOMPRESSION OF CARPAL TUNNEL SYNDROME AIM OF STUDY: WE EVALUATE THE EFFECTIVENESS OF MINIMAL INVASIVE SURGICAL

DECOMPRESSION OF CARPAL TUNNEL SYNDROME COMPARE TO TRADITIONAL SURGICAL DECOMPRESSION AS TREATMENT METHOD

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Materials and methods: A total of 100 patients eligible for carpal tunnel decompression were classify into two groups, Post exclusion-inclusion criteria of these patients. Group A ,50 patients treated by standard traditional decompression, Group B, 50 patients treated by minimal invasive decompression. We evaluate patients´ outcomes, used the Boston Carpal Tunnel (BCT) questionnaire. Also Carpal tunnel syndromes evaluated according to the Vancouver scar scale and short- plus long-term complications.
Results: In our series, there was no complication related to the surgical intervention of any injury to nerve, artery or tendon structures. Group B patients had significantly better results than patients in group A in the follow up at 6 and 12 months´ using Boston BCT questionnaire ($p < 0.001$). Also, the Vancouver scar scale, there was a significant difference between two groups´ scores; group B patients had significant improvements plus decrease rate of complications compared with group A patients.
Conclusions: In our prospective study, Minimal invasive surgical decompression showed significant statistical improvement, compared to traditional surgical decompression of carpal tunnel syndrome with high reasonable tolerance to minimal invasive surgery than traditional decompression.
Conflict of Interest: We evaluate & study the effectiveness of minimal invasive surgical decompression of Carpal Tunnel Syndrome as small incision compare to traditional surgical decompression as large incision treatment method plus effectiveness the functional outcome post surgical decompression .

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DELAYED PRIMARY FLEXOR TENDON REPAIRS: HOW LATE IS TOO LATE?

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Objective: In the UK, most flexor tendon injuries are repaired within two weeks. Patients who present beyond that time, and are not given the option of primary repair, as it is deemed “too late”. We present our experiences from a major trauma centre over the last 5 decades, of delayed primary repair of flexor tendons.
Methods: We present a series of 7 consecutive patients who had primary flexor tendon repair and discuss their outcome. A systematic review did not find any papers on this subject.
Results: Our consecutive group of 7 patients, aged 24 - 77 years presented from 14 to 78 days later. There were various mechanisms of injuries, most occurred in zone 1. In all cases the wound was healed or unidentifiable and the joints were mobile. Exploration of finger showed that in all these cases tendon ends could be dissected and stretched to affect a primary repair using conventional techniques. We used a four-strand repair or the Kessler technique. Following repair active mobilisation was used in all cases. No repairs ruptured during therapy. 5 patients in this series achieved good to excellent results. One patient is still in therapy, while another patient had surgery. One patient with a zone 1 injury refused the offer of a tenolysis to attempt to improve DIP flexion.
Conclusion: We recommend that all patients presenting with flexor tendon injury as late as 3 months be explored soon after their presentation to see if a primary repair is possible. In many cases it will be possible to repair the flexor tendon primarily while in very late cases it may be necessary to insert a silastic rod as a first stage of 2-stage tendon reconstruction although we did not have to do it. Additional measures to facilitate a primary repair will be discussed.
Conflict of Interest: Nothing to disclose

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TWO SEQUENCE MRI SCAN: USEFUL IN EARLY DIAGNOSIS OF SUSPECTED SCAPHOID FRACTURE AND ASSOCIATED INJURIES

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Aim: Scaphoid fracture is one of the commonest carpal bone injuries. Traditionally patients with suspected scaphoid fracture are investigated with serial radiographs in a couple of weeks. This increases the duration of treatment as well as delays achieving accurate diagnosis. To optimize the treatment we devised a protocol which included early two sequence MRI scan (T1 coronal & STIR

images) in suspected scaphoid fractures.
Material and methods: A new early MRI scan protocol for suspected scaphoid fractures was developed. 50 consecutive patients with suspected scaphoid fracture were prospectively followed up and investigated with an early two sequence MRI scan (T1 coronal and stir images). We compared the results of these patients with 50 patients (retrospective data) who were treated with the traditional treatment pathway, which involves serial clinical examination, follow up and radiographs.
Results: In the traditional pathway group, 42/50 (84%) patients had repeat radiographs with an average being 2.7 (Range 2-6). 12/50 (24%) had an MRI scan. Out of those 12 patients one single patient had a scaphoid fracture. The mean number of fracture clinic visits in this group was 3 (Range 0-9) and the total duration of treatment was an average of 57.6 days (Range 1-276).
In the early MRI protocol group, 7/50 (14%) had a undisplaced scaphoid fracture, 37/50 (74%) had associated injuries (including distal radius fracture, other carpal bone injuries and ligamentous injuries). The mean number of visits to the fracture clinic was 3.02 (Range 1-9) and the total duration of treatment was an average of 47.2 days (Range 6-120).
Conclusion: In traditional pathway group there was lack of accurate diagnosis and longer duration of treatment. With this new early two sequence MRI protocol we were able to diagnose scaphoid and associated injuries early and accurately. This protocol also reduced the total duration of treatment.
Conflict of Interest: Nothing to disclose

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DEFINING DISPLACEMENT THRESHOLDS FOR SURGICAL INTERVENTION FOR DISTAL RADIUS FRACTURES - A DELPHI STUDY
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Background: Distal radius fractures are common yet controversy exists regarding which require treatment. This is reflected by significant variation in surgical intervention rate.
This study had three aims; to identify which radiographic parameters are clinically important; quantify the threshold of displacement at which intervention should occur and investigate which patient factors influence this threshold.
Methods: A modified three round Delphi study was carried out and responses were qualitatively analysed. The protocol was registered with ClinicalTrials.gov(Identifier: NCT03126474).
The Delphi panel was composed of three groups of national and international expert surgeons:
1 - Hand and wrist surgeons.
2 - Trauma surgeons.
3 - International researchers
46 participants initially agreed to take part. 43 completed the first round and all then completed three rounds.
Participants were asked questions based around case vignettes in patients of three ages (38, 58, 75 years).
Results: For all age groups ulnar variance was ranked as the most important extra-articular parameter followed by dorsal tilt, step was ranked as the most important intra-articular parameter.
Agreed thresholds were the same for all parameters for patients aged 38 and 58. Surgeons would intervene in patients aged 38 and 58 with +2 mm ulnar variance, 10 degrees dorsal tilt, 2mm step and 3mm gap. In patients aged 75 the agreed thresholds were 20 degrees dorsal tilt, 3mm step and 4mm gap, consensus was not achieved for ulnar variance.
Mental capacity, pre-injury functional level and medical co-morbidities were ranked as the three most important factors influencing the decision to intervene.
Conclusions: Our findings provide useful advice about which parameters should be measured and radiographic thresholds for intervention. These thresholds may then be modified depending on important patient factors.
Implications: This information can help guide clinicians with management decisions and reduce variation.
Conflict of Interest: Nothing to disclose

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MID TERM RESULTS FOLLOWING SUBTALAR EXTRA-ARTICULAR ARTHROERESIS FOR FLEXIBLE PES PLANOVALGUS IN THE PAEDIATRIC POPULATION

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Background: Flatfoot deformities are common in children. Subtalar extra-articular arthroereisis limits talar motion, spares the subtalar joint, and prevents excessive subtalar joint pronation. In this paper, we look to ascertain the mid term outcomes of the procedure.
Methods: All cases of subtalar arthroesis between 05/2010 and 08/2016 were identified. Hindfoot alignment was measured pre and post operatively, and weight bearing AP/lateral radiographs were used to measure the standard flat foot parameters. Pre and post operative pedobariography was also used to calculate the Staheli flatfoot index. All patients completed Oxford and AOFAS scores.
Results: 70 procedures were performed in 41 patients. 29 cases were for bilateral deformity. 20 were male (48.8%) with 21 being female (51.2%). The mean age at operation was 13.4 years. The mean calcaneal pitch improved from 13.83º preoperatively to 16.18. Meary's angle also decreased from 19.64 to 5.32. There was likewise an improvement in both Kite's angle and the LTC angle from 24.47 to 15.8 and 48.83 to 39.87. Clinically the mean hind foot valgus preoperatively was 12.72, decreasing to 5.35 post operatively. This was maintained at 1 year post removal (5.41). Pedobariography revealed a improvement from 0.99 to 0.59 post operatively. This was maintained at 1 year post removal (0.6). Oxford foot and ankle scores improved from 35.2 to 43.58, as did AOFAS scores, improving from 64.64 preoperatively to 87.8 post operatively. 33 (46.5%) of the implants had been removed at the time of last contact, at a mean interval from surgery of 33.48 months (2.78 years).
Conclusion: We believe this procedure to be a simple and effective method of treating symptomatic flexible pes planovalgus in the paediatric population. It is technically simple and can be performed with minimal surgical insult, and delivers repeatable results owing to its mechanical and proprioceptive effects.
Conflict of Interest: Nothing to disclose

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COMBINED BONY AND SOFT TISSUE STABILISATION OF THE HIP IN CONGENITAL FEMORAL DEFICIENCY

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Introduction: Congenital Femoral Deficiency (CFD) is a rare condition with limited literature about hip reconstruction and the effects of limb lengthening especially hip subluxation. Aim of this study was to review a single surgeon series and analyse the results of hip reconstruction and compare them to the previous cohort.
Methods: Retrospective review from a prospective database was undertaken of 113 CFD children since 1999; the largest series in the UK. 31 of these patients had hip reconstruction with combined soft tissue and bony procedures akin to the **SUPERHIP**. This cohort was compared to the results of the previous series between 1988 and 1999. The comparison was made using deformity planning methods on radiographic imaging, quantification of acetabular and femoral geometry, focussing upon the effects and results of hip reconstruction and lengthening. look for any improvements in the service and if present,evaluate the reasons for those.
Results: Compared to the previous series, this cohort achieved greater objective increases in length and significantly fewer complications involving the hip joint during the process.11 hips out of 45 (24.4%) that were treated in the previous cohort subluxed during lengthening. Since 1999 there were no subluxations with improved hip geometry. Primary difference between the cohorts was the recent group´s preparatory hip surgery before the commencement of any lengthening even for borderline dysplasias. This had not been the case for all children in the previous cohort. This indicates a steep learning curve in the last 3 decades concerning the importance of primary hip reconstruction as a preparatory stage of treatment before lengthening in CFD with almost normalised acetabulae.
Conclusion: Management of CFD needs detailed and methodical planning of soft tissue and bony deformities, Hip subluxation during limb lengthening is a major surgical concern. Better understaning has evolved over time to provide improved results and outcomes.
Conflict of Interest: Nothing to disclose

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PROXIMAL HUMERUS FRACTURES IN OLDER CHILDREN AND YOUNG PEOPLE: THE OUTCOMES OF CONSERVATIVE MANAGEMENT

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The treatment choice of proximal humerus fractures (PHF) in older children and young people remains debatable, we therefore aim to investigate the radiological and functional outcomes of conservative management of PHF in these cohorts.
With Ethics approvals, all shoulder X-rays performed in patients aged from 10 to 18-year-old and from year 2008 to 2015 were reviewed. Radiological parameters, including degree of displacement and angulation; and any radiological residual deformities were recorded. Follow-up length was defined as the last clinic appointment or the most recent X-ray taken after the fracture. Mail questionnaires based on the Upper Extremities Functional Index(UEFI) were sent out and recorded.
1271 X-rays were reviewed and 118 patients with an average age of 12-year-old at fracture event were identified. 91 patients had surgical neck fractures. 56 and 84 patients had displacement and angulation respectively on initial X-rays. Majority of the fractures were displaced < 25%. 3 patients had displacement >50%. The mean angulation angle was 26 degrees. The mean follow-up length was 66 days. 55 patients had residual angulation and 25 patients had worsened angulation on follow-up X-rays. The 3 patients with initial displacement >50% had no residual displacement on follow-up. No non-union was identified. We had 30% questionnaire response rates, where 76% denied pain and differences in appearance between injured and non-injured arm. The mean UEFI was 57/59 points.
Some studies have suggested that healing is less marked in older children. Our study focused on older cohort and have at least 1-year or more follow-up. Our study showed that the outcomes from PHF in older children and young people cohorts remain excellent even for those with extensive displacement and residual deformity in the follow-up X-ray. Late displacement can occur in PHF, but the functional outcomes after conservative management remain excellent. Routine follow-up might not necessary be required.
Conflict of Interest: Nothing to disclose

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IDENTIFYING THE INCIDENCE OF OSTEOMYELTITIS IN CHILDREN WITH SICKLE CELL DISEASE: A 15-YEAR RETROSPECTIVE REVIEW
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Background: The reported incidence of osteomyelitis (OM) in the paediatric sickle cell (SCD) population ranges from 0.3% to 12%. We aimed to identify the incidence of OM among our SCD cohort and clinical parameters to aid clinicians in considering OM in children presenting with bone pain.
Methods: A prospective database was created in 2002 of children with SCD under the care of our regional referral centre. Patient notes were retrospectively reviewed to identify each presentation to hospital with bone pain. Data extracted included temperature, c-reactive protein (CRP) and white cell count (WCC) on admission. Radiographic imaging, treatment and any cultured organisms were recorded. VOC was defined as bone pain that improved without antibiotics.
Results: Over 15 years, 93 children with SCD presented 358 times to hospital. There were five cases (1.4%) of imaging or culture confirmed OM. The humerus was affected in one case, tibia in three and pelvis in one. There were 50 presentations of VOC bone pain that improved without antibiotics. Median age in the OM and VOC groups were 10 and 8 years respectively. Median WCC (15.8 (*12.9-17.5*) vs 14.8 x10^9/L (*6.7-33.0*)), CRP (51.4 (*19.6-83.7*) vs 7.8mg/dL (*1.1-8 9.1*)) and temperature (37.5 (*37-38.4*) vs 36.8°C (*36.0-38.0*)) were elevated in the OM compared to VOC group. Temperature (*p=0.03*) and CRP (*p=0.02*) were significantly elevated in the OM group. Cultures were positive in two cases (*P.Stutzeri* and *S.Aureus*). Three cases resulted in chronic osteomyelitis.
Conclusion: In our centre, early administration of empirical antibiotics to children with SCD with suspected OM results in a low incidence of OM compared to what is reported in the literature.
Implications: This study reaffirms that clinicians should suspect OM in SCD children presenting with bone pain, elevated WCC, CRP and temperature. Early empirical antibiotics results in a low rate of acute and chronic OM.
Conflict of Interest: Nothing to disclose

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MANAGEMENT OF MEDIAL HUMERAL EPICONDYLE FRACTURES IN CHILDREN: A SYSTEMATIC REVIEW OF THE LITERATURE AND IDENTIFICATION OF A CORE OUTCOME SET USING A DELPHI SURVEY
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Background: Medial humeral epicondyle fractures of the elbow are one of the most common injuries in childhood often requiring surgery. There are currently no standardised outcome measures to assess progress after an elbow injury in a child. Wide variation in currently reported outcomes makes comparison of treatment difficult. This study aims to identify outcome measures that have previously been reported in studies evaluating the management of medial epicondyle fractures in children and to facilitate the development of a consensus core outcome set (COS) suitable for use in all future studies of medial humeral epicondyle fractures in children.
Methods and results: Systematic review of the literature identified a list of 53 outcome measures that have previously been reported. A single round survey with children and a two round Delphi process was used to define the most important outcomes to key stakeholders (parents, UK surgeons, UK physiotherapists and International Trialists). The final COS was determined after a consensus setting meeting with representatives from key stakeholders.
Conclusion: Core outcomes represent the minimum expected data reported for a specific condition and will improve the quality of future studies reducing bias, allowing easier comparison and enhancing opportunities for larger meta- analysis.
Implications: It is anticipated that this COS will form part of the feasibility to a National Institute for Health Research (NIHR) Health Technology Assessment (HTA) funded trial concerning the management of elbow fractures in children.
Conflict of Interest: AOUK grant

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DISTURBANCE IN GROWTH OF THE FEMORAL NECK AFTER LATERAL ENTRY PAEDIATRIC FEMORAL NAILS

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Background: Locked rigid anterograde nails provide stable fixation in femoral shaft fractures in older children and adolescents with larger diameter femoral canals, particularly suited for length-unstable and comminuted fractures. They are also useful for minimally invasive stabilisation in deformity correction, such as femoral derotation osteotomy. The entry point is lateral to the tip of the greater trochanter; avoiding disruption of the femoral head blood supply. After insertion, there have been concerns about subsequent femoral neck and trochanteric growth. The aim of this study was to assess proximal femoral anatomy radiologically: to determine if deformity was a seqeulae of nail insertion.
Methods: Data was collected retrospectively from clinical notes and the Picture Archiving Communications system (PACs) for 36 patients who underwent 41 (six bilateral) Pedinails (Orthopaediatrics, Warsaw) over an eight year time period. Thirteen had post-op standardised AP pelvis radiographs for comparison of both operated and non-operated, normal sides. One patient with McCune Albright syndrome and coxa vara was excluded. We assessed pre and post-operative Neck Shaft Angle (NSA), Femoral Neck Diameter (FND) as well as the Articulo-trochanteric (ATD) distances.
Results: All patients had successful union and there were no cases of femoral head osteonecrosis. All nails were removed by 26 months. No significant difference was observed in NSA before and after nail insertion: 136.8 and 133.8 operated side, and 139.1 and 134.2 degrees non-operated side, respectively. Similarly, FND did not change before and after: operated side 31.7 and 30.9mm, and non-operated side 28.0 and 30.9mm respectively. Comparing ATD, there was also no significant difference observed between operated and non-operated groups: 22.6 and 22.5mm.
Conclusions: Lateral entry nails did not produce femoral neck valgus, narrowing or growth disturbance. However, since all nails were routinely removed, it is not known whether retaining them in-situ for longer results in clinically important deformity.
Conflict of Interest: Nothing to disclose

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INITIAL MANAGEMENT OF PAEDIATRIC FEMORAL SHAFT FRACTURES AT A REGIONAL PAEDIATRIC ORTHOPAEDIC CENTRE: A CLOSED LOOP AUDIT. HOW DO WE DRIVE IMPROVEMENT ACROSS A REGION?

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Background: Royal Victoria Infirmary (RVI) accepts paediatric femoral shaft fractures that present to

the hospital and from across the region that initially present to treating units. This requires an appropriate regional protocol to ensure adequate initial management and analgesia provision. Our aim was to evaluate regional emergency treatment of paediatric femoral shaft fractures.
Methods: An Initial Retrospective Audit of RVI admissions of paediatric femur fractures between 1st February to 1st August 2017 was performed. Data was collected against standards taken from NICE guidelines (NG38) on A&E femoral block insertion, application of Thomas splint, intranasal diamorphine or IV morphine administration. A prospective re-audit was then performed on admissions between August 2017- Jan 2018 following standard operating procedure (SOP) release to Accident and Emergency and Orthopaedic units.
Results: Retrospective audit (RA): 25 patients. 20/25 received Intranasal/IV opioid. 17/25 had Thomas splint applied. 8/25 received femoral block.
Prospective re-audit (PRA): 10 patients. 10 received Intranasal/IV opioid. 8 had Thomas splint applied. 3 received femoral block.
Compliance was higher if patient initially presented to RVI in regard to femoral nerve block (RA 5/13(38%); PRA 2/4(50%)) and application of Thomas splint (RA 10/13 (77%); PRA 4/4 (100%)).
Conclusions: Some improvement seen following SOP dissemination with small sample size but improvement is still required to meet standards and requires a regional strategy.
Implications: This audit highlights difficulties that remain in meeting standards of care when provision of service is both across specialites and across different hospital trusts.
Conflict of Interest: Nothing to disclose

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DISPLACED SHORTENED MID-SHAFT PAEDIATRIC CLAVICLE FRACTURES CAN REMODEL AND REGAIN LENGTH
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Background: In the last 20 years there has been an increase in operative fixation of paediatric clavicle fractures, with the aim of restoring clavicle length. Level one evidence does not currently support the routine operative fixation of displaced clavicle fractures in children. We assessed the outcomes of displaced shortened mid-shaft paediatric clavicle fractures at a regional paediatric Trauma Centre.
Methods: Coding data and radiological review was performed to identify isolated displaced shortened paediatric clavicle fractures sustained between January 2010 and January 2015. 44 patients were identified and invited for follow up. Ipsilateral and contralateral clavicle length were measured. QuickDASH, shoulder symptoms and complications were recorded.
Results: 18 patients attended with an average of 64.2 months follow up (24-86 months). Average age at injury was 12yrs (7-16yrs). 9 patients were managed non-operatively and 9 with surgical fixation (8 plating, 1 Flexible nail). In the non-operative group clavicle length was restored in 6 of the 9 patients, with a mean DASH 0.75 and no significant symptoms were reported. 3 of 9 healed short (10,15,15mm), these patients were 16,13 and 12 years old at injury and 2 had ongoing discomfort (DASH 15.9, 6.8, 0 - Mean 7.56). In the operative group, age range was higher (12-16yrs), in all patients clavicle length was restored, with a mean DASH was 3.79 (0-18.18). 4 patients required metalwork removal and 2 complained of ongoing discomfort.
Conclusions: Overall outcomes for non-operative and operative management are good following this injury. Paediatric patients with radiographically shortened clavicle fractures managed non-operatively can remodel and regain clavicle length. Operative fixation to restore clavicle length is not without risk and does not guarantee a symptom free outcome.
Implication: Displaced and shortened mid-shaft clavicle fractures in children have the capacity to remodel and regain length.
Conflict of Interest: Nothing to disclose

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COMPARTMENT SYNDROME IN CHILDREN - 11 YEAR EXPERIENCE IN TERTIARY REFERRAL UNIVERSITY HOSPITAL
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Aim: To study epidemiology and outcome following CS.
Methods: Retrospective case study of all children admitted to RMCH from 01/2006 to 11/2017 with diagnosis of CS. Inclusion criteria were-limb CS caused by trauma, infection, post elective surgery, burns. Exclusion criteria were- non limb CS like abdominal CS, prophylactic fasciotomy . 63 case

notes looked at, 29 patients meet the inclusion criteria. 10 were associated with trauma, 10 with infection, 2 with burns and 7 were related to elective operations.
Results:
Trauma subset: 10 patients. Age 2 to 14 years. 6 were in lower limb and 4 in upper limb. Aetiology- 1 stab, 2 fall , 3 RTA, 2 crush injuries, 1 iv fluids into hand and 1 cause not known. 2 had burns. *Outcome*- 6 patients made a good recovery, 1 had stiff ankle, 1 developed severe ulnar nerve palsy and 1 had growth arrest.
Infection subset: 10 patients. Age 1 month to 15 years.Aetiology-9 patients had sepsis - (4 streptococcal , 3 meningococcal, 1 unknown and 1 pneumonia.) Outcome- 4 died, 2 developed contractures, 2 had severe bone deformities and 1 had osteomyelitis.
Elective subset: 7 patients. Age 5 to 16 years. Aetiology - 3 were in cerebral palsy patients who had major surgery, 3 in patients who had limb deformity corrections and 1 was post exertional CS. Outcome- 2 had good results, 1 developed claw foot.
Conclusion: Only 34% patients with compartment syndrome were related to trauma and majority had satisfactory outcome. Post infective causes are 34% of CS they have very high- 40 % mortality and high morbidity. Post elective surgery CS, majority were in upper limb and we would recommend prophylactic release in major deformity correction.
Conflict of Interest: Nothing to disclose

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DOES THE IHDI CLASSIFICATION FOR DEVELOPMENTAL DYSPLASIA OF THE HIP (DDH) CORRELATE WITH THE SURGICAL INTERVENTION REQUIRED?: A 10 YEAR LONGIDUTINAL OBSERVATIONAL STUDY
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Background: Developmental dysplasia of the Hip (DDH) is a spectrum of disease from minor dysplasia to irreducible dislocation. We aimed to assess if the IHDI classification and pre-operative Tonnis acetabular index were related to the type of surgery required and if this evidence would be useful in predicting the optimum surgical approach.
Methods: Between 2004 and 2013, a prospective 10 year longitudinal observational study was undertaken for cases that required operative intervention for DDH. Demographic data and treatment were recorded along with severity of the DDH according to the International Hip Dysplasia Institute (IHDI): classification (Grade 1 to 4) and pre-treatment and post-treatment acetabular index (Tonnis method).
Results: 67 hips in 59 Patients were surgically operated upon (85% female 15% male), the IHDI classification results showed 24% were Grade 2, 40% Grade 3 and 36% Grade 4.
27% of hip joints required a closed reduction, 73% required open reduction, 22% required a femoral osteotomy and 49% required a pelvic osteotomy.The higher IHDI grades were more likely to require an open reduction (Grade 2: 18%, Grade 3: 65%, Grade 4: 100%), a femoral osteotomy (Grade 2: 0%, Grade 3: 12%, Grade 4: 50%) and also to a lesser degree a pelvic osteotomy (Grade 2: 35%, Grade 3: 58%, Grade 4: 58%). The Tonnis Acetabular index was measured at diagnosis and post-treatment. At diagnosis the acetabular index was more than two standard deviations above the mean angle for age in 57%. Post-treatment 79% of patients were within 2 standard deviations and 21% of patients were more.
Conclusions/ implications: The study highlights usefulness of various pre-operative classifications in managing DDH. This study shows good correlation with the severity of IHDI and the type of surgical intervention required. This suggests a more aggressive surgical approach is appropriate at an earlier age in more severe cases.
Conflict of Interest: Nothing to disclose

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HUMERAL DEFORMITY CORRECTION, INTRAMEDULLARY STABILISATION AND COMPLICATIONS IN SEVERE OSTEOGENESIS IMPERFECTA
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Objective: Surgical correction of upper limb deformities in severe osteogenesis imperfecta (OI) is technically difficult and less absolving. We aimed to analyse the outcome and complications of rodding the humeri in severe OI.
Materials and methods: Retrospective analysis for consecutive humeral roddings for severe OI in last 3 years was done. Surgical technique included retrograde nailing (female or both components

telescopic FD or TST rods) with olecranon fossa entry, exploration of radial nerve followed by osteotomies. Deformities were quantified (< 30^0, 31-60^0, 61-90^0, >90^0 angle) and classified with level of deformity (upper, middle, lower third, combined). Variables included number of osteotomies, radiological union, functional improvement, change in range of movements (ROM) for elbow and shoulder joints and intraoperative and postoperative complications.
Results: Total 20 humeri in 14 patients (7 boys, 7 girls) with type III OI (except 1) with mean age of 8.9 years (SD-3.3) underwent nailing, with the radiological union at 6- 10 weeks for all. Marked improvement in the mean ROM was observed especially for shoulder flexion (23^0). Function in 6 out of 12 children objectively upgraded for push and transfer to and from wheelchair. Total 8 complications (44.4 %) were reported within mean 8.4 months follow up. Four segments (22.2 %) had intraoperative fractures at distal third of the humerus while negotiating the nail. Intraoperative complications were encountered in humeri fixed with both components (p=0.02), upper third level deformities, deformities>90^0 and more than 2 osteotomies. Other complications included prominent implant, contralateral fracture and distal humeral varus.
Conclusions: Humeral nailing for severe OI is justified by ROM and functional improvement despite of association with complications. Meticulous surgical planning and execution is advised with awareness of complications which are inherent to the pathology.
Implications: Upper limb deformity correction benefits wheelchair bound children with OI.
Conflict of Interest: Nothing to disclose

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PRELIMINARY RESULTS OF PHYSIOLYSIS AND VICKER'S LIGAMENT EXCISION FOR MADELUNG DEFORMITY IN LÉRI-WEILL DYSCHONDROSTEOSIS
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Introduction: Limited literature is available in the treatment of pediatric Madelung deformity since Vicker's description. The aim of this preliminary series was to report the outcome of excision of the Vicker's ligament (VL) and physiolysis.
Materials and methods: Retrospective review of 16 children with Léri-Weill dyschondrosteosis with Madelung deformity were conducted. The index surgical procedure, done for 8 wrists in 4 children, included volar approach VL excision (MRI confirmed) and physiolyisis at anteromedial distal radius physis at VL origin with the insertion of hypodermic needles on either side of physis. Clinical assessment involved range of wrist movement and satisfaction of appearance. Radiological evaluation included preoperative and postoperative distance between needles, ulnar tilt, lunate subsidence, lunate fossa angle, lunate-covering ratio and ulnar head dorsal translation index.
Results: Eight wrists in 4 children underwent VL excision and physiolyis at a mean age of 9.3 years. Analysis at a mean follow up of 42.3 months revealed that all 4 children had a satisfactory outcome with improvement in the range of motion except for terminal 20^0 of supination in 2 children. None of the wrists require further intervention due to acceptable functional status. Growth at distal end radius was evident from distance between marking needles improving from 5.6 to 15.7 mm. Maintenance of carpal position was suggested lunate subsidence (corrected to 1.01 to 0.8 mm) and lunate covering ratio (improved from 76 to 89%). Distal end radius shape re-aligned adequately with improvement of lunate fossa angle from 29.6^0 to 46.5^0 and ulnar tilt to 66.4^0 from 57.2^0. Sagittally, ulnar head dorsal translation index improved from 5.5 mm to 4 mm.
Conclusion: This only series after Vicker's original description, reaffirms his observation that the excision of the VL and physiolysis alter the natural history of paediatric Madelung deformity and avoid the complex osteotomies and fixations.
Conflict of Interest: Nothing to disclose

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TEMPORAL TRENDS AND SURVIVORSHIP OF TOTAL HIP ARTHROPLASTY IN VERY YOUNG PATIENTS
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Background: In this study, we aimed to describe temporal trends and survivorship of total hip arthroplasty (THA) procedures in very young patients (aged ≤20 years).
Methods: A descriptive observational study was undertaken using data from the National Joint Registry (NJR) for England, Wales, Northern Ireland and the Isle of Man. All patients aged ≤20 years

at the time of undergoing primary THA were included and the primary outcome was revision surgery. Descriptive statistics were used to summarise the data and Kaplan-Meier estimates calculated for cumulative implant survival.
Results: There were 769 arthroplasty procedures performed in 703 patients. Seven patients died and 35 THAs were revised during the follow-up period. Uncemented implants and ceramic-on-ceramic (CoC) bearing surfaces were most commonly used. The use of metal-on-metal (MoM) bearings and resurfacing procedures declined from 2008. The most frequently recorded indications for revision were loosening (20%) and infection (20%), although the absolute risk of these events occurring within the cohort was low at 0.9%. Factors associated with lower THA survival were MoM and metal-on-polyethylene (MoP) bearings and resurfacing arthroplasty (versus ceramic-on-polyethylene [CoP] and CoC bearings, p=0.002), and operations performed by surgeons with a lower frequency of very young patient THAs recorded in the NJR (versus those with >5 recorded operations, p=0.030). Kaplan-Meier estimates suggested 96.2% (95% confidence interval [CI] 94.2-97.6%) survivorship of implants across the cohort at 5 years.
Conclusion: Within the NJR, the overall survival for very young patients undergoing THA exceeded 96% over the subsequent five years. Surgeons should consider the increased risk of early revision with implant type, volume of young hip arthroplasties performed and bearing surface when performing THA in children and young adults.
Implications: Survival of THA in very young patients may be associated with surgeon and implant factors.
Conflict of Interest: Nothing to disclose

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PAEDIATRIC PELVIC FRACTURES, ARE WE TREATING THEM WELL?

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Purpose of study: To review the treatment and outcomes of paediatric pelvic ring injuries in the UK.
Methods and results: We performed a retrospective review of all pelvic fracture admissions to an English paediatric major trauma centre (MTC) from 2012 to 2016. Treatment of these patients involved clinical input from the regional pelvic injury unit. Follow up data was collected and analysed.
A total of 29 patients were admitted with pelvic ring injuries with a mean age of 11 years (4- 16yrs). Road traffic accident was the mechanism in majority (72%), followed by fall from height (24%). Associated injuries were present in 83% of patients. Femoral shaft fracture was present in 5 (17%), head injury in 5 (17%), chest injuries in 5 (17%) and bladder injury in one child. 48% patients needed surgical procedures for fractures or associated injuries.
We differentiated injuries according to the classification system of Torode and Zeig. 17% were Type A, 3% Type B, 48% Type C and 31% Type D.
Almost all (93%) patients were treated conservatively. 51% of patients were allowed to mobilize full weight bearing after a period of bed rest. Non-weight bearing mobilization was recommended for fractures extending into the acetabulum, sacral fractures, unstable fracture patterns or associated fractures (neck of femur, femoral shaft and tibial shaft).
Surgical fixation occurred in two patients. Both of these patients had significantly displaced Type D fractures. Only 44% of patients were back to sports at six months.
Conclusions: Pelvic ring injuries are rare within the paediatric population and are associated with a high incidence of concomitant injury and significant functional morbidity. Their treatment should involve a multidisciplinary approach, which includes specialist in the care of pelvic trauma.
Conflict of Interest: Nothing to disclose

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RISK OF DDH IN BABIES WITH BIRTH WEIGHT > 4 KGS. DO WE NEED TO SCAN HIGH BIRTH WEIGHT BABIES?

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Background: DDH is a common infant orthopaedic condition with the reported incidence of 1-2/ 1000 live births. Various risk factors have been reported in the literature like, family history, breech delivery, etc. There is paucity of literature reporting birth weight on its own as a risk factor. Also there is no consensus either in UK/ Europe to consider what is regarded as high baby birth weight.

Objective: The aim of our current study is to analyse the incidence of DDH in babies with more than 4kg birth weight.
Methods: Analysis of the prospectively collected data from Consultant Led Hip Ultrasound clinics of all the babies scanned at the Royal Wolverhampton Hospital between Jan-2008 to Dec 2015 was included. All at risk babies and high birth weight babies have been routinely scanned.
Results: A total of 7608 patients were scanned, of which 831 (11%) babies are more than 4kg birth weight, predominantly of this group were females (91%). There were only 11 patients with breech presentation and 4 others had a family history of DDH. Around 1 in 5 patient (19%) with high birth weight has had an abnormal hip scan. During hip monitoring with regular scans, 88 babies hips matured to normal over a period of 4-12 weeks. Around 44 % (69 of 157 patients) had dysplastic hips requiring treatment. Pavlik harness or abduction brace treatment for a median period of 6weeks (6-12weeks) was required in 63 Patients. Surgical treatment was needed in 3.8% (6 of 157 patients) of high birth weight babies with abnormal hip scans.
Conclusion: From our study, we were able to identify that birth weight more than 4 kg is also an independent risk factor and such patients should be referred to the specialist for the regular scan of the hips.
Conflict of Interest: Nothing to disclose

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VIRTUAL FRACTURE CLINIC IN PAEDIATRIC ORTHOPAEDICS: A NEW OUTPATIENT STRUCTURE FOR APPROPRIATE, SAFE AND COST EFFECTIVE PATIENT CARE AND MANAGEMENT IN A PAEDIATRIC POPULATION

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I**ntroduction:** The introduction of a virtual fracture clinic (VFC) in to adult orthopaedic trauma services has seen a significant decrease in outpatient attendances with improved patient satisfaction. There is little data published on the effect of a VFC in a paediatric population. Our study assesses the introduction of this service in a paediatric tertiary referral centre in the Republic of Ireland. The purpose of this study is to assess patient and service outcomes of introducing this service in a paediatric national centre
Method: Protocols for management of stable paediatric orthopaedic injuries were applied in a paediatric hospital from August to December 2017 for patients under the age of 16 years old. Plain film images were reviewed along with emergency department clinical notes the following weekday after presentation. Outcomes from this review were return to outpatient clinic, discharge from service to GP, return to emergency department or refer to surgical day ward. All outcome data was collected.
Results: 622 patients were reviewed in the VFC over the period of this study. Of these, 374 (60%) patients were discharged from the orthopaedic service, 227 (36.5%) referred on for outpatient follow up, 2.1% referred back to the emergency department and 7(1.1%) referred to surgical day ward for intervention. Of those returning for surgical intervention, only 4 of the 7 patients underwent operative intervention for their fractures. 30% of all referrals included fractures about the wrist and hand and were discharged to home treatment.
Conclusion: This study reveals a successful introduction of a VFC in a paediatric population in a tertiary referral centre. This study highlights the benefits of the VFC to patients, parents and trauma services in a paediatric environment. We also highlight the cost and clinical effectiveness of introducing a VFC service in a paediatric setting.
Conflict of Interest: Nothing to disclose

8 Trauma

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DISCHARGED BUT NOT DISSATISFIED: OUTCOME AND SATISFACTION OF PATIENTS DISCHARGED FROM THE EDINBURGH TRAUMA TRIAGE CLINIC

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Background: The Edinburgh Trauma Triage clinic (TTC) streamlines outpatient care through the consultant-led 'virtual' triage of referrals and the direct discharge of minor fractures from the Emergency Department. The recent NICE guideline (NG38) on the management of non-complex fractures highlighted the need for research comparing the clinical and cost effectiveness of virtual

triage versus next-day consultant review. We compared the patient outcomes for simple fractures of the radial head, little finger metacarpal and fifth metatarsal before and after the implantation of the TTC.
Methods: 626 patients who had sustained these injuries over a one year period were identified. There were 337 patients in the pre-TTC group and 289 in the post-TTC group. QuickDASH or Foot and Ankle Disability Index (FADI), EQ-5D, VAS pain score, satisfaction rates and return to work/sport were assessed 6 months post injury. Development of late complications was excluded by an electronic record evaluation at three years post injury.
Results: Outcomes were as good or better post TTC, when compared to pre-TTC scores. At three years, the pre-TTC group required a total of 496 fracture clinic appointments compared to 71 in the post-TTC group.
Conclusion(s): Management of minor fractures via the Edinburgh TTC results in clinical outcomes that are comparable to the previous system of routine review. Outpatient work load for these injures was reduced by 86%.
Implications:

1. The direct discharge of simple fractures via the TTC system offers comparable outcome and satisfaction to the tradition of early fracture clinic review
2. Significant cost and time savings can be expected while lessening inconvenience to patients

Conflict of Interest: Nothing to disclose

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COMPARISON BETWEEN RADIAL HEAD EXCISION VERSUS RADIAL HEAD REPLACEMENT BASED ON MAYO ELBOW SCORING IN COMMINUTED RADIAL HEAD FRACTURES
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Methods: This is comparative prospective study comprising 32 patients
between age 22 - 60 years with Mason type II/III radial head fractures.They were randomized placing 17 patients in the Arthroplasty group and 15 patients in the excision group. The patients were followed up for a period of 18-24 months (average 20 months)
postoperatively. Results were analysed by the Mayo's elbow performance score at 6 months and 18 months and were statistically evaluated by **UNPAIRED t TEST**
Results: At **6 months ,** radial head **Arthroplasty** gave excellent results in 2 patients, good in 5 patients and fair in 8 patients. In **excision** there were 5 patients with excellent results at 6 months, 7 with good results and 2 with fair results.
At 18 months, of the 17 patients who had undergone head **arthroplasty**, **2** had **excellent** results and same number had poor results. **7** (46.7%)of the 15 cases who had undergone radial head excision had **excellent** results. **Good** results were obtained in **7** cases of each.There were **6** case (35.3%) of radial head **arthroplasty** which fell into the **fair** group.
As per Mayo's score at **6 months** follow up, Mean and standard deviation (SD) of the scores in Arthroplasty was 68.82 and 18.66 respectively & for Excision it was 85.66 and 10.66.
At 1**8 months** follow up, it was 75 and 14.89 for arthroplasty & 90.66 and 7.98 for excision.
The difference between the results was statistically significant (p< 0.01).
Conclusion: Our study shows that long and short-term results of radial head excision is better as compared to arthroplasty in comminuted radial head fractures based on mayo elbow scoring, particularly for dominant upper limbs.
Conflict of Interest: Nothing to disclose

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VALUE ADDED CT? DOES SCANNING IN "SIMPLE" ANKLE FRACTURES CHANGE MANAGEMENT?
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Background: Obtaining a pre-operative CT scan for non-pilon type ankle fractures has been advocated in recent national guidelines where the posterior malleolus is involved. We have obtained such CT scans for the past 4 years. Our aim was to analyse whether a pre-operative CT changes surgical planning.

Methods: Twenty consecutive patients (that presented over two years ago) with fractures involving the posterior malleolus with or without dislocation were retrospectively selected and had their x-ray radiographs and CT scan anonymised. The x-ray radiographs only were presented to 9 surgeons (8 consultants and one post training fellow). They were asked to comment on their approach, implants and fixation techniques. After at least 6 weeks, they were presented with both x-ray radiographs and CT scans and asked the same questions. This generated 180 paired results to analyse intra-observer differences.
Results: 10 patients had a fracture-dislocation and all 20 had a fracture involving the posterior malleolus. 36.7% of the surgical ankle approaches changed following CT scan review. Following CT in 16.1% of cases the decision to fix the posterior malleolus was made and in 8.8% of cases the decision to fix the posterior malleolus was reversed (kappa 0.452, p-value< 0.001). The CT also allowed planning of the syndesmotic fixation in 10.0% of cases and reversed this decision in 6.6% of cases (kappa 0.527, p-value< 0.001). A CT changed the procedure from a hindfoot nail to internal fixation in one case (0.6%) and from non-operative management to internal fixation in three cases (1.7%).
Conclusions: A CT scan provides useful information and detail in ankle posterior malleolus fractures and/or dislocations and can affect surgical decisions.
Implications: When weighed against the risk of a malreduced posterior malleolus fragment, ankle instability and post-traumatic degenerative change, we advocate the use of pre-operative CT in the context of these injuries.
Conflict of Interest: Nothing to disclose

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A RETROSPECTIVE COMPARATIVE COHORT STUDY COMPARING TEMPORARY INTERNAL FIXATION TO EXTERNAL FIXATION AT THE FIRST STAGE DEBRIDEMENT OF GRADE IIIB OPEN DIAPHYSEAL TIBIAL FRACTURES

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Background: The definitive reconstruction of grade IIIb open tibial fractures is rarely undertaken at the first operation in favour of a staged approach. It is not known if temporary internal fixation, so called "in-fix", is effective in place of traditional methods of external fixation (ex-fix). We compared the outcomes of in-fix, to ex-fix in the context of a two-stage orthoplastic reconstruction.
Methods: We reviewed the medical notes for 47 consecutive patients, who had reconstruction of a grade IIIB open fracture of the tibial diaphysis (minimum 1.2 year follow-up). All patients had definitive fixation and soft tissue reconstruction in a single operation following initial debridement. We compared the rates of deep infection, non-union and flap failure between the in-fix and ex-fix groups. The primary outcome measure was deep infection.
Results: There were 4 complications in the ex-fix group (3 infection; 1 nonunion) and 2 complications in the in-fix group (1 infection; 1 flap failure). The incidence of infection was lower in the in-fix group (4% vs. 13%). Multiple regression modelling revealed infection (p=0.610), nonunion (p=0.918) and flap failure (p=0.112) were not significantly associated with the method of temporary fixation, or other demographic variables. The odds ratio of patients treated with in-fix developing an infection compared to those treated with an ex-fix was 0.29 (95% CI 0.03 to 3.01).
Conclusion(s): In-fix of grade IIIB open diaphyseal tibial fractures does not increase the risk of deep infection when compared to external fixation in the context of a combined orthoplastic service. It appears to be at least as safe as external fixation and may confer some additional advantages in terms of longer term infection.
Implications: This study supports the continued use of in-fix in the reconstruction of open tibial fractures when used in the context of an orthoplastic approach.
Conflict of Interest: Nothing to disclose

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EARLY DISCHARGE FOLLOWING HIP FRACTURE IS INDEPENDENTLY ASSOCIATED WITH INCREASED MORTALITY AT 30 DAYS, 90 DAYS AND 1 YEAR

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Background: A recent Swedish study identified a short length of stay (LOS) to predict increased risk of 30-day mortality in the hip fracture cohort. This effect has not been previously studied for 90-day

and 1-year mortality or in the United Kingdom (UK). Our aim was to investigate the effect of length of inpatient stay on mortality.
Methods: We retrospectively identified 1356 consecutive hip fracture patients and collected additional data including demographic, co-morbidities and admission blood results. Causes and risk factors for 30-day, 90-day and 1 year mortality were examined using stepwise univariate and multivariate Cox regression analyses.
Results: Overall mortality was 8.7% at 30 days, 16.4% at 90 days and 27.9% at 1 year. Patients with a LOS less than 10 days (254 patients) had a 30-day mortality of 21.6%, compared to 5.7% in those who stayed over 10 days (1102 patients), p< 0.001.
LOS less than 10 days was an independent risk factor for 30-day mortality (odds ratio (OR) 3.989, 95% confidence interval (CI) 2.750-5.787). This effect was present but less pronounced at 90 days (OR 1.897, CI 1.417-2.539) and at 1 year (OR 1.370, CI 1.067-1.760). Other risk factors significantly associated with 30-day mortality were advancing age (OR 1.067, CI 1.042-1.093), male gender (OR 1.799, CI 1.206-2.681), admission source other than own home (OR 1.327, CI 1.130-1.557), chest infection during admission (OR 3.247, CI 2.211-4.768), myocardial infarction (OR 2.387, CI 1.293-4.406), liver disease (OR 4.308, CI 1.299-14.284), anaemia on admission (OR 1.818, CI 1.165-2.836) and renal failure on admission (OR 1.003, CI 2.750-5.787).
Conclusion: In hip fracture patients, an 'early' discharge is independently associated with increased mortality at 30 days, 90 days and 1 year.
Implications: Early discharge in this patient cohort may be detrimental and discharge should be delayed until the patient has fully undergone rehabilitation.
Conflict of Interest: Nothing to disclose

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ACUTE KIDNEY INJURY FOLLOWING SURGERY FOR HIP FRACTURE

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Introduction: Acute kidney injury (AKI) is a common complication following surgery for hip fracture and is associated with adverse outcomes. An observational study was carried out to determine the rate of AKI following surgery for hip fracture at our institution and to look for factors associated with AKI.
Methods: Pre-operative creatinine values were compared to post operative results for all patients who underwent surgery for hip fracture at our institution between Januray 2015 and September 2016. AKI was defined as a rise in post-operative creatinine of greater than or equal to 1.5 times the pre-operative value within 7 days. Group comparisons were using 2 x 2 contingency tables with Chi-squared analysis. Student's t-test was and Mann-Whitney U test were used to look for factors associated with AKI.
Results: Out of 500 patients, 96 developed an AKI (19%). Patients with chronic kidney disease (CKD) were more likely to develop AKI (31%) that those without (17%, p = 0.018). Likewise patients with 2 or more co-morbidities were more likely to develop AKI (22%) than those without (12%, p = 0.009). No statistically significant association between type of surgery and AKI was observed.
Conclusion: A large proportion of patients following surgery for proximal femoral fracture developed an AKI. Patients with CKD and the presence of 2 or more co-morbidities had significantly higher rates of AKI.
Conflict of Interest: Nothing to disclose

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IS THE CURRENT MANAGEMENT OF PATIENTS PRESENTING WITH SPINAL TRAUMA TO DISTRICT GENERAL HOSPITALS FIT FOR PURPOSE? OUR EXPERIENCE OF DELIVERING A SPINAL SERVICE USING AN ELECTRONIC REFERRAL PLATFORM IN A LARGE DISTRICT GENERAL TEACHING HOSPITAL WITHOUT ONSITE SPINAL SERVICES

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Background: Our aim was to describe the provision of a spinal service using an electronic referral platform to direct management from an external spinal unit, and quantify the time taken to obtain a definitive management plan whilst under prescribed spinal immobilization.
Methods: A retrospective review was conducted of 104 patients presenting to a single centre and admitted following instruction from a regional spinal service during a 12-month period. We used the British Orthopaedic Association Standards for Trauma outlining that “spinal immobilisation is not

recommended for more than 48 hours" as the standard of care.
Results: 100 patients occupied a total of 975 hospital inpatient bed days. 117 radiological investigations were requested after the point of external referral (47 CT-scans, 37 MRI-scans, and 33 weight bearing radiographs). The period between initial referral to the regional spinal service and then receiving a definitive final management had a median value of 72 hours and a range of 0 - 33 days. Patients will have been under some form of prescribed spinal immobilisation until the definitive management plan was communicated. 34 patients (34% of the overall cohort) had a definitive management plan in place within 48 hours.
Conclusion: Patients are being placed under prescribed immobilisation for longer than is recommended. Delays in obtaining radiological imaging were an important factor, together with the time taken to receive a definitive management plan.
Implications: Limitations in social care provision and delays in arranging this were additional barriers to hospital discharge following the final management plan. Hospitals should have dedicated management pathways to ensure rapid assessment and discharge of this patient group.
Conflict of Interest: Nothing to disclose

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UNDER-TRIAGE OF THE ELDERLY MAJOR TRAUMA PATIENT: INADEQUATE ASSESSMENT CRITERIA OR AGEISM IN PRACTICE?
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Introduction: Older trauma patients exhibit higher mortality, complex clinical needs, altered physiology, and difficulties in triage and assessment compared to the traditionally conceptualised younger trauma patient. Under-triage of older trauma patients in the pre-hospital setting is a recognised phenomenon; little research has assessed if this persists into the hospital environment. No formal measure for in-hospital under-triage currently exists, although NCEPOD, the Royal College of Surgeons & British Orthopaedic Association suggest standards of trauma care for the severely injured patient, including the presence of a consultant team leader, and availability of a "24-hour resuscitative trauma team".
Method: Trauma Audit & Research Network (TARN) data for three major trauma centres was interrogated for trends in elderly trauma presentation, triage and reception. Age, Injury Severity Score (ISS), mechanism and areas of injury were correlated against the standards of trauma team activation and the presence of a consultant first attender as surrogate markers for appropriate triage of the severely injured patient.
Results: 260 adult patients with severe trauma (ISS ≥16) presented in the period observed; 99 were aged ≥60 years. Falls were the commonest mechanism of injury. Mortality was significantly higher in the older patient group. Older patients were significantly less likely to receive the attention of a consultant first attender (71%, P=0.029) or a trauma team (26%, P=0.003) than younger patients, despite comparable ISS. Subgroup analysis demonstrated similar trends, despite controlling for variation in mechanism of injury or number of injured body areas.
Conclusions & Implications: Even in the specialised major trauma centre environment, under-triage of older trauma patients is significantly more likely. This implies either limitations of existing triage criteria amongst older trauma patients, or potentially ageism in major trauma care. Existing hospital trauma triage and assessment practices should be further investigated to explain and minimise this difference in practice.
Conflict of Interest: Nothing to disclose

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IS IT NECESSARY TO STOP DIRECT THROMBIN AND FACTOR XA INHIBITOR ANTICOAGULATION THERAPY PRIOR TO HIP FRACTURE SURGERY?
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Introduction: There has been an exponential increase in the use of direct thrombin (DT) and factor Xa inhibitors (FXI) in patients with cardiovascular problems. Premature cessation of DT/FXI in certain patients with cardiac conditions has been associated with an increased risk of coronary events. Such patients often present with femoral neck fractures requiring surgical intervention. Our aim was to ascertain whether it is necessary to stop DT/FXI preoperatively to avoid postoperative complications following hip fracture surgery.
Methods: Prospective data was collected from 189 patients with ongoing DT/FXI therapy and patients

not on DT/FXI who underwent hip fracture surgery. Statistical comparison on pre- and postoperative haemoglobin (Hb), ASA grades, comorbidities, operative times, transfusion requirements, hospital length of stay (LOS), wound infection, haematoma and reoperation rates between the two groups was undertaken.
Results: There were 91 patients in the DT/FXI group (DTX) and 88 in the non-DTX group (NDTX). The mean age was 81.9 years. There was no difference with respect to ASA grade, number of comorbidities (except cardiac comorbidities), age, gender and operation times between the two groups. The mean preoperative Hb was 12.9 g/dl and 13.5 g/dl respectively in the DTX and NDTX (p=0.68). The mean postoperative Hb was 11.1 g/dl and 11.6 g/dl respectively in the DTX and NDTX (p= 0.41). 4 and 2 patients respectively required transfusions postoperatively in the DTX and NDTX (p= 0.17). There was no difference with respect to LOS, wound infection, haematoma and reoperation rates between the two groups postoperatively.
Conclusion: Our study suggests that maintaining DT and FXI therapy throughout the perioperative period in high risk patients with femoral neck fractures is not associated with an increased risk of bleeding or complications following hip fracture surgery.
Implications: It is not necessary to stop DT and FXI perioperatively for hip fracture patients.
Conflict of Interest: Nothing to disclose

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HOW EXTENDED SCOPE PHYSIOTHERAPIST FRACTURE CLINICS HAVE IMPACTED VIRTUAL FRACTURE CLINICS AT ROYAL LIVERPOOL UNIVERSITY HOSPITALS NHS TRUST
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Background: The National Institute for Clinical Excellence (NICE) has encouraged research and analysis of the Virtual Fracture Clinic (VFC) model to explore clinical effectiveness and patient satisfaction. Since 2000, at Royal Liverpool University Hospitals NHS Trust (RLBUHT), Extended Scope Physiotherapists in Trauma Management (ESPs) roles in fracture clinic are fully integrated into the service delivery model with VFC introduced in 2016. Post VFC introduction, the ESP team delivered telephone consultations and ESP led fracture clinics post triage adding another possible outcome and potentially freeing more consultant time and improving efficiency: ensuring patients were seen by the right clinician, in the right place at the right time.
Methods: 12 months of VFC data was analysed at RLBUHT identifying patient outcomes by whether they were discharged by telephone; appointed to an ESP led fracture clinic or to a consultant led fracture clinic. Patient feedback was gathered with a mixed methodology of telephone semi structured interviews and patient questionnaires.
Results: 5527 patients were appointed to VFC from February 2016 to March 2017. Of this total 18% were discharged by telephone consultation; 15% were appointed to an ESP led clinic and 2% were directly appointed by the Emergency Department. 65% were appointed to a consultant led clinic however of these 10% could have been appointed to an ESP led clinic but were limited due to lack of ESP clinic capacity. In addition 5-7% of those appointed to a clinic were uncontactable by phone. Since this time an option to discharge by letter has been utilised. Patient feedback was positive with 98% being very satisfied.
Conclusions: ESP led clinics can add an additional dimension to VFC, meeting patient's needs and improving clinical throughput and efficiency.
Implications: This may be replicable in other centres where suitably experienced and knowledgeable ESPs are included in the workforce.
Conflict of Interest: Nothing to disclose

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CHANGING EPIDEMIOLOGY OF ACETABULAR FRACTURES: A NATIONAL TRAUMA REGISTRY STUDY
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Background: Acetabular fractures are rare with a reported incidence of approximately 3 per 100,000 person/year. However, large scale epidemiological evidence is lacking, mostly limited to single centre database studies. The purpose of this study was to describe the epidemiology of acetabular fractures

in the UK using the Trauma Audit and Research Network (TARN).
Methods: A retrospective analysis of TARN was carried out identifying patients admitted to hospital with acetabular fractures between 2009 and 2016. Their incidence was taken as the primary outcome measure of this study. Secondary outcomes included trends in patient age, treatment, mortality, length of stay, length of stay in critical care and discharge destination.
Results: 19005 acetabular fractures were identified. Acetabular fractures increased almost 4-fold over the study period (912 in 2009 to 3759 in 2016 ($r = 0.996$, $P < 0.0001$)). A corresponding increase in crude incidence occurred from 1.7/100,000 in 2009 to 6.4/100,000 in 2016 ($r = 0.995$ $p < 0.0001$). The majority of fractures occurred in males (n=12545 (66%)). A significant trend towards increased female incidence occurred (27% in 2009 versus 36% in 2016 ($p < 0.05$)). Median age at the time of fracture increased from 53.7 in 2009 to 60.7 in 2016 ($r = 0.95$, $p < 0.001$), with the greatest proportion occurring in patients 60 years or older (33% in 2009 versus 63.5% in 2016 ($p < 0.05$)). There was a trend towards increased operative treatment from 27.3% in 2009 to 40.4 % in 2016 ($p < 0.05$). Mortality at 6 months remained constant throughout the study period at 3.7%.
Conclusions: The incidence of acetabular fractures in the UK has increased significantly from 2009 to 2016. The majority of this increase occurred in older patients with a further trend towards increased incidence in female patients and operative treatment.
Conflict of Interest: Nothing to disclose

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MEDIAL MALLEOLUS FIXATION IN UNSTABLE ANKLE FRACTURES: ARE WE WASTING OUR TIME?
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Background: The role of the medial malleolus in ankle joint stability is debated. Fixation of medial malleolar fractures in combination with fibular intramedullary nailing requires a generous medial skin incision and periosteal stripping, often leading to soft-tissue complications. Despite a reduction in lateral sided soft tissue issues since the introduction of the fibular nail we have noted a persistent rate of medial-sided wound and metalwork problems. We compare outcomes of patients with bimalleolar or trimalleolar ankle fractures who underwent fibular nail stabilisation with or without medial malleolar fixation.
Methods: We identified 336 fibular nail cases over an 8-year period with adequate peri-operative radiographs. Lateral malleolar only fractures were excluded. Demographic data, clinical outcomes, radiographic evaluation, return to work and sport, and patient reported outcomes (EuroQol-5D, Olerud-Molander Ankle Score, and Manchester Oxford Foot Questionnaire) were collected.
Results: This study included 247 patients with a mean age of 66.7 years (range, 25-96 years), of whom 200 were female (81%). Medial malleolar fixation was not performed in 54 cases (22%). There was no significant difference between groups with respect to failure of fixation ($p=0.634$) or loss of talar reduction ($p=0.157$). No patient required subsequent surgery for a symptomatic medial malleolar non-union. Medial sided complications occurred in 32 (16%) of the fixation group, of whom 20 (10%) required further surgery. There was no statistical significance between the groups with respect to patient reported outcome measures (n=150).
Conclusion: We have shown no significant difference in revision rates between fixation and non-fixation groups. With anatomical reduction of the talus coupled with intramedullary fibular fixation, medial malleolar fractures can be treated non-operatively.
Implications: Surgeons have the option of leaving the medial malleolus fractures without fixation, especially in high-risk patients. These results have informed a prospective randomised trial.
Conflict of Interest: One of the senior authors (TOW) has been involved in the design of 2nd generation of the fibular nail, Acumed (Hillsboro, Oregon, USA). TOW has not received financial rewards for this. Acumed sponsored The Edinburgh International Trauma Symposium (EITS) organised by the registered Scottish charity (SC142054), between 2009 and 2014.

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THE TERRORIST ATTACK (TA) ON MANCHESTER - THE IMPACT ON A MANCHESTER MAJOR TRAUMA CENTRE (MTC): LESSONS LEARNT. PART TWO
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Background: On 22nd May 2017 22:31 a suicide bomber detonated an improvised explosive device in Manchester, packed with nuts & bolts. Twenty-two people were killed and 250 injured.
Patients were admitted to the MTC for treatment of complex orthoplastics injuries. The subsequent learning will shape future service planning.
Methods: Retrospective thematic analysis was conducted to assess the care of 45 Patients involved in the TA. Exploration of the patient´s immediate and long term needs was carried out.
Aims:

- To evaluate patient´s needs, priorities and gaps in service provision to influence developments in a MTC, in readiness for future TAs/Major Incidents (MIs).

Results: The following themes were identified as essential to improve the recovery of patients involved in a TA/MI.

- Daily MI MDT
- Allocation of key workers for **all** patients
- Coordination of specialist skills across departments and hospitals
- Involvement of senior therapist in NHS MI plans to coordinate AHPs and facilitate patient flow and repatriation
- Regular tertiary surveys/MDT assessment for shrapnel, blast injuries and secondary complications
- Media/social media management skills and coordination
- Patient tracking through database development
- Rehabilitation prescriptions for **all** patients
- Additional therapy investment for up to 9 months
- Recognition of occult concussion
- Immediate access to wheelchairs
- Psychological first aid for patients by front-line staff
- Increased availability of outreach services and clinic follow up
- Patient counselling at 6-8 weeks
- Staff psychological support and debrief

Conclusion: Although table top exercises are of value in MI planning, there were a number of important factors not realised until occurrence of the TA. It is essential these valuable lessons are shared across the NHS.
Implications: By addressing themes within NHS MI plans, the care of TA/MI patients of the future, will be enhanced and the wider impact lessened.
Conflict of Interest: Nothing to disclose

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USE OF ANTICOAGULANTS REMAINS A SIGNIFICANT THREAT TO TIMELY HIP FRACTURE SURGERY

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Introduction: Hip fracture remains the biggest single source of morbidity and mortality in the elderly trauma population. Intervention focused on quality improvement and system efficiency is beneficial for both patients and clinicians. Two of the variables contributory to improving care and efficiency are time to theatre and length of stay, with the overall goal being to improve care reflected within the achievement of Best Practice Tariff. One of the biggest barriers to optimizing these variables is pre-injury anticoagulation.
Method: Building on our previous work with warfarin in this population, we utilized a regional hip fracture collaborative network collecting prospective data through the National Hip Fracture Database with custom fields pertaining to all agents, including direct-acting oral anticoagulants (DOACs).
Results: 1965 hip fracture patients median age 83 years (1639 not anticoagulated) were admitted to five centres over 12 months. Median length of stay was 20.71 days, significantly longer for the

anticoagulated patients (19.94 vs 24.57, p=< 0.001). Time to theatre was 23.09 hours demonstrating a delay in the anticoagulated population (22.57 vs 28.35 p=< 0.001).
Fracture type and procedure performed were similar for both groups. A higher percentage of patients in the anticoagulated group missed BPT due to time to theatre compared to the non-anticoagulated patients (p< 0.05). All variables per agent were noted and the impact of each assessed.
Conclusions: Despite the widespread use of newer anticoagulants, popular due to unmonitored reversal and administration, patients stay longer in hospital and wait longer for surgery than non-anticoagulated patients of the same age and injury.
Implications: Contemporary perioperative practices impact negatively on the ability to perform timely surgery on hip fracture patients. We have developed a robust, evidence-based protocol to prevent delays in the DOAC population, aiding optimum preparation of patients for theatre and potentially reducing length of stay.
Conflict of Interest: Nothing to disclose

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DOES DELAY IN SURGERY AFFECT MORTALITY IN DISTAL FEMORAL FRACTURES?
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Background: Patients with distal femoral fractures are associated with similar mortality to neck of femur fractures. Surgery is often delayed due to the complexity of fracture configuration, temporary stabilisation or an associated periprosthetic fracture, requiring sub-specialty surgical expertise. We investigate the association of delay in surgery on mortality in distal femoral fracture patients.
Methods: All patients admitted to a level 1 major trauma centre with distal femoral fractures were retrospectively reviewed between June 2012 and October 2017.
Results: 77 patients were included for analysis with mean follow-up of 32 months, mean age of 69 (range 16-101). 46 (60%) of patients were female, 10 (17%) were open fractures and 26 (34%) were periprosthetic fractures.
56 (73%) patients were operated in < 48 hours. Of those operated on >48hours, the mean time to surgery was 8 (range 3-20). On Kaplan-Meier plotting and Log-Rank test, there was no difference in mortality between those receiving operations before or after 48 hours (p=0.933). When age was considered, in those above 60 years old (n=55, 71%), there was no difference in mortality (p=0.783).
Conclusion(s): There was no association between delay to surgery and mortality in patients with distal femoral fractures, especially those age >60 years.
Implications: Whenever required, delay to surgery should be utilised for medical optimisation, temporary skeletal stabilisation and for the patients to receive the right operation from the right surgeon in distal femoral fractures.
Conflict of Interest: Nothing to disclose

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DOES NOTTINGHAM HIP FRACTURE SCORE PREDICT MORTALITY IN DISTAL FEMORAL FRACTURE PATIENTS?
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Background: Patients with distal femoral fractures are associated with similar high rates of mortality to neck of femur fractures. Identifying high risk patients are crucial in pre-operative medical optimisation, risk stratification for anaesthetics and orthogeriatric input. Nottingham Hip Fracture Score (NHFS) has been validated as a predictor of mortality in neck of femur fracture patients, especially in those with score of ≥5 as high risk. We investigated the validity of NHFS in predicting 1 year mortality of patients sustaining distal femoral fractures.
Methods: All patients admitted to a level 1 major trauma centre with distal femoral fractures were retrospectively reviewed between June 2012 and October 2017. NHFS were recorded using parameters immediately pre-operatively.
Results: 92 patients were included for analysis with mean follow-up of 32 months, mean age of 69 (range 16-101). 56 (61%) of patients were female, 10 (11%) were open fractures and 32 (35%) were periprosthetic fractures with 77 (85%) patients surgically managed.
41 patients were found to have NHFS ≥5. Overall mortality at 30 days was 7% and 1 year was 33%. Patients with NHFS of < 4 had a higher survival rate at 30 days (96% vs 90%) and at 1 year (74% vs 49%, p=0.002) when compared with those of higher risk (NHFS ≥5) On Kaplan-Meier plotting and Log-Rank test, patients with a NHFS of ≥5 were associated with a higher mortality (p=0.0001).
Conclusion(s): NHFS can be used to stratify distal femur fracture patients, identifying those with high

risks of mortality.
Implications: NHFS is a validated tool not only in hip fracture but also distal femoral fractures in risk stratifying patients for pre-operative optimisation as well as predictor of mortality at 30 days and 1 year.
Conflict of Interest: Nothing to disclose

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AGE- AND SEX- SPECIFIC INCIDENCE OF HIP FRACTURES IN THE ELDERLY: A 10 YEAR OBSERVATIONAL STUDY
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Introduction: The number of patients sustaining neck of femur fractures in the Republic of Ireland is expected to increase by 100% from 2004 to 2026. However, the projected rise in hip fracture incidence has not been seen either in local or international literature. Our aim is to assess the age- and sex-specific incidence of hip fractures in patients over the age of 65 years in the reporting region and to determine whether the projected increase in incidence is mirrored in the reality of the Irish experience.
Method: This is a retrospective observational cohort study including all patients discharged from a tertiary referral centre post hip fracture from 2005 to 2015. Population data was obtained from the Central Statistics Office of Ireland and Health Atlas Ireland which calculates census and population data.
Results: 3818 hip fractures in the over 65 age group were recorded. The highest incidence of hip fractures occurred in the 85-90 year old age group. This age group has the largest decrease in incidence per 100,000. The standardised incidence per 100,000 of the population 65 years old and over, revealed that in 2010 there was an incidence of 955 per 100,000 for females and 410 per 100,000 for men. In 2014, this had reduced to 668 per 100,000 in females and 332 per 100,000 in males.
Conclusion: Although the numbers of hip fractures presenting has remained stable, the annual fracture incidence has decreased in almost all age groups. For all ages over 65, the incidence of hip fractures in females over the 10 year period is significantly reducing ($p < 0.01$). This is likely attributable to education and preventative measures in place as well as early treatment for osteoporosis. This study highlights the importance of investment in preventative strategies for hip fractures and will help to plan future services.
Conflict of Interest: Nothing to disclose

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OUTCOMES FOLLOWING HIP FRACTURES IN YOUNG ADULTS
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Hip fractures in young adults are rare but represent an important cohort of patients, of which relatively limited data exists. The aim of this study was to evaluate this distinct subgroup of hip fractures from an epidemiological perspective and assess their subsequent outcomes and predictors of complication. Patients aged 18-50 were identified across an 8 year study period from a total of 5326 hip fractures. 46 hip fractures met the inclusion criteria and a retrospective case series analysis was performed. 25/46 (54%) were intracapsular and 21/46 (46%) were extracapsular. Only 15/46 (33%) of fractures were sustained from a high energy mechanism and 31/46 (67%) were a low energy mechanism. Mean age in the low energy cohort (44) was higher than the high energy cohort (41). The low energy cohort was significantly more comorbid with a mean Elixhauser comorbidity score of 1.5 compared to the high energy cohort 0.3 ($p < 0.0005$, unpaired t-test). Alcohol excess was the most prevalent comorbidity present in 24% of patients and was a positive predictor in complication ($p=0.006$, binary regression). Rates of AVN and non-union were lower than existing literature for all hip fractures (4.5% non-union, 7% AVN). However, failure of fixation in displaced intracapsular fractures managed by internal fixation 5/11 (45%) was markedly higher than the low energy cohort 0/6 (0%). 5 year mortality was 9% for all hip fractures, six times higher than an aged matched cohort of non-hip fractures ($p=0.007$, Wilcoxon test).
Representing only 0.86% of all hip fractures in the study period, hip fractures in young adults are rare. A clear sub-division of patients is observed between patients with a low and high energy mechanism, both in terms of level of comorbidity and surgical outcome.

Consideration could be given to primary arthroplasty in young adults sustaining low energy displaced intracapsular fractures.
Conflict of Interest: Nothing to disclose

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HIP HEMIARTHROPLASTY FOR FRACTURED NECK OF FEMUR: A NATIONAL STUDY OF CURRENT PRACTICE
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Background: During 2016 over 65,000 patients presented with a hip fracture of which approximately half were treated with hemiarthroplasty. NICE guidelines advise the use of proven cemented implants. Whilst variation in implant usage may impact patient outcomes, recent interest has turned to the cost implications. The Getting It Right First Time Report highlighted the financial implications of 'unwarranted variation' and stressed the importance of rationalising and standardising service provision, in particular implant usage.
Methods: We aimed to assess the predominant implant used (cemented/uncemented, manufacturer and model) for hip hemiarthroplasty procedures and implant costs. Freedom of Information Requests (FOI) were sent to all 177 hospitals listed in the 2017 National Hip Fracture Database (NHFD) Report.
Results: At time of submission 162 (92%) responses were received. Eighty two (46%) provided implant name and cost, 77 (44%) provided implant name but refused costs and 3 (2%) refused to provide any details. Thirteen different femoral components were used nationally with 20 hospitals using a non-ODEP 10A implant. Average total cost was £472.00 (range £110-£1,378). Significant cost variation was demonstrated for the same implants; for example one implant's cost ranged from £978.19 £285.59. Our results also demonstrated variation in implant use and costs in different hospitals within the same Trust.
Conclusion: This study highlights huge variation in hip hemiarthroplasty implant use and costs. Notwithstanding the nuances of departmental procurement processes, the financial implications for this variation are significant. There was also a wide variation in practice in the interpretation of the FOI Act. It could be argued that the refusal to publish implant costs is counterproductive to creating an open, competitive market where procurement prices can be reduced.
Implications: Here we highlight a requirement for rationalisation of implant usage and procurement in order to potentially improve patient outcomes and provide opportunities for significant cost saving.
Conflict of Interest: Nothing to disclose

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TRAUMATIC MULTIPLE RIB FRACTURES: CORE QUALITY OF LIFE OUTCOMES FROM A PATIENT´S PERSPECTIVE
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Background: Traumatic multiple rib fractures are one of the many injuries treated at Major Trauma Centres (UK). Outcomes used in randomised controlled trials comparing surgical and conservative management to date are primarily process-based: including mortality, mechanical ventilation duration, length of stay. There is limited inclusion of quality of life measures; yet we know selecting outcomes important to patients contributes to developing high quality, yet meaningful, healthcare. This study identifies quality of life factors from the patients' perspective and maps them onto the WHO International Classification of Functioning, Disability and Health (ICF).
Methods: A qualitative methodology, Interpretative Phenomenological Analysis, explored how people make sense of major life experiences. After obtaining ethical approvals, a purposive sample of 15 people recovering from traumatic multiple rib fractures, without significant or lasting head injuries, provided written consent and completed one audio recorded interview 3 to 9 months after injury. Initial analysis identified sub-themes representing patient perspectives. The most prevalent factors were determined by mapping sub-themes to ICF domains and ranking proportions.
Results: Pain, respiratory structure, emotional function (15/15), exercise tolerance (14/15), energy and drive, carrying out daily routine, and immediate family support (13/15) affected most participants. Physical symptoms relating to injury (pain and respiratory function) were readily identified using ICF domains whereas recovery experiences or meanings (managing pain effectively, healing, coping strategies), were more challenging.
Conclusions: Pain, respiratory structure, exercise tolerance, and psychological impact are important

to an individual's recovery after traumatic multiple rib fractures. Impact on breathing is specific to chest wall injuries compared to orthopaedic major trauma and not represented by most patient reported outcome measures.
Implications: To optimize design of clinical services or research protocols meaningful to patients after traumatic multiple rib fractures, outcomes should include pain and effective management, respiratory function and aerobic capacity, and emotional impact including coping with trauma.
Conflict of Interest: Nothing to disclose

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THE TERRORIST ATTACK ON MANCHESTER - THE IMPACT ON A MANCHESTER MAJOR TRAUMA CENTRE (MTC): LESSONS LEARNED. PART ONE
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Background: The Manchester Arena bombing, targeting children and parents, was the first attack of this nature since the 2005 London bombings. The 7/7 bombing report highlighted areas needing improvement, but there were further lessons to be learned from the Manchester bombing.
Methods: An overview of the major incident planning, emergency response, surgical workload and learning points will be presented. Surgeon accounts and TARN data collected from the incident were collected and analysed.
Results: There were 22 fatalities and 250 injured resulting from the bomb blast. The majority of the severely injured patients were treated in Manchester University NHS Foundation Trust. The pattern of wounds were similar to those of war injuries - penetrating soft tissue injuries and associated open fractures
The following lessons were identified
· Informed review and exercising of emergency plans require multi-disciplinary input
· Hospital Major Incident Plans require supplementation
· Damage control type surgical tactics are required to maximise patients treated per unit time
· Specific surgical decision making oversight is required to prevent erroneous surgery
· Wound and fracture management techniques are different from normal practice and surgeons require specific training
· External fixator stock levels should be reviewed
· Availability of O negative blood should be reviewed
· Supra-regional use of trauma networks should be considered by Gold Command
· Specific microbiological considerations are required for biological shrapnel
· Topical antibiotics can preclude the need for lengthy systemic antibiotic therapy
· Severity of trauma dramatically influenced the number of operative episodes, time to recovery and discharge.
· Tertiary surveys will detect further injuries days or weeks later
· Beware the media.
Conclusion: Terror attacks will occur again in the UK. Part of preparing a surgical response to treat patients includes learning from the lessons gained from previous experience of terrorist attacks such as Manchester.
Conflict of Interest: Nothing to disclose

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SHOULD RADIATION EXPOSURE AND RISK OF DEVELOPING FATAL SOLID TUMOURS IN POLYTRAUMA PATIENTS BE AN ISSUE OF CONCERN?
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Purpose: The aim of the study was to explore the amount of radiation received by polytrauma patients at a Major Trauma Centre, over a ten-year period.
Method: Between 01/01/2007 to 30/12/2016 patients admitted in our institution with an injury severity score (ISS) 16 or greater were eligible to participate in this study. The records of these patients were then explored to assess the number and type of clinical investigations that involved exposures to radiation, for 12 months following initial admission. In calculating the risk of developing a neoplasm, we adopted the models within the International Commission on Radiological Protection (ICRP) Report (103).

Result: During the study period 2,463 patients with an ISS of 16 or greater met the inclusion criteria. The patient group had received a total of 40,099 radiological investigations, which were then assigned the effective dose of ionizing radiation (mSv). The mean ISS of 26.57(17-66) with a mean number of radiographs per patient 11.87 (1-172) and CT investigations 6.08 (1-96). The mean radiation dose received in the 12 months following injury, through both CT and radiographs, was 36.05 (0.001-291.6) mSv.
In our patient group 88 patients received in excess of 100 mSv of radiation, the mean of this group 160,87 mSv (100-291.6). Using the models within the ICRP, within our patient sample the average risk of developing a fatal solid tumour was 1:59,173 (SD 764,932) with the highest risk being 1:109.
Conclusion: ICRP recommend that public exposure should be limited to 1 mSv, and for occupational exposure to be limited to an annual exposure 20 mSv, with no annual greater than 50 mSv. Below 100 mSv the effect is proportionate, namely for 1 mSv of exposure there is a 1:20,000 risk of developing a fatal solid tumour, above 100 mSv the risk has been thought to become expediential.
Conflict of Interest: Nothing to disclose

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RESEARCH PRIORITIES IN LOWER LIMB AND PELVIC FRAGILITY FRACTURES: A UK PRIORITY SETTING PARTNERSHIP WITH THE JAMES LIND ALLIANCE

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Objective: To determine research priorities in lower limb and pelvic fragility fractures which represent the shared interests of patients, healthcare professionals, and carers.
Setting: A national (UK) priority setting partnership.
Participants: Patients: over 60 years of age who have previously suffered a fragility fracture of the lower limb or pelvis. Carers: all those involved in the care (both in- and out-of-hospital) of adults with a fragility fracture of the lower limb or pelvis. Healthcare professionals: all involved in the care of patients with fragility fractures of the lower limb or pelvis including but not limited to surgeons, physicians, physiotherapists, and occupational therapists.
Methods: The process and methodology employed was overseen by the James Lind Alliance over an 18-month period between August 2016 - Jan 2018. A national scoping survey asked respondents to submit their research uncertainties. These research uncertainties were then amalgamated into a smaller number of representative research questions. A second national survey was distributed asking respondents to prioritise the research questions. A final shortlist of 25 questions was taken to a multi-stakeholder workshop where the top ten research priorities were decided.
Results: There were 963 original research uncertainties submitted by 365 respondents to the first survey. These original research uncertainties were refined into 88 representative research questions of which 76 were determined to be true uncertainties following a review of the current research evidence. Healthcare professionals and non-healthcare professionals (patients, carers, families) were represented equally in the respondents to both surveys.
The top ten research questions represent uncertainties in rehabilitation, pain management, anaesthesia, and surgery.
Conclusions: We report the top ten UK research priorities for fragility fractures of the lower limb and pelvis derived by a Priority Setting Partnership with the James Lind Alliance.
Conflict of Interest: Nothing to disclose

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ADMISSION PATHWAY FOR PATIENTS ADMITTED TO HOSPITAL WITH SUSPECTED BUT UNPROVEN HIP FRACTURE: SHOULD IT BE MEDICINE OR ORTHOPAEDICS? AN ANALYSIS OF THE MEDICAL COMORBIDITIES OF SUCH PATIENTS SUGGESTING THAT THEIR CARE IS BEST PROVIDED PRIMARILY BY MEDICAL SPECIALISTS

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Background and purpose: Patients with suspected hip fractures who require cross-sectional imaging to confirm or disprove the diagnosis may be admitted under orthopaedics or medicine. This research aims to help orthopaedic departments provide evidence to trust management boards regarding the appropriate admission pathway for such patients.
Methods: A retrospective study of all suspected hip fracture patients receiving second line pelvic imaging between 1st Jan 2015 to 30th June 2016 in one hospital trust. Information was gained from

electronic and paper hospital records to determine indication and result of imaging, eventual diagnoses, length of stay and mortality.
Results: One thousand and forty-seven (1047) hip fractures were admitted to our centre in the study period. Of those in whom hip fracture was suspected but not visible on plain radiography, 126 underwent second line imaging (CT or MRI). Twenty-seven percent of these were positive for having a hip fracture (n=34, 3.2% of total hip fracture admissions). Ninety two patients (81%) were admitted under medical teams. The number of admitted bed days occupied by those without a hip fracture was 979 days, which equates to 2.51% of our total trauma unit bed days. This is equivalent to two continuously occupied hip fracture beds.
Conclusions: This research provides objective evidence that occult or suspected hip fractures should be admitted under medical specialists until second line imaging has confirmed a fracture. These patients have a wide range of acute and chronic medical problems, and a minority require acute orthopaedic input, whilst the majority are best served by medical specialists.
Conflict of Interest: Nothing to disclose

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TIME TO SURGERY FOR ANKLE FRACTURES. DOES THIS AFFECT INFECTION RATES?
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Background: Ankle fractures constitute 9% of all fractures and surgical fixation is often required when they are unstable. The bony anatomy has little soft tissue coverage overlying the malleoli. The surgical site is therefore at risk of infection and wound breakdown. BOAST guidelines advise operative fixation on the first or second day after injury. Often in practice this window is missed and fixation is undertaken many days after the injury.
Methods: We aimed to prospectively review the incidence of early wound complications and infection in 300 patients treated early or late with plate osteosynthesis for Weber B or C ankle fractures. This was conducted at a UK Trauma Unit. Between November 2013 and November 2016 consecutive patients with closed, isolated ankle fractures were included. Patients were followed up at 2 weeks post operation. They were categorised by time to surgery into the following subsets: < 24 hours, < 48 hours and > 48 hours. The 2 week consultation letters were reviewed retrospectively and reported wound complications recorded. The Hospital microbiology database was used to identify any positive superficial or deep wound culture results. Comorbidity data and demographics were collected.
Results: 208 out of 300 patients had a complete dataset. The mean age was 46 (range 16-95). The superficial infection rate at < 24 hours, < 48 hours and > 48 hours was 4%, 0% and 3% respectively. There were no suspected deep infections at 2 weeks. There were 7 (3%) positive deep wound cultures. The mean BMI was 28 and venous thromboembolism prophylaxis was instituted for all patients as per local guidelines. 3% had diabetes and 23% were smokers.
Conclusions: This study has shown that timing of surgery has not shown any significant influence on early infection rates.
Implications: Surgery may be safely delayed until soft tissue swelling has reduced.
Conflict of Interest: Nothing to disclose

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A CASE SERIES OF THE OUTCOME OF SURGICAL TREATMENT OF INTERPROSTHETIC FRACTURES
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Introduction: Interprosthetic fractures occur in between a total knee replacement and a femoral stem of either a hemiarthropalsty or total hip replacement.
The aim of this study was to determine mortality in patients following surgical treatment of a femoral interprosthetic fracture. Secondary outcomes included union, complications, length of stay, re-admission, and time to surgery.
Methods: A retrospective case note review of all interprosthetic femoral fractures admitted to a single institution between.
The inclusion criteria were a patient with a femoral fracture between a total knee replacement distally, and a femoral stem from either a hemiarthroplasty or total hip replacement proximally. Statistical Analysis was undertaken.
Results: There were 24 patients with a mean age of 82.29 (65-98). There were 4 males and 20 females.

The median length of stay was 16 days (4-38).
19 patients underwent open reduction internal fixation, 1 of these used a strut graft, 2 revision knee replacements and 3 revision hip replacements.
3 patients suffered a complication that required further surgery within 2 years following initial surgery. 1 was for a plate breaking, and 1 was a re-fracture and failure of fixation. 1 further patient suffered a fracture proximal to a revision knee replacement, after union had occurred. 2 other patients developed a non-union that were treated conservatively. Therefore out of 23 patients that survived more than 30 days, 19 had successful union (82.6%).
1 patient died in 30 days following fracture and a further patient died in the 1st year following fracture. At 2 years follow-up a total of 3 patients had died.
Conclusion: Interprosthetic fractures have long delays to surgery and length of stay. Despite this they have high rates of union, relatively low complications and mortality rates.
Implication: Further research should be undertaken to further improve outcomes, and improve union rates.
Conflict of Interest: Nothing to disclose

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ORTHOPAEDIC PBAS: WHY THE NEED FOR CHANGE?
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Background and Context: To achieve CCT orthopaedic trainees must currently achieve 1 PBA level 4 (competence to perform unsupervised) for each of the index procedures. At the 2017 BOTA conference it was suggested that this would be increased to 3 level 4 PBAs by at least 2 trainers, mimicking the general surgery requirements. The thinking behind this was that achieving this will provide a more robust assessment of surgical competence. This will, however, add further 'tick-boxing' to the training pathway. This study examines the predictive validity of PBAs in orthopaedics to address the necessity of these increased CCT requirements.
Methods: Procedural Based Assessment records for 78 orthopaedic trainees were reviewed to ascertain the date of the first PBA level 4 in ankle fixation, carpel tunnel decompression, compression hip screw, hip hemiarthroplasty, total hip and total knee replacement. Following initial award the proportion of subsequent PBAs achieving level 4 was then reviewed to obtain the predictive validity of a single level 4 outcome.
Results: Across all 6 procedures, the percentage of PBAs being awarded a level 4 following the initial was 75.5%, which would be considered a high predictive validity for a test. This compares favourably with general surgery, where a similar study found that over half of subsequent general surgical index procedures PBAs were scored lower than a level 4[i].
Conclusions: PBAs in orthopaedic training achieve a higher predictive validity than found in general surgery, and may suggest that increasing the CCT requirements is not necessary. The authors would suggest that further studies examining PBAs as an assessment method are required before increasing the administrative load on trainees.
[i] De Siqueira JR, Gough MJ. Correlation between experience targets and competence for general surgery certification. Br J Surg. 2016 Jun;103(7):921-7. doi: 10.1002/bjs.10145.
Conflict of Interest: Nothing to disclose

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ONLINE CONSENT FOR UPPER LIMB SURGICAL PROCEDURES - IS THIS THE WAY FORWARD
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Aims: As the use of online patient information becomes common practice, it was proposed that the next logical step would be adding the option of “online consent”. Standardised consent forms were created, with guidance from the BOA (http://www.orthoconsent.com). It was felt that this offered the patient the ability to sign a form, within their own timescale, confirming they had read and understood the information provided. This online form would not replace the current NHS consent, rather act as a supplement. This study was organised to determine whether this online method is an acceptable, and therefore viable, method of consenting patients for elective upper limb surgery.

Methods: 56 patients undergoing elective upper limb surgery between 1/11/16 - 31/5/17 at Inverclyde Royal Hospital were asked to complete an online consent form, via the senior authors patient information website, in addition to the standard written consent form.
Patients were subsequently followed up by telephone questionnaire.
Results: Of the 56 people included in the study, 48 completed the questionnaire. 62.5% participants completed the online consent form, 37.5% did not. Of those completing the form 50% preferred the consent process involving the healthcare professional, 16.7% preferred the online method, and 33.3% had no preference.
Conclusion: Our study demonstrated that there are still a significant proportion of patients who are unable to access online information. Therefore at this time online consent forms should not replace the consent process in the hospital environment, but should be used to supplement the process.
Conflict of Interest: Nothing to disclose

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"TRANSFUSE AND CHECK": A QUALITY IMPROVEMENT PROJECT OF POSTOPERATIVE BLOOD TRANSFUSION IN HIP FRACTURE PATIENTS

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Background: In 2016 over 65,000 patients presented with hip fracture costing NHS hospitals £1.9 billion a year, a significant number of which required red blood cell (RBC) transfusion.
The National Institute of Clinical Excellence (NICE) recommend restrictive strategy for transfusion using a haemoglobin (Hb) threshold of 70 g/L (except major haemorrhage or acute coronary syndrome (ACS) where the threshold is 80g/L).
As a result of our initial audit cycle in Orthopaedics a Trust-wide “Transfuse and Check” protocol was introduced in Warrington Hospital to encourage the use of restrictive transfusion practices.
Aim: Re-audit our post-operative transfusion practices for hip fracture patients against NICE guidance for transfusion.
Method: A retrospective cohort study of fractured neck of femur patients over a 12-month period from Warrington Hospital (UK Hip fracture database).
Post-operative red blood cell transfusions were identified using electronic patient records, Sunquest ICE request software and hospital transfusion records. Pre and post-Hb checks, units transfused and Hb checks after each unit were recorded.
Results: 292 fractured neck of femur patients over a 12 month period. 46 (15.7%) of these patients were transfused. 27 (56%) patients were transfused a single unit only. 60.4% of patients received a Hb check after 1 unit transfused. 61% fewer RBC units transfused on re-audit and an average saving of £112 per patient requiring transfusion.
Additionally, an independent review into Trust wide transfusion practices revealed that 76% of Warrington Hospital RBC transfusions are now single unit only.
Conclusion: Since the introduction of “Transfuse and Check” protocol to encourage restrictive transfusion practice, there has been a significant reduction in the number of post-operative red blood cell transfusions in hip fracture patients.
Implication: Our work has resulted in reduced risk to patients, reduced cost and reduced need for red blood cell units not only in our Orthopaedic Department, but Trust wide.
Conflict of Interest: Nothing to disclose

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THE EVALUATION OF KETAMINE SEDATION FOR THE MANAGEMENT OF DISPLACED PAEDIATRIC FOREARM FRACTURES IN THE EMERGENCY DEPARTMENT

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Introduction: Emergency department (ED) procedural sedation is uncommon for paediatric emergencies in the UK. The primary reason for this is due to inexperience and anecdotal cautious behaviour. However ED procedural sedation is attractive considering the human and financial cost effectiveness it can offer. The aim of this quality improvement project (QIP) was to determine if ketamine sedation is a safe and cost effective way of treating displaced paediatric forearm fractures.
Methods: In a locally registered QIP (CWH LA353) from the period of May to September 2017, we prospectively audited a new ketamine protocol for ED procedural sedation. All displaced forearm fractures during daylight weekday hours that needed sedative manipulation without the need of surgical metalwork was included. Radiological data along with ED observations were assessed. Exit

questionnaires after orthopaedic discharge were also collected.
Results: A total of ten significantly displaced (mean 45° angulation) paediatric forearm fractures, fitting the inclusion criteria, that required procedural sedation were included. All children achieved radiologically satisfactory reduction (mean 6° angulation) of their fractures in the ED and were immediately discharged home. All were followed-up in fracture clinic and required no further procedures. No major complications were identified however vomiting was observed in three of the cases. The cost saving, avoiding admission and formal general anaesthesia, was £1470 per child. The overall parental satisfaction score was 9.6 out of 10.
Conclusions: In this small pilot study, the new ketamine protocol in the ED for procedural sedation for displaced paediatric forearm fractures appears to be safe and cost effective. It definitively treated 100% of cases without any major complications. Feedback demonstrated high praise from parents along with positive learning experiences from juniors.
Implication: Ketamine sedation should be routinely offered to treat appropriately displaced forearm fractures in the children´s emergency department.
Conflict of Interest: Nothing to disclose

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THE IMPACT OF PATIENT EDUCATION, ANAESTHETIC TECHNIQUES AND EARLY MOBILISATION ON LENGTH OF STAY AND SHORT-TERM OUTCOME FOLLOWING TOTAL HIP AND KNEE ARTHROPLASTY
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Background: Reducing post-operative length of stay(LOS) in hospital for patients undergoing hip and knee arthroplasty is associated with several benefits including reduced risk of hospital acquired infections post-operatively. Understanding the impact of post-operative management strategies is essential in order to reduce LOS and improve patient outcome. Our study was to assess the impact of patient education, intra and post-operative anaesthetic techniques and post-op mobilisation time on LOS comparing 2 NHS hospital sites.
Methods: 120 adult patients undergoing TKA/THA were prospectively stratified into 2 groups based on treating hospital. All patients were operated under the care of a single surgeon and had comparable ASA grades. Group 1 had educational hip/knee classes prior to surgery, had same day mobilisation and were not given patient controlled analgesia (PCA) /regional blocks. Group 2 did not receive any pre-op educational classes, were treated with regional blocks/PCA and were mobilised the day following surgery. Demographic data, time to surgery, time-to-discharge, PROMs before and after surgery were collected and analysed.
Results: There were 27 knees and 35 hips in group 1 and 32 hips and 26 knees in group 2. Mean time-to-discharge was significantly shorter for group 1, 1 day (Mean 1.03 days) compared with group 2, 4 days (Mean 4.1 days) (p value < 0.01). All patients in group 1 were mobilised within 2 to 6 hours after surgery whereas group 2 were mobilised within 24 hours. Post-op PROMs at 6 weeks were improved in group 1 compared to group 2.
Conclusion: Patient education, mobilisation within 6 hours and use of oral analgesia rather than regional blocks or PCAs enabled an enhanced readiness-to-discharge with a reduction in LOS by an average 3 days.
Implications: Patient education, mobilisation 2-6 hours and oral analgesia can reduce LOS from 4 days to 1 day for TKR/THR patients.
Conflict of Interest: Nothing to disclose

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A STUDY ON PATIENTS´ SATISFACTION UNDERGOING AWAKE SHOULDER SURGERY
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Background: Regional anaesthetic techniques for ambulatory shoulder surgery have proved safe with low complication rates when performed by experienced anaesthetists. Local anaesthetic blocks also provide good peri-operative analgesia. The purpose of this study is to assess the experience and overall satisfaction of patients who underwent shoulder surgery under regional anaesthesia alone, where the perceived advantages are quick recovery, early patient discharge and avoidance of side effects related to general anaesthesia.
Methods: We prospectively identified consecutive patients who met the inclusion criteria (adults undergoing awake shoulder surgery) and invited them to fill in a satisfaction questionnaire immediately following their surgical intervention. The main components of the questionnaire were anxiety level,

satisfaction with block insertion, pain level during surgery and overall experience measured on a Likert scale between 0-10.
Results: 42 consecutive patients completed the survey postoperatively with an equal distribution between males and females. A large spectrum of operations was performed under regional anaesthesia including total shoulder replacement, arthroscopic rotator cuff repair, capsular release or excision of distal clavicle. No immediate complications were encountered. 4 patients (10%) were extremely anxious prior to surgery, but all were completely satisfied with being awake during the procedure. 6 patients (14%) experienced some pain but 5 of them did not consider this as being significant and were extremely satisfied with being awake during surgery. 26 patients (62%) stated that neither the block insertion nor the surgery caused them any anxiety. Overall satisfaction was 9.90 and all patients (100%) would recommend regional anaesthesia.
Conclusions: We conclude that awake shoulder surgery is positively accepted by all patients and our results strongly support it as an effective form of anaesthesia for all shoulder procedures.
Implications: Performing shoulder surgical interventions under regional anaesthesia leads to enhanced patients´ recovery and could represent a safe anaesthetic option for high risk patients.
Conflict of Interest: Nothing to disclose

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90 DAY READMISSIONS TO NHS HOSPITALS FOLLOWING NHS FUNDED ARTHROPLASTY AT INDEPENDENT SECTOR PROVIDERS - A HIDDEN CLINICAL AND ECONOMIC BURDEN?

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Background: An estimated 21% and 23% of all NHS funded hip and knee replacements are performed by independent sector providers. Independent sector hospitals typically do not provide services for readmissions; unscheduled emergency care for these patients is provided by local NHS trusts**.** Our aim was to provide an assessment of this clinical and economic burden to NHS trusts, which has not been previously reported in the literature.
Methods: All total knee and hip replacements performed by independent sector providers, funded by Mid Essex Clinical Commissioning Group (CCG) between April 2013 and July 2016 were identified alongside records of all attendances within 90 days of surgery to the local acute NHS hospital. Case notes were reviewed retrospectively recording length of stay (LOS), specialty, presenting complaint, diagnosis, surgery, investigations, ITU admissions and follow-ups.
Results: 1515 hip and knee replacements were performed. 117 (7.72%) patients re-attended within 90 days. 60% were admitted as inpatients and mean LOS was 6.58 days. Suspected venous thromboembolism and surgical site infection were the most common presentations accounting for 21% (n=25) and 20% (n=23) respectively. Readmissions under orthopaedics had the longest mean LOS of 14.74 nights. 14% of patients readmitted needed a further surgical procedure.
Conclusion: Our study demonstrates a significant burden to our acute NHS trust of emergency readmissions following elective arthroplasty at independent providers, associated with prolonged length of stay, need for investigation and NHS follow-up. We recommend further prospective cost analysis studies to model appropriate tariff adjustments.
Implications: Policymakers and CCGs must consider the economic impact on NHS trusts of independent sector readmissions which increase costly emergency activity and lead to lengthy bed occupancies which may prevent more profitable elective activity. Tariffs should be adjusted accordingly and independent providers should develop systems for managing common readmission presentations such as suspected deep vein thrombosis.
Conflict of Interest: Nothing to disclose

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OPTIMIZATION OF ENHANCED RAPID RECOVERY AFTER SURGERY (ERAS) FOR TOTAL JOINT ARTHROPLASTY - A CANADIAN COMMUNITY HOSPITAL PERSPECTIVE

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Background: Enhanced Recovery After Surgery (ERAS) is a multi-modal perioperative care pathway designed to achieve early recovery for patients undergoing major surgery. ERAS allows for the incorporation of evidence based practices and incorporated a comprehensive assessment of the

patient's journey through the surgical process. The purpose of this study was to determine if optimization of ERAS protocol with pre-operative screening and incorporating patient-specific factors into their post-operative care would improve length of stay (LOS), readmission rates (RAR) in 30 days and the cost following total joint arthroplasty (TJA) in a Canadian community hospital setting.
Method: The study collected clinical, demographic data and the physical status on 508 patients who underwent TJA between January and August 2015 and compared similar data from the same time frame in the previous calendar year prior to implementation of the pathway. Cohorts were analyzed for LOS, RAR, and cost.
Pre-operative assessments, relevant labs, patient history (surgery, medical, social), and patient values were all considered when developing a specific patient plan for care post-operatively. A standard post-operative management tool was used to decrease post-operative complications. While in hospital, physiotherapy and nursing were consulted by the pharmacist to assess whether patient's post-operative management needed to be altered to optimize mobilization and recovery in hospital .
Results: A total of 508 patients were included in the intervention group versus 450 patients in the control group. The mean LOS decreased from 3.6 to 3.3, (student t test p=0.021).RAR in 30 days decreased from 2.9% to 1.4 % (z test P=0.087). The cost saving was approximately $125000.
Conclusion(s): Optimization of ERAS protocol for TJA reduced mean length of stay, with no increase in readmission rates and could result in substantial cost saving.
Implications: Patient centered care by Optimization of ERAS can improve quality of care and decrease the cost.
Conflict of Interest: Nothing to disclose

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MULTIPLE AUDIT CYCLES WITH ASSOCIATED SERVICE IMPROVEMENT STRATEGIES LEADING TO PROGRESSIVE IMPROVEMENT IN ACHIEVING AND MAINTAINING THE 72-HOUR NEW FRACTURE CLINIC STANDARD

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Background: The BOAST guideline 7 recommends that all acute orthopaedic injuries should be seen in a new fracture clinic within 72 hours of presentation. In this study we evaluated the impact of multiple audits with subsequent service changes in the delivery of the 72-hour standard.
Methods: Five audit cycles of waiting times from ED presentation to fracture clinic appointment were collected from May 2016 to December 2017. Each audit represented one working week of data, including adult and paediatric referrals. The waiting time was measured via digital records and standardised to the nearest hour for reproducibility. This was audited against the 72-hour standard set by BOAST 7. Non-acute referrals were excluded. Clinical governance meetings were held after each audit to implement service improvement strategies for the next cycle.
Results: A total of 892 referrals were recorded, of which 806 patients met the inclusion criteria. The median wait in hours (interquartile range) for each weekly cycle was: 86 (72-114), 53 (41-83), 64 (46-68), 63.5 (47-71) and 46 (40-67) respectively. The overall BOAST 7 standard compliance (95% confidence interval) for each weekly cycle was: 21% (0.14-0.27), 72% (0.65-0.79), 86% (0.82-0.92), 79% (0.72-0.85) and 87% (0.82-0.92). Initial analysis demonstrated Thursday and Friday presentations had the most number of breaches, however this had become Monday by the final audit cycle.
Conclusions: Multiple cycles of audit over 18 months with ongoing clinical governance and management support led to significant improvements in waiting time for new fracture clinic appointments. Service improvement strategies included separating new and follow-up fracture cases, removing the cap on new fracture clinic numbers, demand and capacity planning and improving inter-departmental and patient awareness.
Implications: The BOAST 7 fracture clinic waiting time 72-hour standard is an achievable objective in a District General Hospital but requires active performance management and multiple service improvement strategies.
Conflict of Interest: Nothing to disclose

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HOW DO WE REACH THE MONTGOMERY STANDARD FOR INFORMED CONSENT IN TRAUMA AND ORTHOPAEDIC SURGERY?

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Background: The process of informed consent is being increasingly scrutinised. The Montgomery vs. Lanarkshire[2015] case sets a precedent and is driving the modernisation of consenting practice. Our aims were to establish consenting documentation practice, provide guidance for surgeons and to improve patient experience during decision making.
Methods: A two-cycle audit of consecutive patients from three-week theatre schedules were included. Documentation from all sources were assessed and the following criteria were reviewed: grade of consenting clinician, documented alternative treatment options, description of specific risks, place and timing of consent and whether the patient received written information or a copied clinic letter. Findings from cycle 1(C1) were implemented into departmental education and thereafter a second cycle(C2) of data collected.
Results: C1: 111 patients. C2: 46 patients. Each cycle assessed 14 consultants' cases. Consent was undertaken by consultants (54%), junior doctors (34%) and AHPs (11%). Specific patient and procedural risks were documented in 43%(C1) and 85%(C2). Alternative treatment options in 48%(C1) and 80%(C2). Only 14%(C1) and 15%(C2) had documented written information provision and 6%(C1) and 35%(C2) received a copy of their letter. The majority (93% C1&2) were consented in clinic, with 22% consented within dedicated consenting clinics. Documentation from dedicated consenting clinics outperformed standard clinics.
Conclusion: Highlighting poor documentation habits to clinicians can lead to improvements in practice. Documentation of all the alternative treatment options is required, doing away with medical paternalism. Clinicians should reflect on how they communicate and document information to the patient (such as through written leaflets and copied letters) and how to demonstrate adequate time for pre-operative patient reflection. Cultural changes have occurred in that consent has rightly moved away from the pre-operative bedside and into the clinic.
Implications: Clinicians should individually reflect on how to address their own shortcomings and other units should strongly consider a similar audit.
Conflict of Interest: Nothing to disclose

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A CLOSED LOOP AUDIT: FROM PATIENTS' PERSPECTIVE: "ARE WE ADEQUATELY CONSENTING OUR PATIENTS?" A COMPARATIVE ANALYSIS BETWEEN TRAUMA AND ELECTIVE ORTHOPAEDIC SERVICES

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Background: Since the Montgomery case in 2015, attention has been drawn to the patient's perspective regarding informed consent. Filing of patients' consent copies was observed in patients' notes in Trauma & Orthopaedics which initiated this study's idea. This study aimed to compare and rate patient consenting in both trauma and elective settings.
Methods: A prospective closed loop audit on adequacy of patient consenting was run in our department at University Hospitals of Leicester NHS Trust. Patients were given a survey questionnaire, asking whether a copy was offered and rating satisfaction with the consenting process. Only compos mentis patients before receiving anaesthesia were included. Data was collected, analysed & presented locally. Posters and e-mail were used to implement change. Data was again prospectively collected to complete the audit.
Results: A total of 200 patients, split between trauma and elective services, were included. Prior to change implementation, only 42% and over 90% of patients were offered a consent copy in trauma and elective services respectively. Furthermore, patient's satisfaction was 58-78% and 42-80% in trauma and elective services respectively. In the second cycle, the number of patients offered a copy was doubled to 80% in trauma services while patient satisfaction rose to 84-90% in elective services.
Conclusion: This audit to huge improvements in terms of offering carbon copies of consents to patients and their satisfaction with figures up to 90%. Physiologic response to trauma and effect of opiates in trauma cases might explain the lower figure of patient satisfaction.
Implication: This audit identified the fall-backs in our clinical practice of patient consenting in both trauma and elective services and maintained a standard of quality for patient patient satisfaction.
Conflict of Interest: Nothing to disclose

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THE VALUE CALCULATOR - ASSESSING THE IMPACT OF A VALUE BASED HEALTHCARE APPROACH TO THE DELIVERY OF CARE IN PATIENTS WITH PRIMARY HIP OSTEOARTHRITIS

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Background: Osteoarthritis has an increasing societal impact and its management is financially burdensome. Current financial challenges can inadvertently lead to strategies that adversely impact clinical outcomes and care costs. Conversely improving outcomes at excessive cost is not sustainable. Hip osteoarthritis represents a common condition that has significant variation in its management and outcomes. This defined segment of patients represents a prospective value based health care (VBHC) model. The VBHC agenda suggests a re-orientation of service about the condition, standardisation of care pathways and alignment of all stakeholders. Value in healthcare is defined as outcomes relative to the costs it takes to deliver them .
The aim was to develop a Value Calculator that could support clinically-driven improvement in both clinical outcomes and costs. This was to be trialled on different pathways for the surgical management of primary hip osteoarthritis.
Methods: 2 groups of patients within the same trust were assessed. Group 1(n=25) lacked prior physio triage and were locused at a teaching hospital. Group 2(n=25) represented a designed service with initial physio triage and were from a DGH community. Both groups shared similar co-morbidities and underwent surgery by the same surgeons at the same elective centre but had different pre and post-operative pathways. Clinical outcomes assessed included EQ-5D, VAS and Oxford Hip scores(OHS). Individual patient care pathways costs were calculated using an activity based model and margin generation was assessed.
Results: Both groups noted similar post-operative improvements to EQ-5D, VAS and OHS. There was more cost variation in the first group whilst the second group had a more standardised care pathway.
Conclusions: The described Value calculator objectively demonstrates increased value being delivered through a standardised care pathway approach.
Implications: The Value calculator can be used as an objective tool to demonstrate a service's sustainability and replicability. Care standardisation is key.
Conflict of Interest: Nothing to disclose

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DEVELOPING THE UNIFIED ELECTIVE ORTHOPAEDIC SCORE (UNEOS). A PILOT STUDY
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Background: Lately there is an increasing use of patient reported outcome measures (PROMs) in orthopaedics. There are many orthopaedic scores which are either site specific or pathology specific. These scores usually are validated for some specific pathologies and can be complicated and extensive, which make them difficult to use. The aim of the present pilot study is to develop a new orthopaedic score, dedicated for elective operations, which is not site or pathology specific. Which can measure the patients' satisfaction and it is simple and easy to use.
Materials and methods: The UnEOS consists from total 16 questions. The main questionnaire has 11 questions and includes three main dimensions (Symptoms, Function, Mental Status). This questionnaire can be obtained pre- and post- operatively. Five questions are added to the questionnaire at the postoperative mode, which form the satisfaction dimension. This flexible design offers the ability to compare the pre- and post-operation status and compare different pathologies and sites. For this pilot study we enrolled patients from our foot and ankle outpatients' department. Each patient was asked to complete the UnEOS and FADI questionnaire.
Results: A total of 53 questionnaires were collected from patients (aged 57.3 years) with variable foot and ankle pathologies, pre- and post-operatively. The scale reliability was checked with the Cronbach's Alpha score, which was 0.874 for the UnEOS scale. Each subscale had good reliability with 0.74, 0.77 and 0.71 respectively (Symptoms, Function, Mental Status). The validity of the scale was checked using the Spearman's Rho correlation, which was strong between the UnEOS and the FADI score (0.83) and each subscale (0.69, 0.76 and 0.69 respectively).
Conclusion: The UnEOS score is a valid and easy to use PROM which is not site or pathology specific. Further validation with other orthopaedic pathologies will lead to a Unified Elective Orthopaedic score.
Conflict of Interest: Nothing to disclose

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HOW VALID IS THE REVISION DATA PROVIDED BY HOSPITALS TO THE NATIONAL JOINT REGISTRY?
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With over 2.35 million records, the National Joint Registry (NJR) is the largest arthroplasty registry in the world. It provides a powerful tool to monitor implant survivorship and influence different surgical strategies. To date, little work has been undertaken to investigate the validity of the *´Reason for Revision´* recorded in Consultant Outcome Publications on the NJR.
Of the 22,046 primary Total Hip Replacements (THR) and Total Knee Replacements (TKR) undertaken by 23 surgeons at our hospital, over an eleven-year period, 1.35% (297) were subsequently reported to the NJR as revised. Review and validation of *´Reason for Revision´* was undertaken using radiological imaging studies, pathology, histology, microbiology and electronic medical records.
Discrepancies in reporting to the NJR were identified for 41 cases (25.6%) for THR and 28 (20.4%) cases for TKR. Revision for infection was under-reported for both THR and TKR by 1.88% and 3.65% respectively. Reporting of adverse soft tissue reaction to particulate debris for THR was unreported by 11%. Progressive Arthritis following a TKR was unreported by 6.56%. All cases reported as 'other' (8.75% for THRs and 3.65% for TKRs), were reclassified to the most appropriate ´reason for revision´ category. The *´reason for revision´* data is recorded to the NJR with findings at the time of surgery. It is some days before microbiology and histology reports become available and source data is not always updated.
If an average of 23% wrong data entry at a highly organised institution is replicated throughout the UK, a formal process to validate primary and revision data submitted to the NJR should be considered. Local scrutiny, review and validation of revision data are all vital to optimise the value of the NJR. Accurate data recorded to the NJR is imperative to provide safe and effective improvements in orthopaedic surgery.
Conflict of Interest: Nothing to disclose

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INTRODUCTION OF THE "GOLDEN PATIENT" IMPROVES TRAUMA LIST START TIMES IN A DISTRICT GENERAL HOSPITAL
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Background: Fewer delays in starting a trauma list can reduce cancellations. A novel system has been previously described where a patient is identified the day before and optimised for theatre. The patient is listed first and designated "Golden Patient". This project aimed to assess the impact of introducing a "Golden Patient" system on trauma list start times in a district general hospital.
Methodology: Two months of first case sending and anaesthetic start times were recorded retrospectively (43 cases). The "Golden Patient" system was introduced with a multi-disciplinary implementation group. Target send time of 0830 hours (hrs) and anaesthetic start time of 0900hrs was agreed. First patients on trauma lists were noted in two cycles, two months apart (Cycle 1: 46, Cycle 2: 38).
Results: Prior to implementation: Mean Send Time (MST) of 0855hrs, Mean Anaesthetic Start Time (AST) of 0921hrs.
Cycle 1: MST fell by 9 minutes (p = 0.03) and AST by 11 minutes (p = 0.023). Lists labelled with a "Golden Patient" (47.8%) were sent 14 minutes earlier (p = 0.004) and started 12 minutes earlier (p = 0.02) than those not labelled "Golden".
Cycle 2: Implementation produced a 13-minute reduction in send times (p = o.oo3) and start times (p = 0.008) overall. "Golden Patient" cases (42.1%) showed an improved MST of 0836hrs and AST of 0902hrs, 10 minutes earlier than those not designated "Golden".
Conclusion: Implementation of the "Golden Patient" produced a significant improvement in trauma list starts overall. Specifically, "Golden Patients" help to improve efficiency in sending and anaesthetic start times, by up to 19 minutes on average.
Implication: Implementation of a "Golden Patient" system serves as a useful tool in improving operative start times.
Conflict of Interest: Nothing to disclose

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THE ABBREVIATED MENTAL TEST SCORE - TIME FOR MODERNISATION?
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Background: Measuring patient's cognitive functions is one of the most important assessments clinicians perform. The Abbreviated Mental Test Score (AMTS) was first established in 1972 with the aim of quickly assessing patient's cognition.
As part of the AMTS patients are required to recall facts such as the year that World War II began and the present Monarchs name.
Our team hypothesise that the recall of such facts is not justifiable given the fact that many of the patient's wouldn't have necessarily lived through this period.
Methods: 100 patients between the ages of 18-75 were asked the following questions as part of their elective and fracture clinic appointments.
· The Year that World War II started
· The current Monarchs name
· The date of a memorable event in their lifetime that they would not expect people of the same age to ever forget
Results: A total of 100 people were included in the study. Only 47% of individuals could recall the year that WWII started. 97% of individuals correctly stated the current monarchs name.
51% of individuals surveyed stated 'The World trade Centre Terrorist attack in New York (9/11)' as the date that they would expect people of the same age to never forget the date of.
Conclusions: Our study highlights the need for modernisation of the current AMTS. It shows that less than half of the population surveyed knew the year that WWII began.
Moreover our study has highlighted a memorable event that is potentially more applicable to our current population - The World Trade Centre terrorist attack in New York.
We propose that the dates of World War II question is replaced with the following question- 'what was the date of the terrorist attack on the World Trade Centre in New York? in a modernised AMTS'.
Conflict of Interest: Nothing to disclose

10 Innovation Education and Simulation

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PERCEPTIONS OF TRAUMA AND ORTHOPAEDIC SURGEONS OF NON-TECHNICAL SKILLS TRAINING

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Background: Non-technical skills include leadership, team working, decision making and situational awareness. These key skills have been shown to be important in ensuring patient safety and preventing error. Whilst non-technical skills training has been embraced by the rest of medicine rather less is known about the experience of orthopaedic surgeons who have classically, been described as lacking in this area. The aim of this study is to explore the perceptions of orthopaedic surgeons of non-technical skills training.
Methods: Orthopaedic trainees from the North-East Thames region of London were invited to participate in this study. Cohort one were trainees who had undergone an immersive simulation course in non-technical skills and cohort two were conventionally trained only. Semi-structured interviews were audio recorded, transcribed verbatim and underwent qualitative thematic analysis.
Results: Seven interviews were completed for cohort one and three for cohort two producing 39,903 and 7,700 words of transcription respectively. Thematic analysis revealed seven overarching themes. Simulation was found to be an excellent method of learning non-technical skills with participants reporting that the immersive scenarios had high face validity and the opportunity to learn from peers and allied-health-care professionals through debriefing. On-the-job-learning was found to be more a nebulous method of acquiring non-technical skills. They were influenced by culture at work and from informal feedback from their consultants. The trainees were motivated to learn about non-technical skills to improve patient safety but also to progress in their careers as there is an increasing focus in post-graduate examinations and interviews.
Conclusions: Orthopaedic trainees were found to have a wide exposure to non-technical skills. Despite this, the trainees perceived these skills as being under-represented in orthopaedics.
Implications: Integration of a dedicated non-technical skills course for orthopaedic surgeons into the higher surgical curriculum and formalisation of feedback on the job using dedicated tools is recommended.
Conflict of Interest: Nothing to disclose

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COMPUTER-ADAPTIVE TESTING VERSUS TRADITIONAL PATIENT-REPORTED OUTCOME MEASURES. A SYSTEMATIC REVIEW

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Traditional questionnaires used to collect patient-reported outcomes are burdensome for both patients and healthcare staff and may have limited sensitivity.
Computer-Adaptive Tests (CATs) reduce the time required to estimate the respondent's score on a given domain. The questions administered depend on the test taker´s responses to the previous questions. The process is based on the Patient-Reported Outcomes Measurement Information System (PROMIS) item bank, which includes measures of patient-reported health status for physical, mental, and social wellbeing.
We investigated the validity and potential advantages of PROMIS CATs over traditional patient-reported outcome measures.
A systematic literature review was performed using PubMed.Four main PROMIS CAT domains were identified: Physical Function (PF), Pain Interference (PI), Pain Behavior (PB), and Depression (Dep). A total of 104 articles were reviewed, of which 44 clinical studies in adults reported on at least one of the four PROMIS CATs. Of these, 36 were related to PF, 16 to PI, 4 to PB and 11 to Dep. The trials focused on upper and lower extremity disorders, and other orthopedic trauma. PROMIS CATs were compared against 39 clinical outcome measures including the SF-36, EQ-5D, and KOOS.
Six studies reported excellent concurrent validity for the PF CAT when compared to the SF-36 PF scale. PF CAT scores also were highly correlated with the KOOS Sport scale. The PF CAT outperformed the SF-36 PF scale in discriminating between patients due to an absence of ceiling/floor effects. In general, researchers reported that the 4 PROMIS CATs in question are quick to administer and highly sensitive.
This review demonstrated the reliability, sensitivity, validity and utility of outcome measurement using PROMIS CATs. The use of PROMIS CATs reduces the question burden on patients and clinicians, and may lower clinical research costs by reducing sample size requirements. Studies are completed quicker with reduced costs of delivery.
Conflict of Interest: We declare that we have read and understood the BOA's Code of Ethics on Declarations of Interests. We hereby declare the following interests in the healthcare industry according to the BOA's published code. Personal Pecuniary Interest in last 3 years: BH, AK; Personal Family Interest, Non-personal Pecuniary Interest: none.

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A MOBILE APP FOR COLLECTING OUTCOME MEASURES: FIRST USER FEEDBACK AMONGST TKA PATIENTS

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The need to generate evidence on safety, efficacy and patient benefit of a device or procedure, fostered by the new MedDev Rev 4 and the Medical Device Regulations, has increased emphasis on timely and accurate acquisition, interpretation and dissemination of clinical data. In parallel, autonomous decision making amongst clinicians is shifting towards a more collaborative approach to patient care.
A new platform to enhance patient engagement and patient-reported outcome (PRO) collection has been developed. This platform consists of a mobile application (App) and a clinician dashboard. The App has several features including staff-patient messaging, reminders to engage in health behaviours, interactive surveys, educational articles, and encouragement. A short series of questions for PRO, developed using item response theory, has been included in the App. Being far shorter than traditional PRO questionnaires, and delivered using mobile technology, this provides an opportunity to reduce burden on test takers, remotely monitor the patient's responses, increase compliance and reduce loss to follow-up. These could represent clear advantages in a clinical research setting.
To gather initial feedback on this new platform, user testing was conducted amongst 18 total-knee arthroplasty patients in two U.K. hospitals in summer 2017. After using the App, participants answered questions regarding the App features and their willingness to use it in the future. All 18 participants confirmed that would like to use a health App before and after their surgical procedures, if offered to them by their clinic. The three most popular App features that participants confirmed they would use

were medication reminder (17/18, i.e. 94%), surveys (16/18, i.e. 89%), and health education (15/18, i.e. 83%). Additional qualitative feedback and suggestions for further development were also elicited from participants and staff.
A feasibility study on this innovative platform is now planned, to further corroborate these results.
Conflict of Interest: We declare that we have read and understood the BOA's Code of Ethics on Declarations of Interests. We hereby declare the following interests in the healthcare industry according to the BOA's published code. Personal Pecuniary Interest: BH, AK, ED, IM; Personal Family Interest: none; Non-personal Pecuniary Interest: ED, IM.

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COGNITIVE TASK ANALYSIS FOR TOTAL HIP ARTHROPLASTY - THINKING LIKE AN EXPERT SURGEON

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Introduction: Understanding and training for the cognitive steps of a complex task improves performance in professional sport, aviation, and keyhole surgery. For total hip arthroplasty (THA), cognitive training prior to performing real surgery may be an effective adjunct alongside simulation to shorten the learning curve. This study sought to create a CTA training tool to perform direct anterior approach THA, validated by expert surgeons.
Methods: We employed a Delphi method with four expert surgeons from three international centres of excellence. Surgeons were independently observed performing THA. Using a semi-structured interview, surgeons then created a Task Diagram and completed a Knowledge Audit in the following domain: Diagnosing and predicting; situational awareness; perceptual skills; improvising; metacognition; recognizing anomalies; and compensating for equipment limitations. This qualitative data underwent thematic analysis by an independent reviewer to create a unified, anonymised CTA. This was sent as an electronic survey to the experts, to keep, eliminate or alter each statement in successive rounds, until a consensus was reached.
Results: Experts reached 100% consensus after five rounds. They defined THA in 46 steps and 52 decision points in 8 distinct procedural phases. Each phase comprised of a set of actions, cognitive demands, and critical errors and strategies. These related to three general domains - patient-related technical demands, equipment-related technical demands, and non-technical demands. This CTA was mapped onto a web-based learning tool with each phase of the procedure linked to intra-operative video and images.
Conclusions: This is the first validated CTA tool for arthroplasty. It provides structure for competency-based learning of this complex procedure; and describes strategies to recognise and solve intra-operative challenges as derived from experts.
Implications: This CTA tool may help surgeons training in arthroplasty to think like an expert. Future work will compare its effectiveness to conventional training in delivering procedural knowledge and skill.
Conflict of Interest: Nothing to disclose

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SIMULATING A PATIENT'S PATHWAY THROUGH A NEW SURGICAL FACILITY: A METHOD TO PROMOTE HOSPITAL SAFETY IN RESOURCE POOR SETTINGS

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Background: Improving hospital safety is challenging in resource poor countries. To promote hospital safety before a new hospital opened in Malawi, we simulated a patient's pathway from admission to discharge.
Methods: We identified administrative and clinical activities associated with a surgical patient's hospital pathway. We convened a simulation team comprising an orthopaedic surgeon, matron, orthopaedic and anaesthetic clinical officers and held a staff meeting each morning. Two hospital personnel volunteered to be the hypothetical patient and their accompanying guardian. The first day of simulation identified equipment and policies associated with admission and pre-operative clinical assessment of a patient for surgery.
The second day simulated the pre-operative preparation of the patient on the ward, admission to the operating theatre prior to a simulated upper tibial osteotomy, equipment safety checks, post-operative

care, and hospital discharge. Contemporaneous written notes were kept and a debriefing meeting held each afternoon.
Results: Hospital personnel were found to be familiar with their clinical and administrative roles. Additional supplies of oxygen, nitrous oxide, and anaesthetic drugs were needed.
Policies requiring clarification, forms requiring amendment, and general maintenance tasks for completion were identified. Absence of essential items meant that the hospital opening was delayed for three days.
Conclusion: Simulating a surgical patient's hospital pathway identified areas for safety improvement. The simulation was conducted during the week prior to the hospital opening. We recommend future simulations be conducted four to six weeks earlier.
This would allow for repeat of the simulation to ensure that safety gaps identified are rectified and that personnel are familiar with changes in policies and procedures.
Implications: The simulation procedure enabled more efficient and safer policies and procedures to be implemented. This was an efficient method promoting team building in a new hospital and could be replicated to promote hospital safety elsewhere in resource poor settings.
Conflict of Interest: Nothing to disclose

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POSTGRADUATE TRAUMA & ORTHOPAEDIC EDUCATION: A MULTI-CENTRE EVALUATION OF FOUNDATION DOCTORS TRAINING & LEARNING ON TRAUMA & ORTHOPAEDIC ROTATIONS

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Disorders of the musculoskeletal system are the commonest reason why a person seeks medical aid, making orthopaedics education a key component of foundation doctors training. With mounting staffing pressures and number of patients, maintaining the quality of postgraduate training in orthopaedics is vital for the future of our foundation doctors.
Our aim was to assess the starting knowledge of our foundation year doctors and to see what aspects of training improved their knowledge on rotation.
Foundation year doctors in orthopaedics departments across the UK where asked to answer a 20 question MCQ examination, covering general aspects of trauma and elective orthopaedics. Doctors completed the MCQ at the beginning and end of their 4-month rotations along with a few generic questions about learning opportunities in their department.
Out of 46 foundation doctors, 38 completed both MCQ's. The mean score across all doctors was improved from 12.4 to 15.3 ($p=0.0007$). An interest in T&O as a career showed no significant improvement in score. Daily attendance at a trauma meeting showed a significant improvement in mean scores ($p=0.05$). Only 28 doctors had weekly teaching and 6 doctors received no bedside teaching. Doctors who attended theatres regularly showed significant improvement in theirs scores ($p=0.016$). Clinics where attended infrequently and showed no significant improvement in scores. Interestingly those who enjoyed their rotation showed a significant improvement in their MCQ scores ($p=0.008$).
With musculoskeletal disorders rising it is crucial that we maintain high levels of training and education in our departments. Clearly there are key aspects in training that set a productive environment for learning, identified in this project. Some as simple as enjoyment; highlighting that a safe and enjoyable environment can have a huge impact on learning.
These results will hopefully help hospitals develop their departments to provide a suitable environment for teaching and learning.
Conflict of Interest: Nothing to disclose

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A RANDOMISED CONTROL TRIAL OF NAÏVE MEDICAL STUDENTS PERFORMING A SHOULDER JOINT CLINICAL EXAMINATION: TEXTBOOK VERSUS SEMINAR VERSUS VIDEO

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Aims and objectives: Medical education is a rapidly evolving field. However, the teaching of clinical examination does not have a strong evidence base and has not changed for many years. Technology is influencing traditional teaching methods, although the evidence for this remains sparse.
This study compared the method of delivery of teaching in a randomised control trial between face to face seminar, text-book learning, and a custom designed video tutorial accessible via a web portal.
Method: Sixty-seven pre-clinical medical students who were naïve to large joint examination were recruited. They completed a learning style questionnaire and were block randomised accordingly into the three teaching styles: textbook, seminar and video tutorial. Assessments were performed at baseline, day five and day 18 post intervention by blinded assessors using a standardised assessment tool (max score 30).
Results: There was no significant difference between the groups at baseline assessment. The mean baseline score was '2.8'. The mean post intervention scores were '16.5' (textbook), '22.4' (video) and '25.5' (face to face). Face to face teaching was significantly better than other methods (p=0.001). There was no significant difference between the first and second post- test assessments. There is no contribution of learning style to performance in any group (p=0.247).
Discussion: Face to face teaching remains the gold standard for teaching clinical examination. A purpose designed open access educational video was inferior to face-to-face teaching. Further work is now required to assess the role of technology in augmenting traditional teaching.
Conclusion: Our study has shown superiority of face-to-face seminar sessions over video tutorial and textbook learning for learning how to perform a shoulder examination. Access to video technology is useful and we received positive feedback for this and we advocate its use as an adjunct to small group seminar sessions.
Conflict of Interest: Nothing to disclose

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PROPHESYING THE DATE OF DISCHARGE PREOPERATIVELY WITH A SMARTPHONE APP: AN ADVANTAGEOUS AMALGAMATION OF TECHNOLOGY AND STATISTICS

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Background: Length of stay [LOS] after total knee arthroplasties [TKA] has steadily fallen over the last few decades and few attempts have catered to this important query. This research was designed to estimate LOS for patients undergoing primary unilateral and bilateral TKA, develop a smartphone application, and to establish its reliability in predicting LOS.
Methods:
In the first part, retrospective analysis of prospectively collected material between January'16 and March'17 was performed. LOS, defined as days from surgery till discharge, was collected for patients above 40 years who had undergone unilateral and bilateral TKA. Complex primary, revision and infected cases were excluded. Charts were analyzed for sixteen preoperative variables [demographic, historical, clinical, laboratory and radiological data and knee scores] using Spearman's rank correlation [continuous variables], Mann-Whitney and Kruskal-Wallis [discrete variables] tests. Multivariate regression analysis [MRA] was also performed [2-tailed,$p < 0.05$].

As a second part, equations, thus derived, were incorporated into a smartphone app, which was prospectively tested over a month on 100 unilateral and 15 bilateral TKAs. App-predicted and actual LOS were compared by blinded investigators.
Results: Among 1,663 patients [1,524 unilateral and 139 bilateral], mean LOS were 4.4 and 5.2 days respectively. Insurance, FFD or hyperextension; poor preoperative Oxford Knee Score [PREOPOKS] and rheumatoid arthritis were significant predictors of prolonged LOS in unilateral knees which could be calculated by entering values into our model equation:**LOS=5.602-[0.386xCI]+[0.041xFFD]-[0.028xPREOPOKS]+[0.064xHE]-[0.707xET]** CI: cash(1)/insurance(0)
ET: etiology:osteoarthritis(1)/rheumatoid arthritis(0)
The only variable delaying LOS in bilateral knees was low PREOPOKS.**LOS=7.712-[0.148xPREOPKS]**.
On comparing app-predicted and actual LOS, no significant differences were observed.
Conclusions: Our study enlisted statistically significant preoperative predictors of discharge following TKA. We were also successful in developing a tested software application.
Implications: Knowledge of LOS has manifold implications; allowing mental, travel and accommodation preparedness, lowering stress, scheduling surgeries, filling insurance details for the hospital authorities and insurance desks.
Conflict of Interest: Nothing to disclose

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FACTORS DETERRING UK MEDICAL GRADUATES FROM PURSUING A CAREER IN TRAUMA & ORTHOPAEDICS - RESULTS OF A NATIONAL SURVEY

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Background: Since the introduction of national recruitment for speciality training in Trauma and Orthopaedics(T&O) in 2013, the competition ratio has fallen by more than a half in just four years. The goal of this study is to explore factors that discourage graduating medical students' from pursuing a career in T&O.
Methods: An online questionnaire aimed at graduating final-year students was emailed to UK medical schools between Feb'17 and July'17. A 3-point Likert scale was used to assess factors that discourage students from pursuing a career in T&O.
Results: We received 236 responses. Seventy-eight per cent (183/236) ruled out T&O as their future speciality. Sixty-two per cent of students stated that lack of early exposure to the speciality and unsociable working hours discouraged them from pursuing a career in T&O. Inadequate undergraduate training (57%) and paucity of positive mentorship (52%) were also found to disincentivize students from following this career. Additionally, perceived high competition ratio (51%), uncertainty about geographical location (50%), length of training (50%), technical aspects of orthopaedic surgery (46%), and high male to female ratio (44%) were identified as deterring factors. Contractual changes (23%) and cost of training (32%) were considered to be relatively less important deterrents.
Conclusions: This study shows that the quality of undergraduate training, timing of clinical exposure, gender parity, access to influential mentors, and work-life balance are areas that need urgent improvement to increase graduating students' interest in this speciality.
Implications: As less than 15% of UK foundation doctors undertake a rotation in T&O, medical schools remain the primary source of orthopaedic training for the majority of medical graduates. To ensure that T&O remains a desirable and competitive speciality in the future, universities and health education boards must work collaboratively to improve the provision of undergraduate T&O curriculum and implement robust regional/national recruitment strategies.
Conflict of Interest: Nothing to disclose

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THE PREVALENCE AND EFFECTS OF ON CALL STEPDOWN ON ORTHOPAEDIC REGISTRAR TRAINING: THE NORTH WEST TRAINEES PERSPECTIVE

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Background: Ensuring safety for patients is increasingly being threatened by gaps in on call rotas. When a gap occurs in junior grade on call rotas the orthopaedic registrar often steps down and under takes the role of both junior and middle grade doctor. This increased burden of responsibility while on call can compromise safety and wellbeing of both patients and doctors. We aim to quantify the prevalence and effects of stepdown whilst on call for trainees in one of the largest orthopaedic training programmes in the UK.
Methods: An online/paper survey was conducted of 55 trainees on the North west orthopaedic rotation. The primary outcomes were: How prevalent trainee experience of stepdown was, the effects of stepdown on patients and trainees, and the overall impact on training and morale.
Results: Response rate was 93% (n = 51). 55% of trainees had experienced step down during their training. Stepdown occurred a minimum of 84 times. It occurred statistically more frequently for expected absences as opposed to unexpected absences (p=0.002). Of the trainees that stepped down 64% felt pressure to do so from seniors and 79% felt pressure from hospital management. When stepping down 43% of trainees felt unsupported. 53% of trainees felt that step down was managed in an unsafe manner. 49% of trainees stated stepdown impacted on their own personal safety and 50% of trainees lost out on a training opportunity. Overall, 57% of trainees felt that step down and rota gaps affected their morale negatively. When step down did occur in 85% of cases there were no issues that resulted in patient harm.
Conclusion and Implications: The results of our survey suggest that step down is common and it does impact negatively impact upon registrar training, safety and morale. Patient safety overall seems

to be well protected.
Conflict of Interest: Nothing to disclose

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FACTORS CONTRIBUTING TO UNDERREPRESENTATION OF WOMEN IN TRAUMA & ORTHOPAEDICS: RESULTS OF A NATIONAL SURVEY
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Background: Although women account for 55% of UK medical students, only 5% of the Trauma & Orthopaedics (T&O) consultants are females, representing the lowest female to male ratio amongst all surgical sub-specialities. The aim of this study is to investigate the deterrents that contribute to poor female representation in T&O.
Methods: An online questionnaire was distributed to UK medical schools aimed at graduating students between Feb'17 and July'17. A 3-point Likert scale was used to assess factors that discourage students from pursuing a career in T&O. Further sub-analysis was performed to compare the effect of these deterrents between female (F) and male (M) students.
Results: We received 236 responses. Seventy-eight per cent (183/236) ruled out T&O as their future speciality. A significantly greater proportion of female students (60%F vs. 40%M, P< 0.05) decided against pursuing a career in T&O. Unsociable working hours, on-call commitments, predominance of male gender, technical aspects of orthopaedic surgery, and lack of undergraduate exposure to T&O were shown to be significantly (P< 0.05) more important deterrents to female students than their male peers. Length of training, lack of mentors and role models, and uncertainty about location of higher training were also found to discourage female students from choosing orthopaedics as a career; though these factors were statistically equally as important to male students (P< 0.05).
Conclusion: This survey shows that lower rate of female applicants in T&O is strongly linked to inadequate undergraduate exposure to the speciality, lifestyle factors, poor female representation, and misperception that one must be physically strong to perform orthopaedic surgery.
Implications: In order to change perceptions of career in T&O and make it more appealing to women, universities and orthopaedic departments must improve the delivery of undergraduate T&O curriculum, students' operative experience, and access to female role models in orthopaedics.
Conflict of Interest: Nothing to disclose

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CURRENT STATE OF UNDERGRADUATE TRAUMA & ORTHOPAEDICS TRAINING IN THE UK: A NATIONAL SURVEY
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Background: Although musculoskeletal conditions account for 20-27% of all referrals to primary and emergency care, deficiency in UK undergraduate training in Trauma and Orthopaedics (T&O) remains well recognised. We aim to evaluate the undergraduate experience of T&O training in UK medical schools and its impact on graduating students' self-perceived level of competence in T&O as well as career choice.
Methods: An online questionnaire was distributed to UK medical schools aimed at graduating students between Feb'17 and July'17. This questionnaire was designed to evaluate the duration of undergraduate T&O training, quality and quantity of teaching received, and students' self-perceived level of confidence in key T&O topics before starting their medical careers.
Results: We received 236 responses, of which 22.5%(n=53) expressed an interest in T&O as a future career. The average duration of T&O experience was 2.8weeks. This exposure was longer in those interested in T&O versus those not interested(3.4weeks vs 2.6weeks, p< 0.05). Worryingly, 21.9%(n=52) reported no T&O experience. Majority of students attended 1-5 sessions of: T&O lectures(62.7%), small group teaching (64.4%), trauma meetings (57.6%), clinics (66.1%), theatres (70.3%) and shadowing on-calls (50.4%). Unfortunately, 38.6% rated their undergraduate T&O experience as either inadequate or poor. Self-reported confidence was low across all T&O core skills: clinical examination (5.7/10), diagnosis (5.2/10) and management (4.7) irrespective of future specialty choice (1=no confidence, 10=complete confidence).
Conclusions: This study demonstrated that undergraduate T&O training is inconsistent across the UK, with medical schools currently failing to provide adequate training in orthopaedics. Overall,

graduating students lack confidence in clinical musculoskeletal skills.
Implications: As less than 15% of UK foundation doctors undertake a rotation in T&O, medical schools remain the primary source of orthopaedic training for the majority of medical graduates. Medical schools should place greater emphasis on musculoskeletal skills teaching through high-quality undergraduate rotations in T&O.
Conflict of Interest: Nothing to disclose

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THE ROLE OF COGNITIVE SIMULATION IN SURGICAL EDUCATION; THE ADVENT OF MOBILE APPLICATIONS
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Background: Simulation provides a safe environment, for trainees to learn through interactions and experiences, maximize learning in a time where working patters are limiting training. The expansion of simulation as a teaching tool has led to innovation in cognitive simulation applications, for example Touch Surgery. The evidence regarding the value and transferability of the learning from these applications is however, scarce. We aim to ascertain the value and current role of cognitive simulation from a core surgical trainee perspective, to help improve surgical training.
Methods: We conducted a prospective study of trainee perceptions during core surgical training. A structured questionnaire was designed and modified after piloting with local trainees. Qualitative and quantitative data was analysed using statistical frequency analysis and thematic analysis respectively.
Results: A representative cohort of core surgical trainees completed the study questionnaire, with a 58.3 return rate. Touch surgery represented the predominant cognitive simulation application used (42.9). The overriding theme (85.7%) being that applications form an adjunct to traditional learning, specifically pre-operative simulation, with an average to good transferability to clinical practice. Thematic analysis highlighted confirmed the pre-operative value of cognitive simulation in the review of surgical techniques, and practical skill development.
Conclusions: Understanding how trainees value and utilise cognitive simulation applications is essential to improving training. These results build upon the established evidence regarding simulation training; however, expand this to include cognitive simulation applications, particularly Touch Surgery. Trainees are using cognitive simulation pre-operatively, re-enforcing intra-operative learning; a potentially powerful tool for trainers to engage with, allowing optimisation of limited learning opportunities.
Implications: The value and role that trainees are ascribing to cognitive simulation demonstrates a potential method of optimising surgical education, particularly with junior trainees. Through adoption of these simulation tools, trainers can tailor individualised learning to specific operative opportunities, enabling trainees to maximise intra-operative learning.
Conflict of Interest: Nothing to disclose

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ELECTROSPUN POLYDIOXANONE (PDO) SUTURES SAFELY INDUCE TENDON HEALING, CELLULAR INFILTRATION AND NEOVASCULARISATION IN AN *IN VIVO* LARGE ANIMAL MODEL
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Background: We aimed to evaluate the safety and efficacy of a multifilament electrospun polydioxanone (PDO) suture compared to a traditional monofilament PDO suture for repairing a tendon defect in a non-healing ovine injury model.
Methods: Longitudinal lesions of the lateral branch of the deep digital flexor tendon of 8 female adult English Mule sheep were repaired by electrospun PDO suture and a traditional PDO monofilament suture (control). All sheep were euthanased at 3 months and tendon tissue was harvested. Haematology and serum inflammatory markers were used to assess a systemic response. Local response was recorded by circumferential limb measurements around the repair site, and by detailed inspection during harvest. Histology was used to assess cellular response to the electrospun and

monofilament sutures by comparing fibroblast cell count, foreign body giant cell (FBGC) count, and vascularity grade (0-3). Statistical analysis was used to compare the cellular response of the electrospun and monofilament sutures.
Results: No tumours or infections were seen at necropsy. All tendon repairs healed. No gross swelling was recorded. We observed a mild local inflammatory reaction around the healed tendons, that were not adherent to the sheath, and surrounded by minimal normal synovial fluid. Electrospun sutures were more densely infiltrated with fibroblasts (89 CI 78-108 vs 16 CI 9-22, p=0.0002), and accompanied by new blood vessel formation (2 CI 1.6-2.7 vs 0, p=0.0002) compared to the monofilament sutures, which did not demonstrate any cellular infiltration or neovascularisation. FGBCs were rarely seen in all specimens.
Conclusions: We successfully applied electrospun bioactive sutures in an ovine tendon repair model that promoted cellular infiltration and neovascularisation, with no systemic or adverse local inflammatory response at 3 months. This study demonstrated the safety and efficacy of electrospun sutures to repair tendon defects and provides necessary evidence to proceed to a first-in-human clinical trial.
Conflict of Interest: Nothing to disclose

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SUBCHONDRAL VESSELS LOST IN EARLY OSTEOARTHRITIS
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Introduction: Bone circulation has been studied extensively but there has been little focus on the subchondral plane with respect to vascular modifications that might cope with weight bearing forces. Fluctuating high subchondral pressures arise during activity. We previously described upper tibial subchondral radiating vascular marks on MRI which are lost in early osteoarthritis. We sought histological evidence.
Methods: We studied subchondral vascular patterns in the transverse or axial plane of calf metacarpal, normal human knee and osteoarthritic knees. We looked for vascular modifications that might allow transmission of pressure to the cortical shaft. We used 5% aqueous nitric acid decalcification and sections up to 10um thick with H&E, Masson, Goldner and Van Gieson trichrome stains. We visualised cell and tissue distribution macroscopically and by light microscopy.
Results: Macroscopically in normal human upper tibial decalcified slices vessels were observed in a radiating pattern correlating with MRI images of equivalent slices.
Microscopically in calf and human samples histomorphometric assessment suggested that the vessels had the appearance of parallel arteries and veins. They lay in the axial subchondral plane in a radiating pattern. While present in normal bone they were absent in osteoarthritic bone.
In both calf and normal human bone the vessels appeared to have complex distortions, nodes or possible choke valves in the subcortical region.
Conclusion: We have described vascular structures which match those seen on MRI slices of the upper tibia. The vessels consist of single arteries with adjacent veins. They appear to be absent in arthritic bone. At the cortical margin the vessel bundles appear to have a valve or choke structure which might protect subchondral vessels from the effects of fluctuating pressures or hydraulic shock during activity.
Implications: This physiology advances our understanding of the pathogenesis of osteoarthritis.
Conflict of Interest: Nothing to disclose

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THE SIGNIFICANCE OF ACROMIO-CLAVICULAR LIGAMENT REPAIR FOLLOWING ACJ RECONSTRUCTION, COMPARING 4 SYNTHETIC IMPLANTS: AN IN-VITRO STUDY
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Background: Acromioclavicular joint (ACJ) injuries are common, with high-grade separations requiring surgical stabilisation. Horizontal instability has been shown to have a closer association with pain and functional impairment than vertical instability.
Aim: To compare various fixation methods available for ACJ reconstruction and evaluate the importance of AC ligament repair in enhancing horizontal stability.
Method: This was a cadaveric study. The ACJ was exposed and native joint was subjected to a constant 70N load on the lateral end of the clavicle to test the antero-posterior (AP) and supero-inferior

(SI) translation and horizontal pivot angle (HPA). The AC and CC ligaments were subsequently divided and above 3 parameters tested. Currently available 4 common synthetic implants - Lockdown, Neoligament, LARS and Endobutton were used to reconstruct the ACJ and tested with and without AC ligament repair (horizontal mattress No2 Ethibond suture).
Results: The native joint allowed 2-3 mm of AP and 3-4mm of SI translation with 20-30° rotation in cross arm adduction. All ligaments improved the stability of ACJ in SI plane very well allowing approximately 5mm of movement in this plane. However it was the worst when it came to AP stability, allowing around 1-2 cm of translation after repair. All reconstructions allowed AP instability of around 1-2 cm, which is 2-3 times what native joint allows. All the reconstructions however performed far superior with ACJ suture and once the AP instability was controlled with the suture, Neoligament and endobutton outperformed the rest.
Conclusion: The devices varied in their approach in fixation and concentrated on reconstruction of CC ligaments. The AC ligament repair significantly improves the stability of the construct allowing the normal native rotations and significantly reduces the AP and posterior-superior translation of clavicle in cross arm adduction test.
Conflict of Interest: Nothing to disclose

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QUANTIFYING IONISING RADIATION DOSAGE TO CLINICIANS' BRAINS DURING FLUOROSCOPIC GUIDED ORTHOPAEDIC SURGERY: SIMULATED CADAVER EXPERIMENT - QIRDOSC STUDY

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Background: Studies have identified interventional cardiologists/radiologists to be at risk of radiation-induced brain cancers. Orthopaedic surgeons routinely use fluoroscopy yet the amount of exposure to the brain and the effect of personal protective equipment(PPE) remains unknown. Our aims were to quantify radiation exposure to the brain during short cephalomedullary nailing, a common orthopaedic procedure, extrapolate lifetime dose, and determine the effects of PPE.
Methods: Two cadavers were used:1.Full body with short cephallomedullary nail inserted on the left; 2.Head/neck specimen placed at a distance reproducing the procedure, with optically stimulated luminescent(OSL) dosimeters placed in specific locations(thyroid, lens, skin, deep brain).
The patient-cadaver's left hip was exposed in AP/LAT planes. Radiation measurements were scaled to clinically relevant Air Kerma values. Measurements were performed without PPE and then repeated sequentially with each then all PPE.
Surgeons averaged 16 cases/year. An average career was estimated at 40 years(age 25-65).
Results: The mean brain radiation without PPE was 3.35µGy. This was significantly reduced in all 4 PPE groups($p < 0.05$). There was no significant additional reduction when the thyroid-collar was used in isolation(2.94µGy) versus when used with leaded-glasses(2.96µGy), lead-cap(3.22µGy) or both(2.31µGy)($p > 0.05$).
The estimated mean brain exposure was 53.65µGy/year with a mean lifetime dose of 2146.11µGy without PPE. PPE decreased exposure to 1883.24µGy/lifetime. The right side of the brain recorded higher exposure in all scenarios with a lifetime dose of 3008µGy. The thyroid-collar reduced it to 2464µGy. The lead-cap did not reduce radiation.
Conclusions/Implications: The cumulative lifetime radiation to a surgeon's brain from short cephallomedullary nailing is small. However, this represents only one of many fluoroscopy-aided procedures of most surgeons and underestimates total lifetime exposure. This study demonstrates that in addition to its primary role, thyroid-collars significantly reduce radiation dose to the brain and should be worn. Lead-caps appear to have minimal additional effect and hence its use is not supported.
Conflict of Interest: Research funded by fellows research grant from AO Trauma North America.

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DEVELOPMENT OF A DRAINING KNEE PERIPROSTHETIC JOINT INFECTION (PJI) *IN VITRO* MODEL TO ASSESS THE ELUTION KINETICS OF ANTIBIOTIC LOADED SPACERS AND HIGH PURITY CALCIUM SULFATE

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Background: PJIs are difficult to treat due to bacterial biofilm formation on the implant and periprosthetic tissue. This affords the bacteria a high tolerance to antibiotics and host immunity. Evidence suggests that biofilm bacteria can be significantly reduced by exposure to high levels of antibiotics for extended periods, a process only safely achieved by local release of antibiotics. Common methods of local antibiotic administration include; a bolus, PMMA spacers and dissolvable beads. Each has different release kinetics. Conventional elution assays into a closed volume do not allow for fluid exchange.
Methods: We develop an artificial draining knee model (DKM), a flow through system which can accommodate a bolus, a clinically sized spacer and packed volume of beads. The system includes a saline reservoir, a 10CC pack of antibiotic loaded (vancomycin and tobramycin) pharmaceutical grade $CaSO_4$ beads, a 6.5 cm diameter spacer, or a spacer plus beads. A flow rate of 1.2 mL/hr was set to simulate clinical values of post-revision drainage. The system can be placed on a rocker set at 15 RPM and 20^o angle to simulate knee motion. Antibiotic concentration was analysed using high performance liquid chromatography (HPLC). Continuous stirred tank reactor kinetics were used to model vancomycin washout from a 0.5g bolus.
Results: The bolus was predicted to achieve very high concentrations in the first 3 days but drop below MIC after 4.5 days. Vancomycin from the beads was still at 62µg/mL at day 6 and remained at 3 µg/mL until the end of the 27 day experiment. Tobramycin dropped to 10µg/mL by day 4, but thereafter remained at ~4µg/mL.
Conclusion: This model can be used to better predict how antibiotic release from multiple local administration strategies can be optimized to treat biofilm PJIs.
Implications: Model may optimize local antibiotic management in a draining knee PJI.
Conflict of Interest: HRP consults/receive funding from Biocomposites Inc. LPA, CJJ and ASS works for Biocomposites Inc. ME consults for Biocomposites Inc., Concept Design Development LLC, Joint Implant Surg Research Found, Zimmer Biomet Inc. and Miller Orthopaedic Review. SP consults for Biocomposites Ltd., Zimmer-Biomet and Smith and Nephew.

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DISTAL RADIOULNAR JOINT INSTABILITY AND INJURY

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Background: Distal Radioulnar Joint (DRUJ) instability is increasingly recognised as a clinical entity post various types of forearm trauma. This can now be measured in-vivo using a novel device.
Methods: In-vivo DRUJ translation, as a proxy for DRUJ instability, was measured in 410 uninjured, asymptomatic wrists to establish the 'normal' range. DRUJ translation was measured in 4 additional groups; 100 clinically lax patients, 100 patients post distal radius or radial head fracture and 50 patients post scaphoid fracture. Influence of hand and forearm positioning on the DRUJ was also tested in each group. Results were compared against the contralateral uninjured limb and the 'normal' database.
Results: Average 'normal' DRUJ translation is 6.5mm (range 5-8mm). Translation is not affected by gender, handedness or size. Hand deviation and forearm prosupination all reduced DRUJ translation. Clinically lax individuals have increased DRUJ translation (mean 14.6mm), with a range outside the normal population's. The hand and foreram tightening phenomenon remains, but never returns to normal.
Post distal radius fracture, DRUJ translation is also increased (mean 12.3mm). The measured range again does not overlap that of normal. Symptomatically lax patients post fracture have values similar to the clinically lax population. Individuals post radial head fracture had a mean translation of 8.7mm. Mason I or II injuries had an increased mean translation but within the 'normal' range. Radial head replacement or excision produced the largest measurements seen to date (mean 18.1mm). DRUJ translation was not altered post scaphoid fracture patients tested, irrespective of severity or treatment modality.
Conclusions: DRUJ translation lies on spectrum and all individuals post distal radius or radial head (Mason II+) fractures have increased translation. Clinically symptomatic DRUJ instability is never within the asymptomatic range.

Implications: Treatments for DRUJ instability need to purely restore a degree of tightness below the established clinically symptomatic threshold.
Conflict of Interest: Nothing to disclose

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PRECLINICAL THERAPIES TO PREVENT OR TREAT FRACTURE NON-UNION: A SYSTEMATIC REVIEW
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Background: Fracture non-union affects up to 10% of fractures, with a significant impact on quality of life. There is currently no single effective therapy for the treatment or prevention of non-union, which remains an active area of research. No systematic review of preclinical trials investigating the efficacy of novel therapies to treat or prevent non-union has been performed.
Questions and purposes: This systematic review aimed to answer two questions:
1. What range of therapies for preventing or treating non-union are currently under preclinical evaluation?
2. Are there groups of studies, which (i) are sufficiently homogenous both methodologically and clinically, and (ii) report sufficient data, to allow meta-analysis?
Methods: MEDLINE and Embase were searched from 1St January 2004 to 10th April 2017 for controlled preclinical trials evaluating an intervention to prevent or treat non-union. Data regarding the model used, study intervention and outcome measures were extracted, and risk of bias assessment performed.
Results: Of 5,171 records identified, 197 were included in the systematic review. Of the 204 therapies investigated, the majority were only evaluated once (179/204, 88%), with chitosan tested most commonly (6/204, 3%). Substantial variation existed in model design, length of survival and duration of treatment. Furthermore, results were poorly reported with high levels of bias across all studies. These factors, as well as a lack of consistently used objective outcome measures, precluded meta-analysis.
Conclusions: This review highlights the variability and poor methodological reporting of current non-union research. The authors call for a consensus on the standardisation of animal models investigating non-union, and suggest journals apply stringent criteria when considering work for publication.
Conflict of Interest: Nothing to disclose

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THE DEVELOPMENT OF A 3D OSTEOPROGENITOR CULTURE MODEL FOR INVESTIGATING FUTURE OSTEOPOROSIS THERAPIES
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Osteoporosis represents an increasing burden to healthcare systems worldwide, and their associated fractures are expected to double in incidence by 2050. Current therapies have proven inadequate, and new, targeted therapies are required. A consistent and reliable three-dimensional (3D) model is required to perform high throughput drug screening, in order to successfully develop improved therapies. Multicellular spheroids have long been established in research fields such as cancer, yet there remains a paucity of information on 3D spheroid cultures for osteoprogenitor cells, which are vital to musculoskeletal research. This study will analyse 3 spheroid-forming techniques with human osteoprogenitor cells to identify the optimal culture conditions.
Human bone marrow aspirates, taken at time of total hip replacement, were utilised. The adherent cells were cultured, which gave rise to the osteoprogenitor population. Three spheroid techniques were assessed; hanging drop (HD), ultra-low attachment (ULA) and magnetic levitation techniques. Spheroids were generated using several cell seeding densities and cultured up to 21 days; analysis included cell viability, morphology (light microscopy) and scanning/transmission electron microscopy at time-points 1,7 and 21 days.
The HD and ULA techniques consistently produced circular spheroids, with viable cells, which increased in diameter with increasing cell number. However, the ULA method formed stable spheroids faster and more efficiently. The magnetic levitation technique formed spheroids of a maximum diameter, regardless of cell density, with clear internalisation of the nanoparticles visible on electron

microscopy, but suffered areas of cell death within the spheroid. Electron microscopy demonstrated cell-cell interactions within all models.
The ULA technique rapidly produces stable and uniform osteoprogenitor spheroids which remain viable in long term culture.
The ULA model can be adopted as a standard 3D model to allow comparison of both osteoprogenitor cells from healthy and osteoporotic patients. This will contribute to the development of targeted therapies.
Conflict of Interest: Nothing to disclose

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MECHANICAL PROPERTIES OF THE ACTIFIT MENISCAL SCAFFOLD IN CONFINED COMPRESSION
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Background: The Actifit meniscal scaffold (Orteq Sports Medicine) is designed to augment meniscal repair through encouraging ingrowth of meniscal tissue. It is composed of polyester and polyurethane components and is designed to mimic the mechanical properties of meniscal tissue. There has been no independent characterisation of the mechanical properties of the scaffold. We aimed to determine the mechanical properties of the Actifit in confined compression.
Methods: 5mm diameter, 2mm thick circular samples of an Actifit scaffold were placed within a confined compression chamber, permeable top and bottom and allowed to equilibrate for 2 hours. The apparatus was bathed in distilled water before being subjected to 5% ramp compressive strain. The hold phase lasted for 3600 seconds. FEBio (v2.4, Univ of Utah) software was used to fit results to a non-linear poroviscoelastic model with strain dependent Holmes-Mow permeability. Goodness of fit was determined using a coefficient of determination.
Results: The mechanical parameters derived using the finite element analysis software suggested the prosthesis to have an average Young's modulus of 1.28 MPa, strain dependent permeability of 0.08 x10-15 m4/Ns, exponential strain coefficient of 2.95 $x10^{-5}$, exponential stiffening coefficient of 5.59$x10^{-5}$, viscoelastic coefficient of 0.21 and relaxation time of 1215.53 seconds. The mean R^2 value for the coefficient of determination was 0.96.
Conclusion: The scaffold is stiffer than meniscus, this may be necessary to allow it to protect nascent fibrocartilage tissue produced following implantation. The permeability is similar to that reported for the meniscus, potentially allowing it to mimic mechanical behaviour of the meniscus when subjected to compression. The non-linear poroviscoelastic model simulates the behaviour of the scaffold well.
Implications: These data can be used to predict the stress environment of fibroblasts developing in situ to further improve clinical outcomes of such scaffolds and inform further development of such prostheses.
Conflict of Interest: Nothing to disclose

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THE ROLE OF NOVEL PROTEASE PAMR1 IN TENDINOPATHY
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Background: Tendinopathy is a significant condition which causes patients pain, swelling and impacts the normal function of the many tendons in the human body. The aetiology of tendinopathy is unclear. Several proteases normally involved in the degradation and remodelling of the Extracellular matrix(ECM) of the tendon have been studied in their involvement in tendinopathy. Many of these proteases have been established to have altered expression in tendinopathy. This study explores the expression of novel protease PAMR1 (peptidase domain containing associated with muscle regeneration 1) in tendinopathy.
Methods: We analysed the expression of PAMR1 mRNA in the Achilles tendon samples from 3 patients with Achilles tendinopathy compared to the expression in the Achilles tendons of normal patients, N=3. We also assessed the expression of PAMR1 in Normal hamstring tenocytes and assessed the expression of PAMR1 with and without stimulation of Transforming growth factor-beta 1(TGFb1). RNA was extracted from these samples and converted to cDNA for Quantitative Real Time Polymerase Chain Reaction (qPCR).
Results: There was a 2.42-fold change in the expression of PAMR1 in pathological Achilles tendon

when compared to normal Achilles tendon, P=0.12. In normal hamstring tenocytes, TGFb1 suppresses the expression of PAMR1 in tenocytes by 2.32 (p=0.001) and 1.98 (p=0.001) times with stimulation at 6 hours and 24 hours time points respectively as compared to the normal untreated level of expression.
Conclusions: PAMR1 mRNA expression may be up-regulated in tendinopathy. We can however hypothesise that PAMR1 expression is linked to TGFβ activation and subsequent signalling. Further studies are needed to explore this further.
Conflict of Interest: This project was funded by the Gwen Fish Orthopaedic Trust. No conflicts of interest.

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INJECTABLE AND SELF-SETTING ALGINATE GEL SYSTEM FOR PROLONGED AND CONTROLLED ELUTION OF ANTIBIOTICS FOR ORTHOPAEDIC APPLICATIONS

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Introduction: Infection remains a problem in trauma patients and athroplasty. Current local delivery systems (cement or ceramic based are cumbersome to handle, often toxic to the local tissues and provide short-lived release. This study presents a novel biodegradable delivery system for antibiotics using alginate fluid gels.
Methods: 2%wt alginate hydrocolloid with varying concentrations of Vancomycin or Gentamicin (1mg/ml, 2.5mg/ml, 5mg/ml) were sheared under controlled cooling. The mechanical properties of the fluid gels were characterised by plate rheology. Cell viability of ultra-violet sterilised gel antibiotic mixtures was performed using confocal microscopy cell staining. Antibiotic elution into phosphate buffered saline across 30um pore semi-permeable membrane, HPLC determined antibiotic concentration at pre-determined time points over two weeks. Residual gel added to agar plates seeded with MRSA and E. Coli to determine anti-microbial activity (ZOI studies).
Results: Palcos G cement (gold-standard control) led to complete cell death within 24 hours. Gel plus gentamicin showed significant cell death after 3 days, but Gel plus Vancomycin showed high cell viability beyond seven days. Elution studies showed a dose dependant release of antibiotic with sustained release beyond 2 weeks, achieving MIC during this period for MRSA strains but only gentamycin achieved a ZOI for E.coli at 2 weeks. Mean daily elution for Vancomycin was: 1mg gel = 0.038mg/day; 2.5mg gel = 0.06mg/day; 5mg gel = 0.123mg/day.
Conclusions: Our studies have identified the cell toxicity of gentamycin and rapid release from cement and gel. Vancomycin was favourable to host cells with a longer release profile. We have demonstrated an almost linear release profile which correlates with increasing vancomycin concentration. Similarly, potent antimicrobial activity was seen across a range of gram+ and gram- bacteria. The combination of cost effective injectable fluid gel with controlled antibiotic release offers unique therapeutic options in many clinical scenarios.
Conflict of Interest: Nothing to disclose

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THE IONIC CONTRIBUTION OF PROTEOGLYCANS TO MENISCAL LOAD TRANSMISSION

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Background: Load transmission is an important function of the meniscus. In articular cartilage, proteoglycans help maintain hydration via negatively charged moieties which generate Donnan osmotic pressures. A similar role for proteoglycans in meniscal tissue has not been established. We aimed to investigate the role of proteoglycans in meniscal tissue.
Methods: 8mm diameter, 5mm thick circular samples cut in the axial plane from bovine menisci were placed within a confined compression chamber, permeable top and bottom. The apparatus was bathed in distilled water, 0.14M PBS or 3M PBS before being subjected to 5% ramp compressive strain, followed by a hold phase of 300 seconds. 3M PBS solutions negate Donnan osmotic pressures whilst deionised water negates all mobile ion gradients. FEBio (v2.4, Univ of Utah) software was used to fit results to a non-linear poroviscoelastic model with strain dependent Holmes-Mow permeability. Statistical analysis was conducted using one-way ANOVA with Tukey post-hoc analysis.
Results: 10 samples, each derived from a pair of medial/lateral mensici were tested in each solution. Significant differences ($p < 0.05$) were observed between the values for Young's modulus, strain dependent permeability and the viscoelastic coefficient for samples tested in 3M PBS as compared to deionised water/0.14M PBS. No significant differences were observed in the strain

dependent/stiffening coefficients or the relaxation time. Approximately 79% of the stiffness of the meniscus appears attributable to ionic effects.
Conclusions: These results suggest that ionic effects play a significant role in modulating the mechanical behaviour of meniscal tissue.
Implications: Although biphasic theory has been used to describe this tissue in the literature, our work suggests that it is necessary to include the influence of ionic effects when developing mathematical models of this tissue, particularly in situations where fluid flow or localised strain is modelled.
Conflict of Interest: Nothing to disclose

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ALGINATE ENCAPSULATION AND 3D OSTEOGENIC DIFFERENTIATION OF HUMAN INDUCED PLURIPOTENT STEM CELLS USING TERIPARATIDE FOR BONE TISSUE ENGINEERING APPLICATIONS
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Introduction: The management of skeletal defects in complex trauma and revision arthroplasty is challenging for clinicians. The results of various grafting techniques are variable, and each have inherent disadvantages. A need for novel strategies exists. Human induced pluripotent stem cells (hIPSCs) are patient derived and capable of osteoblast formation in vitro and in vivo. This study was aimed at: (1) Enhancing osteoblastogenesis using hIPSCs with several osteogenic agents (2) Producing 3-dimensional tissue constructs with biochemical, histological and phenotypic features of bone.
Methods: hiPSCs were cultured in 2D and in 3D alginate microbeads, induced towards an osteogenic lineage using osteogenic media (OM), and supplemented with Teriparatide. Comparative osteoblastic gene and protein expression was assessed with PCR and immunocytochemistry. Histology and biochemical function of novel bone tissue was assessed using H&E and Alizarin staining, and ALP assay.
Results: Teriparatide enhanced final tissue mineralisation compared with OM alone in both 2D and 3D cultures ($p< 0.05$). Osteoblastic gene expression with Teriparatide produced greatest gene expression (Day 28: RUNX2 logRQ 3.52, $p< 0.05$; COL1 logRQ 4.6, $p< 0.05$; ONN logRQ 2.7, $p< 0.05$). There was increased ALP activity at days 14 and 21 with Teriparatide supplementation compared with OM alone (mean pNPP/100,00 cells 71.00 and 65.22 vs 55.7, $p< 0.05$). In 3D culture, features of bony architecture were demonstrated OM groups and Teriparatide groups on electron microscopy. Osteoblast phenotype was confirmed in all treatment groups on immunocytochemistry.
Discussion: These data demonstrate for the first time the feasibility of using Teriparatide as an enhancing agent in 3D culture and osteogenesis using hiPSCs. 3D encapsulation of hIPSCs is effective in producing 3D bone tissue for tissue engineering applications. Translational application to *in vivo* animal models may lead to the potential clinical application of patient-derived, hIPSC-based bone regeneration strategies for conditions characterised by bone loss.
Conflict of Interest: Nothing to disclose

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DIFFERENCES IN THE METABOLIC COMPOSITION BETWEEN HIP AND KNEE SYNOVIAL FLUID: A NUCLEAR MAGNETIC RESONANCE (NMR) SPECTROSCOPY STUDY OF SMALL METABOLITES
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Background: The hip and knee joints differ biomechanically in terms of contact stresses, fluid lubrication and wear patterns. It was been postulated that these differences may be reflected in the synovial fluid (SF) composition of the two joints but the nature of these differences remains unknown. The objective of this study was to identify differences in hip and knee SF composition using the novel technique of metabolic phenotyping with NMR spectroscopy.
Methods: SF samples were collected from patients with end stage osteoarthritis (ESOA) undergoing hip/knee arthroplasty. Samples were matched for age, gender and ethnicity. NMR spectroscopy was

used to analyse the metabolites present in each sample. Multivariate analysis was performed using SIMCA 14©. Principal Component Analysis (PCA) and Orthogonal Partial Least Squares Discriminant Analysis (O-PLS-DA) was performed to investigate metabolic differences between the two SF groups. The individual metabolites were identified using the Human Metabolome Database (HMDB) and Biological Magnetic Resonance Bank.
Results: Twenty-four SF samples were used in our analysis, consisting of 12 hips and 12 knees. The PCA and O-PLS-DA representation identified significant differences in the metabolic profile between the two groups (P=0.023). The spectroscopic peaks demonstrated that the knee group showed increases in citrate, glucose, glutamine, glycosaminoglycans (GAGs), lysine and valine.
Conclusions: This is the first study to demonstrate differences in the metabolic profile of hip and knee SF in ESOA. The identified metabolites can be grouped into those involved in branched chain amino acid catabolism, those involved in the Tricarboxylic acid cycle and those that are breakdown products of proteoglycans. These findings may be due to differing wear and lubrication profiles between these joints that could be related to differing biomechanics.
Implications: Larger studies examining these metabolites in more detail are required, which may form the basis of new diagnostic tests and intraarticular treatment strategies.
Conflict of Interest: Professor John Lindon declares a shareholding in the company “Metabometrix Ltd” which is contracted to perform small molecule studies. Dr Claire Boulange receives funding from “Metabometrix Ltd”. No other authors disclose any competing interests.

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3D OSTEOGENESIS USING HUMAN INDUCED PLURIPOTENT STEM CELLS IN A ROTATING WALL BIOREACTOR ENHANCED WITH SIMVASTATIN AND ATORVASTATIN

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Introduction: Human induced pluripotent stem cells (hIPSCs) are an attractive cell source for bone tissue engineering applications as they are patient derived and can be expanded in a pluripotent state across multiple passages. The efficacy of statins as osteogenic agents has been previously reported in murine cells. The present study demonstrates the feasibility of using simvastatin and atorvastatin as inducers of 3D osteogenic differentiation in hIPSCs.
Methods: hIPSCs were cultured using osteogenic media (OM) containing dexamethasone, ascorbic acid and β-glycerophosphate. OM was supplemented with varying concentrations of both simvastatin and atorvastatin (1µM, 100nM, 10nM. 1nM) for 21 days. Comparative studies of simvastatin or atorvastatin alone or with dexamethasone in OM were subsequently performed. 2D and 3D tissue mineralisation was assessed after alginate encapsulation in a rotating wall bioractor and at days 7, 14 and 21 Alizarin Red staining (ARS),osteoblastic gene expression, and ALP assay was assessed. Protein expression for osteoblast markers runx2, collagen 1 and osteopontin was assessed using immunocytochemistry.
Results: Addition of simvastatin to OM at 1µM and 100nM produced improved tissue mineralisation compared with OM alone, whilst atorvastatin at 10nM improved final tissue mineralisation. Osteoblastic gene expression was significantly increased with either simvastatin or simvastatin at day 14, and day 28. (Day 14: RUNX2 mean RQ 5.68, $p< 0.05$) Day 28: runx2 RQ and 3.52, $p< 0.05$; OCN RQ 1.85, $p< 0.05$; ONN mean RQ 2.00, $p< 0.05$). ALP assay demonstrated increased ALP activity at day 21 with the addition of either simvastatin (mean pNPP conc. 58.22 vs 47.26, $p< 0.05$) or atorvastatin (mean pNPP conc. 57.94 vs 4.57, $p< 0.05$).
Discussion: These data demonstrate the feasibility of using the agents simvastatin and atorvastatin as osteogenic supplements for the 3D osteogenic differentiation of hIPSCs, and may valuable in the development of protocols for regenerative therapies for skeletal disorders.
Conflict of Interest: Nothing to disclose

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DOES THE MOVEMENT OF THEATRE TRAFFIC INCREASE INFECTION IN ELECTIVE THEATRES? COMPLETING THE CYCLE

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Introduction: Infection remains a major problem within orthopaedic theatres due to interruption of the

laminar airflow system. Wound contamination is a direct result of this. We had previously audited the amount of traffic within our orthopaedic theatres over the course of one day, which demonstrated that measures needed to be taken to reduce the chance of prosthetic infections within orthopaedic theatres.
Methods: Data was collected over one day analyzing 4 orthopaedic theatres; one trauma and three elective. Each theatre had 3-4 cases running. The number of times the main theatre door and anaesthetic door were opened and closed was monitored respectively throughout the day.
Results: Four theatres were analysed over one day with 5 different consultant lists. Overall, doors were opened a total of 718 times a day; an increase of 55 from 2015. Results showed that the trauma theatre was accessed the most; with doors being opened 247 times over the course of the day in comparison to 139 in 2015. On looking at the cases in the trauma theatre that day; there was 115 people entering and exiting during a primary hemiarthroplasty case.
Again observations show that there were multiple members of staff wearing surgical masks outside of theatre and food and drinks being consumed in the main theatre corridor.
Conclusions: It is clear from these years results that theatre traffic has indeed increased in theatre; especially in trauma theatres. Measures, which were taken to educate staff regarding infection control and the importance of reducing prosthetic infections in orthopaedic theatres need to be reiterated to reduce the amount of traffic in theatres. Food and drinks should not be permitted in the anaesthetic rooms or theatre corridors.
Conflict of Interest: Nothing to disclose

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THE ANTIBIOFILM ACTIVITY OF ACETIC ACID IN THE MANAGEMENT OF PERIPROSTHETIC JOINT INFECTION

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Background: Periprosthetic joint infection (PJI) following joint replacement surgery is one of the most feared complications. The key to successful revision surgery for PJI, regardless of treatment strategy is a thorough deep debridement. There has been increasing interest in the use of acetic acid (AA) as an adjunct to debridement strategies in the management of PJI. Previous studies have demonstrated its inhibitory and eradication action against bacteria in both in planktonic and biofilm states. However its effectiveness in the eradication of established biofilms following clinically-relevant treatment times has not yet been established. Using an *in vitro* biofilm model this study aimed to establish the minimum biofilm eradication concentration (MBEC) of AA following a clinically-relevant treatment time.
Methods: Using a methicillin-sensitive *Staphylococcus aureus (MSSA)* reference strain and the dissolvable bead assay, biofilms were challenged by AA at the desired concentration (0-20% (pH 4.7)) for 20 minutes, one hour, three hours, or 24 hours.
Results: The MBEC of AA was found to be; 11%, 6.1%, 3.2%, and 0.8% following a 20 minute, 60 minute, 180 minute, and 24 hour treatment, respectively.
Conclusion: This study found that the MBEC of AA, when used for a clinically-relevant treatment time of 20 minutes, was 11%. Acetic acid is considered to be harmless below concentrations of 5%, as in vinegar; but in concentrations between 10% and 30% acetic acid has been found to be corrosive.
Implications: The MBEC of AA with a 20 minute treatment time exceeded its safety threshold; however a clinically acceptable concentration (5%) was still found to eliminate 96.1% of biofilm-associated *MSSA* following a 20 minute treatment time.
Conflict of Interest: Nothing to disclose

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SHIFT WORKING REDUCES OPERATIVE EXPERIENCE FOR TRAUMA & ORTHOPAEDIC HIGHER SURGICAL TRAINEES: A UK MULTICENTRE STUDY

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Background and Aim: In recent years there has been a rise in the number of trauma and orthopaedics (T&O) trainees working on full shift patterns. Historically, most T&O trainees worked 24 hours non-resident on calls and the effect of this change on training has not previously been measured. As two trusts (one trauma unit, one major trauma centre) in our region underwent a change

to full shift working, we assessed the impact on trainee's operating experience.
Methods: 55 logbooks of trainees were analysed across the two trusts over a two year period, with comparisons made between pre and post shift working.
Results: Overall operating fell by 13% for trainees working full shift patterns at both trusts (pre shift mean of 164 procedures done by trainees, 142 procedures post shift), which was statistically significant. There was a loss of elective operating by 15% (13 fewer elective cases) at the trauma unit, 32% (28 fewer elective cases) at the major trauma centre for trainees doing shift work. There was a 19% drop in elective index cases (8 fewer) at the major trauma centre post shifts. The effect on trauma operating opportunities was mixed.
Conclusions: Shift working significantly impacts on surgical training opportunities for higher surgical trainees in orthopaedics. Elective operating opportunities are particularly affected.
Implications: As other trusts and deaneries may be faced with this change in working practice for higher surgical trainees, consideration must be made for the impact of shift working on levels of operative experience.
Conflict of Interest: Nothing to disclose

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CLINICAL EXPERIENCE OF TREATING FUNGAL PERIPROSTHETIC JOINT INFECTION IN A SPECIALIST ORTHOPAEDIC HOSPITAL
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Background: Fungi are a rare and devastating cause of Periprosthetic Joint Infection (PJI) A recently published review identified 75 cases of fungal PJI.
Objective: To describe our experience of treating fungal PJI since 2011 within the Bone Infection Unit at our institution.
Methods: A retrospective observational study including all patients who received systemic or local antifungal treatment for PJI. Data was collected from electronic patient notes and databases.
Results: We identified ten patients who were treated for fungalPJI between May 2011 and March 2017. Seven were female, three male. The mean age 68 years old (range 19to 87). Prosthesis infected were four total knee, two proximal femoral, a single total hip, distal femoral, total shoulder and distal humeral replacement. Organisms requiring treatment were all candida species, including three c.albicans, and c.parapsilosis, two c. dublinaesis, a single c glabrata andc.orthopsilosis.
Treatment of the ten patients was a two-stage revision in eight cases and single stage in two. Local antifungal delivery using cement spacers loaded with voriconazole (300mg per 40mg cement), used in all five in which fungal organisms were identified prior to revision.
Initial systemic antifungal treatment continued for a mean duration of 2.6 months (range 0.9 to 8.4), and included fluconazole in six casescapsofungin in four cases and a single case was treated with voriconazole. Of six patients initially treated with an azole three required change due to derangement in liver function teats.
Primary outcome measure was the presence of clinical indications of infection at a mean of 13.2 months follow up (range 1-29). Of the 8 patients who underwent two stage procedure 5 were successful, 2 were awaiting follow up and 1 was unsuccessful (requiring amputation). Of the single stage patients one died.
Conclusion: Our case series supports 2 stages surgery.
Implacation: 2 stage therapy with capsofungin performed well.
Conflict of Interest: Nothing to disclose

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HOW ACCURATE IS THE NJR IN RECORDING TRAINEES AS LEAD SURGEON?
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The National Joint Registry has collected arthroplasty data since 2003, including the identity of the lead-surgeon as well as Consultant-in-charge.
Accurate lead-surgeon information is important for outlier-identification and research. All UK trainees are required to complete 40 THR and 40 TKR operations and keep records of these on eLogbook.org.

Arthroplasties completed in training count towards NJR analysis when a Consultant. These cases are important as they are often supervised, simpler cases, with potentially lower risk of revision, giving new Consultants a strong foundation on the NJR.
We audited NJR records of trainees as lead-surgeon with eLogbook as the gold-standard. 31/34 (91%) trainees on the Peninsula rotation accessed their NJR record and extracted their lead-surgeon THR and TKR data and corresponding eLogbook records between 1/4/2003 and 30/9/2017.
All trainees had discrepancies between the NJR and the eLogbook. In total 755 arthroplasties were recorded on the NJR compared to 2153 on the eLogbook (35%, 95%CI 33%-37%). THRs recorded on the NJR were 325/966 (34% 95%CI 31%-37%) and TKR 430/1187 (36% 95%CI 34%-39%).
Looking at individual trainees, the median proportion of eLogbook cases present on the NJR was 29%(0-75%). The eLogbook procedure range was 0-247 and the NJR range was 0-79. The hospital in which the procedures were performed was not recorded, therefore potential clustering effects were not assessed.
This is the first study to assess disparity between NJR and eLogbook recording of trainee-led arthroplasty and raises questions regarding the accuracy of recording trainees as lead-surgeon on the NJR. Trainees must be aware that operations performed count towards Consultant records and that they have access to this data. Trainees should make efforts to ensure the correct recording of the lead-surgeon. Those submitting and analysing NJR data should be aware of this potential inaccuracy.
Conflict of Interest: Nothing to disclose

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THE SPECIFICITY AND SENSITIVITY OF INDIUM 111 - LABELLED WHITE BLOOD CELL SCAN IN THE CONTEXT OF PROSTHETIC JOINT INFECTIONS
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Background: The need for prosthetic joint replacement is increasing annually along with an ageing population. Infections of prostheses are a major cause of morbidity and can constitute a serious complication which can threaten surgical success and outcome for patients. An Indium scan is an imaging modality which is often used to help detect the presence of prosthetic joint infection. However, there is a paucity of evidence surrounding its diagnostic accuracy. The aim of our study was to ascertain the sensitivity and specificity of Indium 111-Labelled WBC scan in the context of prosthetic joint infection.
Method: Retrospective imaging and electronic medical record data was collected from all patients who underwent an Indium scan in a single trust between the dates 2013-2017. Indium scan results were subsequently cross correlated with patients had a final clinical diagnosis of prosthetic joint infection and the results statistically analysed.
Results: A total of 36 patients underwent an Indium scan, of which 23 scans were performed for a suspected prosthetic joint infection. 13 scans were requested for alternative reasons and were excluded. 13 indium scans were positive. Of those positive scans, 8 patients had a final clinical diagnosis of prosthetic joint infection. No infection was detected in the negative indium scans.
Conclusion: From our study, indium scans for suspected prosthetic joint infection had a sensitivity of 100%, specificity of 67% and a diagnostic accuracy of 62%. Our results are in keeping with similar published studies. Overall accuracy of an indium scan is between 50-70% and is a useful screening test given its high negative predictive value however is not conclusive for a definite diagnosis of prosthetic joint infection. There is a need for larger studies to confirm these findings.
Implications: Indium scans are a helpful screening tool for prosthetic joint infection but not conclusive for infection.
Conflict of Interest: Nothing to disclose

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INFORMED CONSENT: A GLOBAL PERSPECTIVE
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Background: Since the Montgomery Vs Lanarkshire Health Board ruling of 2015, consent for surgical intervention has come under great scrutiny. Traditional concepts of obtaining a patient's consent have been challenged and there is much debate about how the process is best performed. To our knowledge, no study has previously investigated global practices in obtaining informed consent.
Methods: We look into how informed consent is obtained across the English speaking developed world, looking at the published guidelines and the case-law they reference. We specifically look at how risks and benefits are discussed with patients, and how we can use these to better inform them.

Results: We provide a legal overview of consenting practices within the UK, Australia, New Zealand, Canada and USA. We demonstrate a global trend away from medical paternalism, describing the major legal cases for each country as well as initiatives to make informed consent more patient focused, such as the Ipswich model.
Conclusions: In cases involving informed consent, the long established Bolam test has been rejected. This traditional ´professional standard´ has been replaced with a focus on a more patient specific approach. Montgomery Vs Lanarkshire is just one, well publicised example of this global trend which has occurred over decades. Examples of this can be found across the world.
Implications: To avoid legal difficulties, robust procedures are essential to improve the consenting process and bring practices up to date with current guidelines and law. The legal cases described help demonstrate how the consenting process involved can help prevent such difficulties. We also state the importance of avoiding on-the-day consenting of patients and cite global examples where this has resulted in legal challenge.
Conflict of Interest: Nothing to disclose

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ASSESSMENT OF MULTIPLEX-PCR AS A POINT OF CARE TEST FOR DIAGNOSIS OF BONE AND JOINT INFECTIONS
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Background: With the increasing adoption of joint replacement to improve mobility in all age groups, the incidence of prosthetic joint infections (PJIs) is rising. It is imperative to diagnose PJIs and start targeted antibiotics early to get an effective outcome.
We report the results of the Curetis® Unyvero I60 ITI automated Multiplex-PCR (m-PCR) for diagnosis of bone and joint infections (BJIs) as a point of care (POC) test in the Orthopaedic theatre.
Methods: This was a prospective observational study, conducted between April and December 2017, to compare the Unyvero I60 ITI m-PCR with conventional culture for diagnosis of BJIs Patients over the age of 18, where microbiological samples were being taken for potential diagnosis of infection were included and patients with incomplete data or invalid m-PCR results were excluded.
Results: Thirty nine samples from 27 patients were included in the study. There were 15 males and 12 females, average age 64.7 (32-87). Compared to conventional microbiogical culture Unyvero I60 ITI m-PCR had a sensitivity of 57%, specificity of 84%, positive predictive value of 67% and a negative predictive value of 78%.
Conclusion(s): Unyvero I60 ITI m-PCR is a useful adjunct to conventional culture for a rapid and reliable diagnosis of BJIs at the POC.
The numbers in the study are however small and more large scale studies are needed for further analysis.
Implications: This study has wide reaching implications, because it saves crucial time allowing effective treatment to start within hours at the point of care, saving multiple bed days for the NHS and a more satisfactory experience for the patient.
Conflict of Interest: Nothing to disclose

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DIAGNOSING PERIPROSTHETIC JOINT INFECTION: AN INDEPENDENT, SINGLE-CENTRE ASSESSMENT OF THE ALPHA-DEFENSIN LABORATORY TEST
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Background: Periprosthetic joint infection (PJI) is difficult to diagnose. A variety of techniques have been described. The efficacy of the alpha-defensin laboratory test was examined and compared with other established modalities in the diagnostic workup of 'real world' arthroplasty patients.
Methods: A retrospective review of 210 episodes (86 hips, 124 Knees) in 172 patients at one centre, including samples from acute admissions, elective aspirations, and planned revisions. MSIS (musculoskeletal infection society) major and minor criteria were used for diagnosing PJI.
Patients investigated using a standardised protocol with inflammatory markers, synovial fluid analysis for white cell count (SWCC) and polymorphonuclear leukoctyes percentage (PMN %), and synovial fluid/tissue culture. Synovial fluid tested for alpha-defensin.
Results: Fifty-two (24.8%) episodes defined as 'PJI' using MSIS criteria, 158 'non-PJI'. Alpha-defensin had 71.2% (95% CI 56.9-82.9) sensitivity, 94.3% (89.5-97.4) specificity. Positive predictive value was 80.4% (68.1-88.8), negative predictive value 90.9% (6.6-93.9).
Thirty-seven (of 52 PJI episodes) were 'culture positive' (identical microorganism on ≥2 samples).

Eighty (of 158 non-PJI) satisfied none of the MSIS criteria, and none of these patients subsequently had a PJI. In this sub-set of 117, alpha-defensin had 64.9% (47.5-79.8) sensitivity, 98.7% (92.9-99.9) specificity, whilst the sensitivities of CRP (>20), SWCC (>3000) and PMN (>80%) were 94.6% (81.8-99.3), 86.5% (71.2-95.5) and 83.8% (68.0-93.8) respectively.
There were 93 episodes where at least 1 minor criterion was satisfied and/or a sinus was present, but were not 'culture positive'. In these, alpha-defensin had 85.7% (57.2-98.2) sensitivity, 88.4% (78.4-94.9) specificity.
Conclusion: The alpha-defensin laboratory test has a lower sensitivity than previously reported, limiting its use for diagnosing PJI. SWCC and PMN % have similar sensitivity and are cheaper.
Implications: Alpha-defensin test is no longer used in our unit. CRP, SWCC and PMN % are of greater clinical value and more cost effective in the work-up of suspected PJI.
Conflict of Interest: Nothing to disclose

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DO JOURNALS RAISE THEIR IMPACT FACTOR BY SELF-CITING IN EDITORIALS? A BIBLIOMETRIC ANALYSIS OF TRAUMA AND ORTHOPAEDIC JOURNALS

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Background: Impact factor is widely accepted as a measure of a journal's quality and ranking, and can be influenced by self-citation. Conversely the SCImago Journal Rank (SJR) excludes self-citation and considers the quality of citations used by other journals. This study aimed to investigate journal editors' use of self-citation and whether this correlates with impact factors or SJR in trauma and orthopaedic journals.
Methods: A comprehensive list of trauma and orthopaedic surgery journals was obtained using the SCImago Journal Ranking (SJR) database. The editorial(s) of each issue in 2015 were reviewed. The number of times editors cited their own journal in the preceding two years (2013 and 2014) was identified. The total number of times editors cited themselves was also recorded. Regression analyses were performed to investigate the association of editorial self-citation with journal impact factor or SJR indicator.
Results: Of the 233 journals identified, 62 trauma and orthopaedic surgery journals (241 editorials) were included in the final analysis. A positive correlation was reported between editors citing their own journals and impact factor (Beta: 0.434; 95% CI: 0.012-0.041; p< 0.001) and SJR indicator (Beta: 0.459; 95% CI: 0.009-0.027; p< 0.001). Citation by editors of their own publications within editorials also positively correlated with impact factor (Beta: 0.388; 95% CI: 0.013-0.054; p=0.002) and SJR indicator (Beta: 0.402; 95% CI: 0.009-0.035; p=0.001). There was a positive linear relationship between journal impact factor and SJR indicators (R=0.937; 95% CI: 0.901-0.964; p< 0.001).
Conclusion: Editor self-citation may influence the impact factor in trauma and orthopaedic journals. The higher the SCImago Journal Ranking, the greater the probability of the editors self-citing.
Implications: Readers should take into consideration our findings when evaluating journals and research.
Conflict of Interest: TOS - associate editor of The Knee journal, CBH - editor-in-chief of The Knee journal.

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HIGHEST RISK PERIOD FOR EARLY REVISION OF TOTAL HIP AND KNEE REPLACEMENT DIFFERS

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Patients need to know the benefits, risks and alternatives to any proposed treatment. Surgeons discussing the risk of a revision procedure becoming necessary, after a hip or knee replacement can draw upon the orthopaedic literature and arthroplasty registries for long-term implant survival. However, early revision is required in a minority of cases. We have investigated whether the probability of revision is similar for hip and knee replacement patients in terms of time-point and indication for revision.
Of the 22,046 Primary Total Hip Replacements (THR) and Primary Knee replacements (TKR), undertaken by 23 surgeons, between January 2004 and March 2015, 1.35% (297) were subsequently

reported to the National Joint Registry (NJR) as revised. Each revision case was reviewed. The modes of failure of were identified through clinical, laboratory and imaging (x-rays, CT, MRI and Isotope scans) studies.
Of the 9,411 primary THRs, 160 (1.60%) were reported as revised. The revision rate was 0.58% in the first year. This was statistically higher than all subsequent years. There was no statistical difference between any pair of subsequent years with an average of 0.3% per annum. The odds ratio for revision during the first post-operative year against the subsequent year average was 1.67.
Of the 12,635 primary TKRs, 137 (1.08%) were reported as revised. The highest revision rate occurred during the second year (0.42%). This was statistically higher than any other year. However, the revision rate in both the first and third years (0.29% and 0.26% respectively) were also statistically higher than in the subsequent years. Thereafter, the average revision rate was 0.11% with no statistical difference between the years.
The main indications for first year hip revisions were infection, dislocation and peri-prosthetic fracture. The indications for the early knee revisions were aseptic tibial component loosening, infection and progressive patella-femoral disease.
Conflict of Interest: Nothing to disclose

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IS THERE AN INCREASED RISK OF PERI-OPERATIVE COMPLICATION IN PATIENTS WITH OBSTRUCTIVE SLEEP APNOEA HAVING SHOULDER SURGERY?

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With the rise of obesity of the incidence of obstructive sleep apnoea is increasing. This condition often worries Anaesthetists and the Surgeons alike especially in patients who have shoulder surgery in a beach chair position.
Aim: To evaluate the Safety and aftercare needs of patients on CPAP following shoulder surgery in beach chair position.
Methods: We prospectively followed up 26 patients who had shoulder surgery with a diagnosis of obstructive sleep apnoea. All patients were on continuous positive airway pressure (CPAP) and had no other significant comorbidities. Arthroscopic procedures were performed in Lateral position and open procedures were performed in Beach chair position. We looked at intra and post-operative complications, use of high dependency unit (HDU) bed, increased recovery time, increased hospital stay. We also looked at 30-day mortality and morbidity.
Results: There were six women and twenty men; age range was 44 to 68. Ten patients had their procedure done as a day case and 16 patients as an inpatient. Five patients had awake interscalene block only, the rest had general anaesthesia with an interscalene block with little or no opioids. 4 patients had shoulder arthroplasty, 8 patients had arthroscopic subacromial decompression +/- ACJ excision, 14 patients had cuff repair. All patients had CPAP treatment post-surgery. In our study, no patients had any significant perioperative mortality or morbidity in the first 24 hours or within 30 days. There was no increased inpatient stay or increased recovery time, and no patient required a HDU bed.
Conclusion: Patients with obstructive sleep apnoea can safely have shoulder surgery in either beach chair or lateral position without any significant increase in perioperative morbidity and mortality. In our opinion, this is largely because of awake interscalene block anaesthesia and general anaesthesia with interscalene block, which reduces or eliminates the use of opioids.
Conflict of Interest: Nothing to disclose

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MONTGOMERY CHANGED THE LAW OF CONSENT BUT MEDICAL PRACTICE WAS ALREADY WELL AHEAD

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In 2015 the Supreme Court delivered the verdict in Montgomery vs Lanarkshire Health Board over turning a judgement passed down three decades earlier in the infamous Sidaway case where it was held that the Bolam rule was sufficient to determine negligence for failure of duty to inform. Montgomery stated that this approach was no longer acceptable, supporting the use of the prudent patient test which had been advocated in the United States at the time of Sidaway. This change in the law of consent was heralded as a paradigm shift and has prompted concern in the medical profession particularly in surgical specialties where obtaining informed consent and has prompted several organisations to produce information on how this affects doctors.

Using medico-legal sources such as previous case law and professional guidelines this paper aims to demonstrate how the Montgomery ruling will have little effect on modern day surgical practice. Several previous significant medico-legal cases avoided implementing the law as set out by Sidaway, medical guidelines set out by the GMC almost 20 years prior to Montgomery also obliged clinicians to respect individual patient autonomy and this was underpinned in the law with the introduction of the Human Rights Act.
Montgomery reinforced the law's position as no longer seeing the doctor patient relationship as paternalistic but the new 'prudent patient' test is more likely to cause a headache for the legal profession than the medical.
Conflict of Interest: Nothing to disclose

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PAINFUL LOCKING SCREWS WITH TIBIAL NAILING, AN UNDER-ESTIMATED COMPLICATION
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Background: Closed tibial fractures are the most commonly seen long bone fracture and open tibial fractures are the most prevalent open fractures. Different methods of definitive tibial shaft fixation exist with intramedullary nailing (IMN) being one of the most frequently used techniques. Post-operative complications can arise from issues with soft tissue, bone healing and metalwork. Knowledge of complication rates is important to inform both clinician and patient.
Methods: We conducted a retrospective study looking at all patients who underwent tibial nailing at St George's hospital between 01/01/2015 - 31/06/2017. All patients who underwent tibial IMN fixation following presentation with a traumatic tibial shaft fracture with at least one subsequent clinic follow up were included. Complications were recorded from letters completed following fracture clinic follow up. Complication prevalence following fixation of open and closed fractures is to be compared using Fisher's exact test, with $p < 0.05$ to be significant.
Results: 129 individuals underwent tibial nailing over the 30-month period, of these 101 had at least one follow up clinic appointment at St George's. Overall, the most commonly experienced complications were painful screws (25.7%) and anterior knee pain (23.8%). Our results did not quite demonstrate significant difference in terms of infection (1.8% closed, 12.5% open, p 0.051) or non-union (1.8% closed, 10.4% open, p 0.09). Re-operation rate was similar in both groups (18.8% closed, 20.8% open, p 0.8).
Conclusions: Pain is a common complaint following tibial IMN fixation and the sometimes aetiology may be unclear. In our study, one quarter of individuals experienced painful locking screws following fixation.
Implications: Surgeons must be aware of the prevalence of metalwork issues following tibial IMN fixation and utilise tools and techniques in an attempt to minimise these.
Conflict of Interest: Nothing to disclose

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VITAMIN D INSUFFICIENCY MAY BE LINKED TO LOWER PATIENT REPORTED OUTCOME MEASURE (PROM) SCORES FOLLOWING TOTAL HIP OR KNEE REPLACEMENT
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Introduction: The number of total hip (THR) and knee (TKR) replacements performed each year is increasing, but up to 20% of patients remain dissatisfied following surgery. Vitamin D deficiency is common in this group of patients, and may be a contributing factor to poor outcome.
Methods: Following ethical approval, day-of-surgery plasma samples were obtained from patients undergoing THR/TKR. 25-hydroxy-Vitamin D levels were measured in each sample using mass-spectrometry (LC-MS/MS). Insufficiency was defined as < 50nmol/L. Pre-operative and 6-month post-operative outcome scores (Oxford hip/knee score) were obtained to calculate 'health-gain', as per the national PROMs programme.
Results: To date, we have measured the Vitamin D level in 33 patients undergoing THR, and 42 patients undergoing TKR; 745 samples in total are being measured with data collection ongoing. Following THR, the mean Vitamin D level in the group with the worst outcome was 39nmol/L, compared to 55nmol/L in the best outcome group ($p = 0.059$, 95% CI -31 to 1). Similarly, following TKR, those patients with the worst outcome had a mean Vitamin D level of 42nmol/L compared to 59nmol/L in the group with the best outcome ($p=0.007$, 95% CI -28 to -4). The mean vitamin D level in those patients with the poorest outcome is at a level where they may benefit from supplementation

according to local guidelines.
Conclusions: Those patients with Vitamin D insufficiency have a lower 'health-gain' following surgery, compared to those with normal levels as assessed with the Oxford hip or knee score. Our ongoing sample analysis will help validate this finding, but it may be that Vitamin D insufficiency is a simple and cheap modifiable risk factor to easily optimise prior to surgery, to improve post-operative outcomes.
Conflict of Interest: Nothing to disclose

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AN ASSESSMENT OF SHOE CONTAMINATION IN AN ORTHOPAEDIC THEATRE

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Introduction: Prosthetic joint infection is one of the most feared complications in arthroplasty. Rates of infection are estimated between 1-2%, however the consequences of infection including revision procedures pose a significant risk to the patient. Infection with resistant organisms in recent times has led to difficultly in eradication and treatment. Theatre staff must follow strict infection control protocols to reduce risk of transmission, however no such protocols exist for the management of theatre shoes.
Aims: To test theatre shoes for presence of bacteria known to cause prosthetic infection. Secondary aims were to test for presence of blood, difference between named and un-named shoes, and correlation between blood spatter and contamination.
Methods: In total 40 theatre shoes were swabbed in an orthopaedic theatre locker room and bacterial analysis carried out. Selective agar was used to test for the presence of resistant organisms. A faecal occult blood test assessed for presence of blood. Presence of name and location was recorded. Blood spatter was measured using photos of the shoes on ImageJ for Mac.
Results: Coagulase negative staphylococcus was isolated from 65% (n=25), staphylococcus aureus from 40% (n=16), and MRSA from 25% (N=10). FOB showed presence of blood in 80% of samples. Increased blood spatter was associated with presence of e. faecalis ($p< 0.01$), with decreased levels associated with presence of MRSA (p0.01) and staph epidermidis (p0.02). Un-named shoes were more likely to carry s. aureus (p0.04).
Discussion: All theatre staff handling shoes are at risk of transmitting these organisms to theatre surfaces, with seemingly clean shoes possibly carrying highly resistant strains of bacteria. The bacteria isolated are known to cause prosthetic joint infections, and there is a strong argument for the development and implementation of a strict protocol for the use and maintenance of theatre shoes.
Conflict of Interest: Nothing to disclose

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SHOULD SYSTEMIC ABSORPTION BE A CONCERN WHEN USING ANTIBIOTIC LOADED CALCIUM SULPHATE IN THE TREATMENT OF OSTEOMYELITIS

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Background: Medical grade Calcium Sulphate can be used as a delivery vehicle for antibiotics. We use these for treating patients with established osteomyelitis, but also use it prophylactic for contaminated war injuries, to fill voids in bone with osteo conductve filler that delivers local antibiotics, and can integrate with bone.
Although antibiotic loaded calcium sulphate is increasingly used, there is little data to demonstrate that systemic levels generated by local release of antibiotics are safe. For this reason, we routinely assay systemic levels of antibiotics.
Objectives: To determine if systemic toxicity occurs after the use of antibiotic loaded calcium sulphate in the treatment of bone and soft tissue infection
Material and method: Bone cavities and soft tissue dead spaces were aggressively debrided, lavaged and packed with Calcium Sulphate (10-40 cc) loaded with Vancomycin (1-4 g) and Gentamicin (240-960 mg). Post-operatively serial assays of Vancomycin and Gentamicin levels 1 hour after surgery then daily for three days. Renal function was also measured.
Results: In patients with normal renal function:The systemic levels were either un-measurable at the first assay, or below the acceptable trough level (Mean 2.4 and 1.8 for Vancomycin and Gentamycin respectively). They had measurable systemic levels at the third assay.
In patients with renal dysfunction: Systemic levels were in the therapeutic range determined for systemically administered antibiotics, but these levels remained high and did not decrease until patients had undergone their routine dialysis.
Conclusions: In patients treated with antibiotic loaded Calcium Sulphate:

1. Antibiotic assays are not necessary in patients who have normal renal function.
2. Patients with impaired renal function should have:
• Use lower doses of antibiotics
• Should undergo assays routinely
• Ensure dialysis after surgery.
• If they remain high, the antibiotic loaded calcium sulphate could be removed.
Conflict of Interest: Nothing to disclose

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STARTING VITAMIN-D IN ACUTE NECK OF FEMUR FRACTURES ON ADMISSION DOES NOT TRANSLATE TO CONTINUATION IN THE COMMUNITY

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Background: Vitamin D (VitD) deficiency is recognised in elderly patients and Northern Britain. We describe the level of VitD deficiency within this population, to quantify how effectively we are currently treating the deficiency.
Methods: Retrospective analysis of 580 patients over 19 Months (Jan'15 - Aug'16) admitted following neck of femur fracture, treated with hemiarthroplasty with analysis of VitD monitoring in hospital and community.
Results:
Total patients - 580 Average age: 85 years
Demographics of patients' location at admission
446 (76%) from their own home, 48 (8%) patients from care homes 27 (5%) from residential homes, 44(8%) from nursing homes, 15 (3%) from other residential sources
388 patients VitD levels on admission(66%)
45(12%) VitD>75 nmol/L
150 (39%) VitD< 75nmol/L >30nmols/L
193 (50%) VitD< 30nmol/L
All patients without sufficient levels, were started on treatment, 50(15%) had post discharge management of VitD.
Average vitD for all patients 45 nmol/L
Average correction level 48 nmol/L (difference between corrected vitD and admission vitD)
Average vitD levels (pre-treatment) by residential status:
Sheltered 47 nmol/L
Residential 41 nmol/L
Own home 41 nmol/L
Nursing 52 nmol/L
Care 45 nmol/L
Inpatient 27 nmol/L
Discussion: We are the first Orthopaedic unit to describe the post discharge outcomes of prescribing VitD in hospital. Current practice is not delivering value for money, in that only 15% of patients who are prescribed VitD are actively managed post discharge. Currently most of our population are deplete on admission and public health efforts need to be made to correct this pre-injury.
Further education of patients and GPs is required to make this intervention in secondary care efficient along with further research into the barriers in delivering this intervention.
Public Health engagment and epidemiological studies are required to ascertain if prescribing VitD in hospital is producing any valuable health improvement given low levels of compliance post-discharge.
Conflict of Interest: Nothing to disclose

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SECOND-SITE INFECTION IN PATIENTS WITH MULTIPLE PROSTHETIC JOINTS: AN ASSESSMENT OF RISK FACTORS AND IMPACT ON RESOURCES

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Introduction: Prosthetic joint infections (PJI) are among the most serious complications in arthroplasty. Second-site PJI in patients with multiple prosthetic joints increases morbidity, with multiple procedures often necessary posing additional risks and requiring significant hospital resources. We aimed to establish why some patients with multiple joints develop second-site infections. We assessed a cohort of patients treated for PJI to establish the incidence of second-site

infection, risk factors and causative organisms.
Methods: A retrospective review of our institution's arthroplasty database was carried out from 2004-2017. All PJIs treated were identified, and all patients with more than one prosthetic joint in situ were included. We recorded risk factors, causative organisms, number of procedures and length of stay.
Results: In total, 44 patients with a PJI and more than one prosthetic joint in situ were identified. Nine percent (n=4) developed second-site infection, three involving total hip replacements, one involving a left total knee replacement. Seven percent (n=3) developed re-infection of the same joint, with failure to eradicate infection in 5% (n=2) all involving total knee replacements. Coagulase negative staphylococcus was the causative organism in 30% (n=13). The primary causative organism was isolated in the second-site infection in 3 of the 4 patients (S. aureus & S. viridans), with coagulase negative staphylococcus causing the other. Mean length of stay was 59.4 days (range 11-189).
Discussion: This rate of concurrent second joint PJI is similar to previously published series. These figures re-affirm the importance of vigilance in regard to other joints as the more symptomatic joint may prove a significant distraction and the associated morbidity is high.
Identifying this vulnerable cohort of patients at an early stage is critical to ensure optimal management strategies can be taken to prevent development of second-site infections.
Conflict of Interest: Nothing to disclose

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SLEEP DISTURBANCE POST TOTAL KNEE AND HIP ARTHROPLASTY

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Sleep disturbance is commonly experienced in osteoarthritis (OA). Arthroplasty is believed to relieve this. Pre and post-operative patient reported outcomes for sleep disturbance were studied. Oxford Hip and Knee Patient Reported Questionnaires data was collected: Question 12: "*During the past four weeks, have you been troubled by pain from your hip/knee in bed at night?*" Answers to the question were: No nights (4 points), Only 1or 2 nights (3 points), Some nights (2 points), Most nights (1 point) and Every Night (0 points).
Oxford scores obtained pre-operatively, one year and two years for 697 sequential arthroplasty patients (368 TKRs, mean age 74.3 years, 329 THAs, mean age 71.9 years).
Pre-operative mean night pain score was 1.4/4 for TKAs, increasing to 3.1/4 at one year and two years. Pre-operative mean score for THAs was 1.2/4, increasing to 3.5/4 at one year and two years. The improvement was significant at one and two years for TKA and THA ($p < 0.00001$).
6% TKAs reported they never woke from sleep pre-operatively because of their knee. One year after TKA, 48% always enjoyed pain free sleeping. At two years, 50%. Including patients who only experienced disturbance one or two nights per month, the figures increased to 13%, 68% and 68% respectively.
Pre-operatively 6% THAs reported they never woke from sleep. One year after THA, 72% always enjoyed pain free sleeping. At two years, 75%. Including patients who only experienced disturbance one or two nights per month, the figures increased to 13% to 83% and 83% respectively.
Sleep disturbance affects over 90% of hip and knee OA patients. Over 80% THA patients' sleep is seldom or never disturbed by their THA: hip replacement is a highly effective intervention. 50% TKA patients' sleep is undisturbed by their TKA. 68% will experience little or no sleep disturbance.
Conflict of Interest: None of the authors have any conflict of interest related to this paper.

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DOES SUPPLEMENTATION FOR VITAMIN D DEFICIENCY IMPROVE OUTCOMES FOLLOWING TOTAL HIP OR KNEE REPLACEMENT? THE VASO TRIAL

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Introduction: 190,000 total hip and knee replacements are performed each year in the UK, but up to 20% of patients remain dissatisfied following surgery. Vitamin D deficiency is common, and studies have suggested a link between deficiency and poor outcome, including longer length of stay, increased infection rate and lower PROM scores. To date, nobody has investigated the effect of supplementation on outcome.

Methods: We designed a prospective, randomised-controlled feasibility study. All patients had their Vitamin D level measured when added to the waiting-list for surgery, as well as completing a lifestyle questionnaire and baseline PROM scores (Oxford hip/knee and EQ-5D scores). Those patients with insufficient Vitamin D levels (< 50nmol/L) were randomised to receive either cholecalciferol supplementation or no treatment, from baseline until 6-months following surgery. Vitamin D levels were rechecked on the day of surgery, and again at 6-months when post-operative PROM scores were completed. The primary outcome was the feasibility of performing a large multi-centre study, with outcome measures to assess the effect on health-gain, and secondary outcomes including length of stay and complications.
Results: 102 patients were recruited to the trial, between May and June 2017, ahead of target time. 38% had Vitamin D insufficiency at baseline. There were differences in mean baseline Oxford measures, with lower scores seen in patients with Vitamin D insufficiency compared to those with normal levels. Day of surgery blood testing has been completed, and 6-month follow-up tests are underway, with final data collected in July 2018.
Conclusion: This is the first interventional trial to investigate if supplementation for deficiency improves outcomes for patients undergoing THR/TKR. Recruitment to the feasibility trial was possible, and the pending results of this trial will inform the design of a larger, multi-centre trial.
Conflict of Interest: Nothing to disclose

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TAKING THE PISS: TESTING THE FEASIBILITY OF USING URINE DIPSTICKS TO AID POINT OF CARE DIAGNOSIS OF PERIPROSTHETIC JOINT INFECTION

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Background: Leucocyte Esterase (LE) testing of synovial fluid with urine dipsticks can diagnose Periprosthetic Joint Infection (PJI) with a high degree of accuracy (81% Sensitivity; 97% Specificity; AUC 0.97) and at a fraction of the cost of the commercially available Synovasure alpha defensin testing kit. Blood contamination of samples may invalidate results of LE strips, so it has been suggested that samples should be centrifuged before testing; making this less practical as a point of care (POC) test.
We designed a trial to see at what concentration blood can disrupt the results reported by the LE component of urine dipstick tests.
Methods: We made five serial 10% dilutions of blood from 100% down to 0.001% and performed LE testing with urine dipsticks, measured light transmission and made a subjective assessment of the appearance of each test sample.
Results: All four solutions down to 0.1% blood concentration were visibly blood stained. 100% and 10% blood solutions stained the LE testing strip, invalidating the result. The 1% solution also stained the LE test strip, but in such a way that it could be misinterpreted as a false positive (FP) result. The 0.1% solution was visibly blood stained, but did not cause a false positive or invalid LE test result. The remaining solutions (0.01% and 0.001%) were not visibly blood stained and did not cause false positive or invalid LE test results.
Conclusions: None of the samples which appeared to be visibly free of blood caused a FP or invalid LE test strip results. This suggests that LE testing strips could be used as a POC test for PJI following joint aspiration; with the caveat that they are only used to test synovial fluid which is not visibly contaminated with blood.
Conflict of Interest: Nothing to disclose

13 Sports Trauma

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SEVERE PROXIMAL HAMSTRING TENDINOPATHY IS CHARACTERIZED BY TENDON ORIGIN TEARS THAT CAN BE MANAGED WITH SURGICAL RE-ATTACHMENT

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Background: Proximal Hamstring Tendinopathy (PHT) is an overuse injury characterized by lower gluteal pain. Surgical therapies have included tenotomy and tenodesis. We propose that tendon origin tears creating interface failure on the ischial tuberosity characterize severe PHT and symptoms respond to suture anchor repair.
Objectives: To report clinical outcome with surgical treatment for proximal hamstring tendinopathy.

Study Design & Methods: Fifty-one athletes (35 men and 16 women; 16 elite and 35 non-elite) who failed non-operative management and underwent surgery for PHT were reviewed. Suture anchor fixation of conjoint and or semimembranosus tendons to the ischial tuberosity was performed. Measured outcomes were athlete return to sport and athlete satisfaction.
Results: Mean time from symptom onset to surgery was 21.2 ± 12.9 months and mean follow-up was 41.1 ± 18.9 months. Forty-two athletes (82.4%) were satisfied with surgical treatment of PHT. Nine athletes (17.6%) were dissatisfied. Thirty-six athletes (70.6%) returned to the same level of pre-morbid sports participation. Younger age (p=0.021) and high Tegner activity level (p=0.012) influenced patient satisfaction. Pre-morbid activity level (p=0.001) and time to surgery (p=0.016) influenced return to pre-morbid sport level. There were eight (15.6%) complications.
Conclusions: Re-attachment of the proximal hamstring tendons to the ischial tuberosity treatment for athletes with PHT yields good results.
Conflict of Interest: Nothing to disclose

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COLLISION SPORTS: A SYSTEMATIC REVIEW OF THE RISK FACTORS AND INCIDENCE OF KNEE INJURIES IN PROFESSIONAL ATHLETES
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Background: Knee injuries have a significant impact on athletes and are prevalent in collision sports (American Football, Rugby Union/League, Australian Football League). Injury prevention strategies are essential for player welfare.
Objectives: This systematic review (using PRISMA guidelines) aims to firstly, determine the incidence of injuries to the anterior /posterior cruciate ligaments, medial and lateral collateral ligaments and meniscus in professional athletes in collision sports. Secondly to evaluate the evidence to which; previous ACL injury, artificial pitch turf and positional play affect risk of ACL injury.
Method: A systematic keyword search was performed of Medline, Embase, PubMed and the Cochrane database. Candidate articles were included if they reported incidence data on ACL, MCL, PCL, LCL or meniscus injuries or if reported risk of artificial turf/previous ACL injury and positional play on ACL injury. Exclusion of studies included those reporting on non-collision sports and nonprofessional athletes.
Results: 11 studies fulfilled the inclusion/exclusion criteria, 4 Rugby Union, 4 NFL, 3 AFL.
MCL had the highest incidence of knee injury in Rugby Union (3.1 per 100 player hours)
Artificial turf, previous ACL injury and NFL receivers/Rugby union second row position increased ACL injury risk.
No meta-analysis was performed due to differing definitions of exposure and outcomes between sports.
Conclusion: There is an increased risk of ACL injury when NFL and RFU populations play on artificial turf. There is also an increased risk of ACL injury after previous ACL injury. Receivers in NFL and second row in rugby are at increased risk of ACL injuries.
Implication: The results highlight the need for more high quality prospective studies, to confidently report knee injury trend and ascertain specific risk factors. Standard exposure and outcome criteria need to be developed for adequate comparison. Preventative strategies focussing on previous knee injuries and receivers/second row players need to be investigated.
Conflict of Interest: Nothing to disclose

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TREATMENT OF THE ACUTE ACHILLES TENDON RUPTURES WITH THE PRBT
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Background: Early functional rehabilitation has been shown to be beneficial to the recovery of acute Achilles tendon rupture, which was independent of surgical or nonsurgical treatment. The panda rope bridge technique (PRBT) was a novel minimally invasive approach that can undergo accelerated rehabilitation, and its clinical effect was investigated in this article.
Methods: A retrospective analysis was performed on acute Achilles rupture patients treated with PRBT. The American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot score, the Achilles Tendon Total Rupture Score (ATRS), time to weight bearing, return to work and sports, subjective satisfaction, and complications were registered.
Results: The PBRT was performed on 21 patients with acute Achilles tendon rupture between June 2012 and November 2016. The mean follow up was 1.6 years. After the surgery, no cast or splint

fixation was applied. All patients began immediate ankle mobilization from day 1, full weight-bearing walking from day 5 to 7, and gradually took part in athletic exercises from 8 weeks postoperatively. No wound infection, fistula, skin necrosis, sural nerve damage, deep venous thrombosis or tendon re-rupture was found. One year after the surgery, all patients reported 100 AOFAS ankle-hindfoot score points and the mean ATRS was 97.2.
Conclusion: The PRBT has significant potential to improve the clinical results of acute Achilles tendon rupture, and is effective and safe for the early functional rehabilitation.
Conflict of Interest: Nothing to disclose

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1-YEAR OUTCOMES OF MEDIAL PATELLOFEMORAL LIGAMENT RECONSTRUCTION WITH TIBIAL TUBEROSITY DISTALISATION FOR PATIENTS WITH RECURRENT PATELLOFEMORAL INSTABILITY AND PATELLA ALTA

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Introduction: Recurrent patellofemoral instability represents a challenging condition to treat. Two of the most common risk factors for this condition are trochlear dysplasia and patellar alta. In carefully selected patients, surgery can restore stability and improve clinical function. We report on the outcomes of medial patellofemoral ligament (MPFL) reconstruction in combination with tibial tuberosity distalisation (TTD) for patients with patellofemoral instability and patella alta.
Methods: MPFL reconstruction with TTD was undertaken for patients with recurrent patellofemoral instability and radiographic evidence of patella alta between August 2013 and December 2016. Patients were evaluated pre- and post- operatively with standard scoring systems. Patients with severe trochlear dysplasia were excluded.
Results: Twenty-four consecutive MPFL reconstruction and TTD procedures were undertaken in 20 patients (6 male, 14 female), with a mean age of 22.8 years (16 - 31), and 1-year follow-up. Four patients underwent bilateral procedures (sequential). Three (12%) had no trochlear dysplasia, 11 (46%) mild dysplasia, and 10 (42%) moderate. Mean operative time was 82 minutes. Mean Kujala and IKDC scores improved from 62.1 pre-operatively to 82.7 at 1 year post-operatively ($p < 0.05$), and 48.7 to 73.4 ($p < 0.05$), respectively. No recurrence of instability occurred during the 1 year follow up period. One (4%) patient developed post-operative stiffness, requiring a manipulation under anaesthetic at 6 months post-operatively.
Conclusions: In carefully selected patients with patellofemoral instability and patella alta, MPFL reconstruction and TTD is a safe and effective treatment.
Conflict of Interest: Nothing to disclose

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PATELLA DISLOCATION: A SYSTEMATIC REVIEW OF KINEMETIC STUDIES OF THE MECHANISM OF INJURY

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Background: Patellar dislocations are a significant injury with the potential for long term problems. The aim of this review is to determine the mechanism of injury of a patella dislocation based on the available published literature and compare them to already proposed theories.
Methods: A systematic review of the literature was conducted following searches conducted on MEDLINE, EMBASE and ProQuest with the aim of investigating elements of proposed injury mechanisms in biomechanical and kinematic studies of the patellofemoral joint. A broad inclusion criteria was used that included studies that looked at patellar dislocations and instability with respect to the patellofemoral joint (PFJ) kinematics or altered kinematics of the PFJ were considered. Studies that did not address the kinematics or biomechanics of the PFJ were excluded. studies were appraised based on their methodology using a combination of the Critical Appraisal Skills Programme tool and the Quality Appraisal for Cadaveric Studies. These tools were modified to provide a framework for assessment of all studies in this review. Data was extracted using a structured proforma based on this combined appraisal tool.
Results: 113 studies were identified from search of MEDLINE, EMBASE and ProQuest databases. Following application of our inclusion criteria, a total of 23 studies were included in our review. 17 of these studies were cadaveric biomechanical studies. The remaining studies were anatomical, imaging based, computer simulation based and an in-vivo study.

Conclusions: For the patella to dislocate a complex mechanism is required to overcome the numerous restraints that have evolved for it to maintain its position and tracking. These studies provide some evidence that a dislocation is likely to occur during early knee flexion with external rotation of the tibia and contraction of the quadriceps. There is limited evidence to support other elements of previously proposed mechanisms.
Conflict of Interest: Nothing to disclose

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ALL INSIDE RECONSTRUCTION OF THE PCL: EXPERIENCE AND CLINICAL OUTCOMES
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Reconstruction of the Posterior Cruciate Ligament (PCL) using hamstring autograft has been practiced for over a decade. The technique involves passage of the graft from anterior to posterior through a tibial tunnel to exit within the tibial footprint. The graft is then drawn back anteriorly through the knee before being passed into a femoral tunnel which runs obliquely from anterior to posterior. The graft negotiates two tight angles over bony tunnel edges and this can compromise results in some cases. The technique is challenging and time consuming even in experienced surgical hands.
The advent of 'all inside' cruciate ligament reconstruction using short sockets reamed from within the knee outwards brings the advantages of being able to orient the femoral socket more transversely, a thicker graft from a single hamstring harvest and easier graft passage into the sockets.
The senior author has performed eight PCL reconstructions using the traditional tunnel technique and six using the all-inside technique. Tourniquet times including graft harvest and preparation fell from a mean of 88 minutes (range 65-112) to 66 minutes (range 59-73). Hamstring graft diameter increased from median 8.0 to 8.5 mm. There were no complications in either group.
Clinical outcomes were prospectively measured using Tegner and Lysholm scores pre-injury, pre-surgery and 1 year post-surgery. There were two clinical failures in the traditional group, none in the all-inside group.
All inside PCL reconstruction is technically less demanding and offers at least equivalent clinical results, with shorter tourniquet times, in this series.
Conflict of Interest: Nothing to disclose

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TAKING STOCK OF THE HIGHEST-QUALITY EVIDENCE AVAILABLE FOR ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION OUTCOMES
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Background: Multiple comparisons of graft choice and bundles for ACL reconstruction have been attempted. Still, the overall effectiveness of the reconstruction is not well stablished. Analysis of common adverse outcomes stand out as potential measure of success.
Methods: Systematic review and meta-analysis of randomised controlled trials comparing outcomes with a minimum one-year follow-up after any type of ACL reconstruction in adults.
Results: 25% of patients presented at least one postoperative complication. The effect estimate for the development of osteoarthritis was 2.98% [95% CI 2.15, 4.13] ($p< 0.00001$). Its risk ratio after 10 years from ACL reconstruction with an autograft was 3.3 [95% CI 2.4, 4.5] compared to the 0.2 risk for the originally uninjured contralateral knee. The total effect estimate for graft rupture was 1.36 [95% CI 1.06, 1.74] ($p=0.003$). There were 149 re-ruptures of an ACL reconstructed knee versus sixty-nine new tears on the contralateral knee.
Conclusion: When advising the patient on graft options for ACL reconstruction, donor site morbidities associated to each should be considered, including the prevalence of sensory changes and muscle discomfort. Emphasis should be made on the long-term care for the operated knee, as the difference with the non-operated knee damage accentuates with time. The development of osteoarthritis appears to be more prevalent on the index knee than on the contralateral knee after primary ACL reconstruction. Likewise, a reconstructed ACL, regardless of the type of graft used, presents a higher risk of rupture than the intact contralateral ACL; particularly significant within the first couple of years after primary reconstruction.
Implications: ACL reconstruction may result in an effective treatment of ACL complete tears. Nevertheless, a 27% of increased anterior knee laxity and a 39% of patients who have to either reduce their level of activity or completely stop their participation in sports, is far from ideal.

Conflict of Interest: Nothing to disclose

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DEVELOPMENT AND EXTERNAL VALIDATION OF A PROGNOSTIC MODEL FOR PREDICTING POOR OUTCOME IN PEOPLE WITH ACUTE ANKLE SPRAINS: THE SPRAINED STUDY

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Background: Ankle sprains are very common injuries. Although recovery can occur within weeks, around a third of patients have longer-term problems. We aimed to develop and externally validate a prognostic model for identifying people at increased risk of poor outcome after an acute ankle sprain.
Methods: Development of the model used a clinical trial cohort dataset (n=584, 8 centres), external validation was a prospective cohort study (n=682, 10 centres). Candidate predictor variables were chosen based on availability in the clinical data set, clinical consensus, and a systematic review of the literature. Poor outcome was presence one of the following symptoms 9 months post-injury: persistent pain, functional difficulty, or lack of confidence. Multiple imputation was used to handle missing data. Logistic regression models, together with multivariable fractional polynomials, were used to select variables. Predictive accuracy was evaluated by assessing model discrimination (c-statistic) and calibration (flexible calibration plot).
Results: In the development dataset, the combined c-statistic across 50 imputed data sets was 0.74 (95%CI 0.70 to 0.79), with good model calibration. Updating these models, which used data collected at the emergency department, with an additional variable at 4 weeks after the injury (pain when bearing weight on the ankle) improved the discriminatory ability (c-statistic 0.77; 95%CI 0.73 to 0.82) and calibration. In the external dataset, the c-statistic was 0.72 (95%CI 0.66 to 0.79), with a calibration plot intercept of -0.71 (95%CI -0.98 to 0.44) and slope of 1.13 (95% CI 0.76 to 1.50). Updating the model with the pain variable at 4 weeks improved discriminatory ability over the baseline model but not calibration.
Conclusions: The models performed reasonably and used predictors that are simple to obtain in routine practice.
Implications: These models may assist clinical-decision making when managing and advising ankle sprain patients.
Conflict of Interest: Nothing to disclose

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BLOOD-FREE, CLEAR VISUALISATION IN ARTHROSCOPIC SURGERY: TO INFLATE OR TO INJECT? RESULTS FROM A PROSPECTIVE, RANDOMISED, CONTROLLED, DOUBLE BLINDED TRIAL

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Background: While over 90% of surgeons in the United Kingdom still employ the tourniquet in arthroscopy, potential hazards with its use have made investigators contemplate on whether its risks actually outweigh the benefits. As suitable alternatives, portal-site injections with lignocaine [PIL] have effectively addressed bleeding in arthroscopic surgery [most commonly arising from portal incisions]. No controlled studies have compared these two modalities. We conducted a prospective, randomized, double-blinded, controlled study comparing tourniquet use and PIL in terms of intraoperative visibility, surgical and anaesthetic parameters. We hypothesized that PIL would be able to offer comparable/ better visibility versus tourniquet application for arthroscopic meniscectomy.
Methods: A prospective, randomized and double-blinded study from October'15 to October'16 was performed, after obtaining ethics approval, on all patients between 16-55 years, undergoing arthroscopic partial meniscectomy. Pre-existing illnesses, single/multi-ligament injuries were excluded. Patients were randomly distributed into 3 groups **A** [controls-PIL 2% lignocaine], **B** [PIL+tourniquet] and **C** [PIL+1:2,00,000 epinephrine]. Intraoperative details analysed at completion, included visibility scores [1;worst>13 flushes to 5;best:0 flushes], surgeon-visual analogue scale [S-VAS, 0;best to 10;worst], duration of surgery, mean arterial pressure [MAP] and heart rate [HR].
Results: Inter-group analysis revealed better visualisation in groups B and C when w.r.t. group A

[p=0.003,p=0.027 respectively]. Mean scores between groups B and C did not significantly differ [p=0.705]. S-VAS scores between three groups varied considerably. Inter-group analysis, however, revealed comparable scores between groups B and C [p=0.805]. Poor intraoperative visibility necessitated tourniquet use in 2 patients of group A. The mean intraoperative MAPs and HR and postoperative analgesic requirements did not vary between the groups.
Conclusions: PIL with 1:2,00,000 epinephrine serves as a safe and efficacious alternative to the tourniquet for arthroscopic meniscectomy with no additional complications.
Implications: Addressing major bleeding in arthroscopy by simple portal-site injections can effectively obviate the need for often complication-ridden tourniquets.
Conflict of Interest: Nothing to disclose

14 Limb Reconstruction

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TO EVALUATE FUNCTIONAL AND RADIOLOGIC OUTCOME OF DISTRACTION OSTEOGENESIS IN PATIENTS WITH INFECTED GAP NONUNIONS OF TIBIA

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Methods: The study was carried out in the Department of Orthopaedic Surgery, Grant Medical College and Sir JJ Group of Hospitals, Mumbai from 2013-2016. Hundred patients with infected gap nonunions of tibia of either sex were included in the study.Surgeries were performed under anaesthesia. All previously used implants were removed. An appropriate incision was given as per local soft tissue status. Radical resection of all necrotic tissue including bone was done and deep wound biopsy sent for culture. Fractures were stabilized with ring fixator or monolateral fixator. Ring fixator was preferred in metaphyseal fractures. Corticotomy, proximal or distal as per need of fracture, was done. Wound margins were approximated. Distraction was started 7 days after surgery at the rate of 1 mm per day. Exercises was advised to patient to prevent contracture and stiffness. Patients was followed up at monthly intervals for a minimum of 6 months.
Results: Distraction osteogenesis and bone transport can be considered to be the gold standard for infected gap non union of the tibia. The overall ASAMI-Bone healing score was Excellent or Good in 86% patients {Excellent-67%; Good-19%}. ASAMI Functional score was Excellent or Good in 89% of patients {Excellent -63%;Good -26%}. The commonest problems were of pin tract infection and wire loosening, and angulation of the transported segment. Joint stiffness especially of the ankle in equinus was also encountered. The ASAMI scores for LRS and Ilizarov were equivocal if specfic indications are strictly adhered to.
Conflict of Interest: Nothing to disclose

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GENU RECURVATUM CAN BE EFFECTIVELY TREATED WITH EXTERNAL CIRCULAR FIXATOR - A TWO CENTRE RETROSPECTIVE CASE SERIES

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Background: Genu recurvatum in children is a rare condition that is treated with osteotomy and plating of the proximal tibial deformity. It has been shown that external circular fixators are a safe and effective method of treating these deformities. We aimed to assess the clinical and radiographic outcomes in this population treated with external circulator fixators in two paediatric centres in England and Canada.
Methods: Retrospective data collection of consecutive cases was carried out from 2001 to 2016. All patients were treated with an Ilizarov or hexapod circular fixator. Notes were reviewed for aetiology, pre-operative symptoms, time in frame and any complications or re-operations. Radiographs were reviewed to assess pre- and post-operative distal femoral and proximal tibial angles and patellar height.
Results: A total of 14 tibiae (13 patients) were included with a mean age of 13 years (range 4-17 years) at frame application. Six deformities were idiopathic, five were secondary to trauma and three were sequelae of infection. One patient had concomitant genu varus and another had concomitant genu valgus. Four patients had significant limb length discrepancies. Four deformities were treated using the Ilizarov method and 10 using a hexapod fixator. The mean treatment time in frame was 188 days (range 107-412 days). The mean initial proximal posterior tibial angle (PPTA) was 108.9 degrees

(range 91-127 degrees), which was corrected to a mean of 88.6 degrees (range 80-109 degrees). The mean distal femoral angles and patellar heights did not significantly change. There were no nerve palsies, deep infections/joint sepsis or knee instability.
Conclusions: Our series is the largest series of this cohort treated with external ring fixators to the best of our knowledge. Proximal tibial recurvatum in children can be safely and effectively treated in an external circular fixator whilst addressing concomitant limb deformities.
Conflict of Interest: Nothing to disclose

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DEFINING THE NORMAL PROXIMAL TIBIO-FIBULAR RELATIONSHIP IN CHILDREN: A SIMPLE RADIOGRAPHIC MEASUREMENT
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Background: Disruption of the relationship between the proximal tibia and fibula is recognised feature in a number of different conditions such as skeletal dysplasias and post-infective sequelae, as well as the consequence of lengthening procedures. Radiographic indices for the tibio-fibular relationship at the ankle been described, but no similar measures have been reported for the proximal ends. The purpose of this study was to investigate the normal radiographic relationship between the proximal tibia and fibula in children to determine the normal range and variation.
Methods: Our radiology database was used to identify a sample of 500 normal anteroposterior radiographs of paediatric knees. All radiographs were reviewed by a single observer. The distance from the corner of the lateral tibial plateau to both the proximal tibial (PT) and fibular physes (PF) were measured, and a ratio of the two calculated (PF/PT). The process was repeated with a sample of 100 radiographs by the same observer, and a second independent observer in order to calculate intra-and inter-observer reliability.
Results: The age range of patients in this study was 4-16 years, with mean age 12.7. The mean PF/PT ratio was 1.7 (standard deviation 0.2, range 1.3-2.0). Intra-observer reliability was 100% and inter-observer reliability was 97.8%.
Conclusion: The PF/PT ratio is a simple and reliable way of quantifying the relationship between the proximal tibia and fibula in children, using a standard anteroposterior radiograph. The results of this study demonstrate that in the normal paediatric knee, there is a consistent relationship between the position of the proximal tibial and fibular physes, with a small range of variation.
Implications: This information could help in the further investigation, diagnosis and surgical management of a number of different causes of tibial and fibular deformities in children.
Conflict of Interest: Nothing to disclose

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THE USE OF BONE WEDGE ALLOGRAFT IN HIGH TIBIAL OSTEOTOMY: A PROSPECTIVE STUDY OF PAIN AND TIME TO UNION
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Introduction: Medial opening wedge high tibial osteotomy (HTO) is commonly used to treat patients with medial osteoarthritis secondary to varus malalignment. It has traditionally been associated with high pain scores, complications with union and hardware prominence. Modern techniques have improved clinical outcomes, however, pain and swelling remains an issue for some patients.
Aims: To identify whether the use of a cancellous bone wedge allograft improves clinical outcomes and time to union.
Methods: A prospective cohort study with three interventions was designed. Group 1 received an HTO using a Tomofix plate (Depuy-Synthes) with no bone graft. Group 2 received a Tomofix plate with bone graft. Group 3 received a low profile Activmotion plate (Newclip Technics) with bone graft. Power was set at 80% with $p< 0.05$, requiring 28 patients in each arm. Patient outcome scores including KOOS, OKS, EQ-5D and APQ scores were collected pre-operatively and 12 weeks. Opiod use and pain scores were measured in the first 48 hours post-operatively, with repeat scores at weeks 3,6,9 and 12. Signs of union were assessed radiologically at 3 months.
Results: There was a significant reduction in pain scores, opiod use and swelling in groups using bone graft in the immediate post-operative period up to 6 weeks, compared to those without ($p< 0.05$). These scores became equivocal at 12 weeks. There were no associated complications using allograft.

Conclusion: Bone wedge allograft can be safely used in high tibial osteotomy surgery with the benefits of reduction of pain and swelling in the immediate post-operative period.
Conflict of Interest: Nothing to disclose

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OUTCOME OF REVISION SURGERY FOR BISPHOSPHONATE RELATED SUBTROCHANTERIC FRACTURE NON-UNION
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Background: Bisphosphonates are widely used and linked to atypical femur fractures, leading to a poor biological environment for fracture healing. Intramedullary nailing is a first line treatment for these fractures but often result in non-union. There is no published paper in the literature on the management of these fractures when nailing has failed. We present our experience with this challenging problem.
Methods: We have retrospectively reviewed all consecutive patients who underwent revision surgery for non-union of bisphosphonate related subtrochanteric fractures in a large teaching hospital between 2012 and 2017.
A single surgeon performed all procedures, which included removal of failed metalwork, resection of non-union, bone grafting and rigid fixation with double plating with a lateral DCS plate and anterior compression plate.
Results: This study included 10 patients (9 female, one male), average age at revision surgery was 71.5 years and average BMI was 34. Average duration of bisphosphonate treatment was 6.2 years. One patient was lost to follow up, three patients have not completed the final follow up yet. Average time for non-weight bearing (NWB) mobilisation was 6 months and average time for fracture union was 15 months. In all patients bony union of the subtrochanteric fracture was achieved. The average neck shaft angle improved from 121 to 132 degrees after revision surgery. Complications included two periprosthetic fractures, two cases wound infections and pressure sore.
Conclusion(s): Fracture healing can be achieved with bone grafting and compression plating in all patients. However, prolonged NWB and follow-up duration is necessary.
Implications: This study is the first of its kind. We present a successful treatment option for revision surgery in bisphosphonate related atypical femur fractures when previous intramedullary nailing has failed. We recommend resection of non-union, bone grafting and rigid fixation with double plating.
Conflict of Interest: Nothing to disclose

15 Tumours

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PREDICTING SURVIVAL, LOCAL RECURRENCE AND METASTASIS IN LEIOMYOSARCOMA OF THE EXTREMITIES AND TRUNK WALL: A SYSTEMATIC REVIEW
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Background: Leiomyosarcomas are aggressive soft tissues account for 10% of soft tissue sarcomas (Farshid et al 2002), their pathogenesis is poorly understood, treatment options are limited and their behaviour varies.
Objectives: Our aim is to quantify prognostic impact of various clinical and pathological markers on survival and recurrence of leiomyosarcomas
Study Design & **Methods:** We conducted a systematic review of electronic databases per PRISMA protocol. Overall survival, local recurrence and metastasis were used as outcome measures. Both raw data and odds ratios from the studies were extracted, the odds ratio along with 95% CI were computed. The pooled odds ratio was calculated and weighted.
Results: Our search brought forth fifteen studies comprising 2799 patients, which we included in our analysis, 7 of these 15 publications were later than 2012. Overall survivalOur analysis showed that, age > 60 years was associated with poor overall survival with an odds ratio (O.R.) of 1.77(95% CI 1.33- 2.35, p 0.0001). Further, Size > 5 cms adversely affected the outcome with an O.R 2.79 (2.19-3.56, p < 0.0001). Other factors which reduced the overall survival were, positive margins of excision O.R 2.32(1.67- 3.22, p < 0.0001), Grade >2 O.R 3.66(p < 0.0001) and deep location O.R 4.16 (2. 34-

7.39, p < 0.0001).MetastasisThe risk of metastasis was strongly associated with increasing size O.R 2.34 (1.35- 4.07, p=0.002) and deeper location OR 5.13 (2.8- 9.3, p < 0.0001). Local recurrenceOnly a few studies analysed the impact of factors on local recurrence.
Conclusions: A higher age (>60 years), size (> 5 cms), grade (>2), depth (deep to deep fascia) and positive margins of excision are associated with poor overall survival. Similarly, size (> 5 cms) and deeper location are associated with ihigher metastasis. There are only few studies analyzing the impact of factors on local recurrence
Conflict of Interest: Nothing to disclose

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EWING'S SARCOMA OF THE SCAPULA: A SINGLE CENTRE LONG-TERM OUTCOME STUDY
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Introduction: Ewing's sarcoma is one of the commonest sarcomas of the scapular bone. As it is a radiosensitive tumour, the clinical dilemma is whether scapulectomy, with its associated functional limitations, can be justified. We therefore reviewed patients with Ewing´s sarcoma treated at our centre to report the oncological and functional outcomes of surgical treatment.
Methods: From a prospective database of over 3800 patients with primary malignant bone tumours, we identified patients with scapular tumours who had a histological diagnosis of Ewing's sarcoma. All patients were treated according to international protocol current at the time of treatment. Limb salvage surgery with total or subtotal scapulectomy was the preferred surgical treatment and radiotherapy was used in patients with very large tumour larger than 500ml or where surgical margins were close. Functional outcomes were assessed according to the Musculoskeletal Tumour Society criteria.
Results: Over the 39-year period, there were 29 cases of Ewing's sarcoma of scapula. Median age at diagnosis was 17.6 years (range 2 - 51 years). Mean follow-up was for 10 years (range 0-30 years). All patients receiced chemotherapy. 23 patients underwent surgery and 6 patients were managed non-operatively. In the surgical group (n=23) 4 patients died due to disease progression and all 6 died in the non-surgical group. The estimated disease-specific survival for all patients was 78.5% (95% CI 63.3% - 97.3%) at five years and 68% (95% CI 50.7 - 91.1%) at ten years. Average MSTS score was 67.38%.
Conclusion: Ewing's sarcoma of scapula is rare. Good survival and functional outcomes can be achieved with total or subtotal scapulectomy. We believe that surgical treatment with chemotherapy offers the best chance of survival. Additional radiotherapy is recommended for patients with large volumes and close surgical margins.
Conflict of Interest: Nothing to disclose

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ACRAL SOFT TISSUE SARCOMAS: A RARE AND CHALLENGING CONDITION
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Background: Acral soft tissue sarcomas are rare and current NICE guidance recommend urgent imaging with a size of greater than 5cm being their stated threshold under certain circumstances.
Methods: A retrospective service evaluation of adult patients with acral soft tissue sarcoma from 2000 to 2016 was undertaken. The data included patient demographics, histological subtype, tumour size in the largest dimension, surgical treatment and outcome (local recurrence, metastatic disease and survival).
Results: A total of 72 patients were identified (30 hands, 42 feet). Mean age was 47 (+/-20), median duration of symptoms was 7 months, and median time of final follow up was 4.2 years. Surgery was wide local and excision with free flap reconstruction in over 40% of cases. Median size of tumour was 4cm and the majority (69%) were not greater than 5cm in size. Amputation was performed in 36% of cases but of these over 70% were limb preserving. Metastatic disease developed in 33% of patients and the overall disease related mortality was 12.5%. Patients with metastatic disease at final outcome had a larger median tumour size (3.5cm) than those without (5.3cm) and this was statistically significant (p=0.03).
Conclusions and implications: The multidisciplinary approach involving orthoplastic surgeons can avoid limb sacrificing amputation in the majority of cases, demonstrating the value of prompt specialist referral. Our experience also confirms that the size of the tumour at presentation is of prognostic value; however this work suggests that 5cm should not be used as a diagnostic threshold and all

suspicious lumps should be urgently investigated, irrelevant of size.
Conflict of Interest: Nothing to disclose

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ENHANCED FIXATION OF DISTAL FEMORAL REPLACEMENTS WITH HYDROXYAPATITE-COATED COLLARS IN SKELETALLY IMMATURE PATIENTS
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Background: The objective of this study was to analyse osteointegration of hydroxyapatite (HA)-coated collars and relate this to radiolucent line (RLL) formation and bone loss at the bone-shoulder-implant junction in skeletally immature patients with distal femoral replacements used for the treatment of primary bone cancers. Bone remodelling and growth in these patients' means that implant fixation and survival may be an issue. We ask the question whether extra-cortical bone growth onto a HA collar prevents loosening as these patients mature?
Methods: Twenty-four patients aged between 8 and 15 years old were treated with a cemented distal femoral prosthesis between 2001 and 2013. The mean of follow-up was 77.2 months (range, 36 - 139 months). Extracortical bone growth into the grooved HA-coated collar, cortical bone loss at the bone-shoulder-implant junction and RLL progression around the cemented stem was quantified on anteroposterior and mediolateral radiographs. A Mann-Whitney U test was used for comparison where $P = < 0.05$ was considered significant. A Pearson's correlation coefficient investigated the relationship between osteointegration and RLL score.
Results: Thirteen patients (54%) showed evidence of osteointegration into the HA-coated collar. A lower RLL score was seen in patients with osteointegration when compared with those with no osteointegration ($p< 0.05$). Reduced bone loss was measured in patients with osteointegration when compared to patients with no osteointegration ($p< 0.001$). A relationship between increased osteointegration and a reduction in the RLL score was found (Pearson's correlation coefficient -0.252; $p=0.005$).
Conclusions: In paediatric cases, cemented distal femoral prostheses with osteointegration of the HA-collar showed reduced progression of RLL adjacent to the stem and less bone resorption at bone-implant junction.
Implications: HA collars enhance fixation, which may increase implant survival as these patients become skeletally mature.
Conflict of Interest: Nothing to disclose

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LOW INFECTION RATES WITH A SINGLE DOSE OF ANTIBIOTICS IN PRIMARY ENDOPROSTHETIC REPLACEMENT FOR METASTATIC DISEASE
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Background: The timing and number of doses of antibiotics required for endoprosthetic replacement(EPR) in metastatic bone disease(MBD) is a matter of debate. Deep infection rates of 2-17% have been noted in various studies even with extended antibiotic prophylaxis. The aim of our study is to present the results of a cohort of EPR in MBD receiving a single dose of antibiotics at induction of anaesthesia.
Methods: All patients who underwent primary EPR for MBD were included in this prospective study. They had been optimised pre-operatively and angioembolisation had been preformed in patients with metastasis from kidneys . The patients were followed up in the wound clinic and the metastatic clinic at 2 weeks, 6 weeks, 3months , 6 months and then annually. The occurrence of infection was noted.
Results: 38 patients were included. The primary tumor was renal(n=12), breast(n=9), lung(n=5), prostate(n=4),myeloma(n=3), colon(n=3), pancreas(n=1),uterine(n=1). The surgeries performed were proximal femoral replacement(n=24),distal femoral replacement(n=8),proximal tibial replacement(n=2), proximal humeral replacement(n=2),distal humerus replacement(n=1),ulna replacement(n=1). 18 patients received 1.5gm of cefuroxime, 14 patients received teicoplanin 800mg and ciprofloxacin 500mg and 6patients patients received teicoplanin 800mg and cefuroxime 1.5gm at induction. There was only case of superficial wound infection which resolved with two weeks of oral Clindamycin. The superficial infection rate in our cohort was 2.6% and deep infection rate was 0%.
Conclusion: We conclude that a single dose of antibiotic at induction of anaesthesia results in a good

outcome and low infection rates. Therefore, they may be no advantage in extended antibiotic coverage. However, the patients need to be optimised pre-operatively for reduced blood loss. A larger trial with a single dose of pre-operative antibiotics may be an avenue for further research.
Implications: Single dose of pre-operative antibiotics is associated with low infection rate in primary EPR for MBD iin the well optimised patient.
Conflict of Interest: Nothing to disclose

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PATHOLOGICAL NECK OF FEMUR FRACTURES - A FIVE-YEAR REVIEW OF RESULTS
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Background: Pathological hip fractures may be the primary presentation for up 15% of new malignancies. This study aims to determine the pathological hip fracture rate, clinical risk factors and the impact of results on clinical management, within a defined population.
Methods: Retrospective review of a prospectively collected pathology database from suspected pathological fractures between 2010-2014. Data collected included demographics, clinical indication for analysis, cancer history, pathology result and subsequent treatments. We defined a pathological fracture as a fracture arising from a primary or secondary malignant process.
Results: There were 137 cases (27 cases/year) with a mean age of 75.6 years (range, 39 - 96). The pathological hip fracture rate, confirmed through laboratory analysis was 30% (n=41). Common primary sites included breast (n=11, 27%), prostate (n=10, 24%), lung (n=8, 20%) and haematological (n=7, 17%). A new diagnosis of malignancy was found in 18 cases (44% of all new malignant cases, 13% of all cases). Seven patients had a cancer history, but this was not found to be the cause of fracture at the time of assessment. Clinical risk factors for pathological fracture included prodromal hip pain ($p< 0.001$), abnormal pelvic radiograph ($p=0.14$), and recent weight loss ($p< 0.01$). Following new diagnoses, 16 patients required further treatment: radiotherapy (n=4, 25%), chemotherapy (n=5, 31%), combined radiotherapy/chemotherapy (n=5, 31%), further surgery (n=1, 6%) and palliative care (n=1, 6%). Total mortality rate was 63% with a mean survival of 322 days (range, 44 days - 3 years). Mean survival in patients with a pathological fracture was significantly lower than those without (248 days versus 522 days, $p=0.007$).
Conclusion: Malignant pathological hip fractures are common. Laboratory diagnosis is critical to confirm the primary site and advise on further management.
Implications: Patients and relatives must be counselled regarding the significantly higher mortality in an already vulnerable population.
Conflict of Interest: Nothing to disclose

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A CT BASED MODIFIED MIREL'S CLASSIFICATION IN THE MANAGEMENT OF SKELETAL METASTASES
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We introduced a referral pathway for patients with skeletal metastases in 2009, with an aim to facilitate prompt, consultant-led decision-making and intervention for patients with risk of pathological fracture of long bones, after discussion in our multidisciplinary meeting (MDM).
We reviewed all referrals from Jan 2009 to December 2017. All imaging was analysed by two musculoskeletal radiologists.
Patient management of all cases was based on discussions in the MDM. Patient demographics, co-morbidities, extent of the skeletal involvement, treatment, predicted survival, actual survival and outcomes following surgical and non-surgical treatments were recorded.
Patients were re-scored on our proposed classification and correlated with outcomes and survival. Drug history (bisphosphonate use, aromatase inhibitors), genetic mutations (BRCA1+2) and hormone receptor status were recorded.
244 patients were referred, M:F 131:113. Primary malignancies were confirmed histologically, breast in 63/244). Femur was the commonest site of metastasis (192/244), 77% intertrochanteric.
72/244 presented with extensive skeletal metastases, precluding surgery.
81 patients underwent surgery, Mirel´s score > 9 in all (27.86%). Mean survival was 9.1 months following surgery. The referring clinician over-estimated patient survival by an average of 8.8 months.

The proposed CT classification scored higher for patients with lower survival than that proposed by their oncologists at the time of referral. Surgery was deferred in patients with extensive loco-regional disease where stabilisation of metastatic disease would have been suboptimal.
Expansile lucent lesions carry a higher risk for fracture and we therefore manage them surgically where appropriate.
Medications influenced metabolic bone turnover.
Cross-sectional imaging is performed routinely in the initial diagnosis and subsequent follow up of oncological patients. Mirel's classification reliably predicts the risk of fracture. However this is based on conventional radiographs, a 2D modality with low sensitivity & specificity for bone destruction. Identifying patients with extensive locoregional disease as a separate subgroup, facilitates management and referral pathways.
Conflict of Interest: Nothing to disclose

16 Physiotherapy/Rehabilitation (ATOCP)

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MEDICAL STUDENTS´ ATTITUDES TO NON-MEDICAL CLINICAL SUPERVISION IN AN INTERPROFESSIONAL ORTHOPAEDIC COMMUNITY OF PRACTICE MODEL
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Background: Interprofessional Collaborative Practice (ICP) positively impacts workplace cultures, clinical outcomes and staff satisfaction. The World Health Organisation steers redesigning healthcare education to promote better teamwork. The General Medical Council endorses cultivating ICP skills during pre-registration training. However, the features of practice-based education that can facilitate ICP and clinical skills are unclear.
The University of Liverpool (UoL) has developed a placement within an established interprofessional orthopaedic Community of Practice (CoP) at the Royal Liverpool Hospital, where Advanced Practice Physiotherapists (APPs) lead clinical supervision. Formal placement evaluation indicates that students value this experience but a more detailed exploration is important to generate deeper understanding of the impact of non-medical supervision within the context of an interprofessional model.
Methods: Nine UoL second-year medical students participated in semi-structured interviews about their experiential learning. Thematic Content Analysis was applied to the data, using NVivo 10 QSR International qualitative data analysis software to facilitate the analytical process.
Results: Three main themes emerged: Environment, Patient as Focus and Supervisor Behaviours. To develop interprofessional behaviour and clinical skill, a busy environment which models ICP is important. All available professions should contribute to learning by involving students in suitably challenging patient-centred tasks. Supervisors should act as facilitators whilst demonstrating robust understanding of the clinical specialism, as well as the medical model of education.
Conclusion: APPs were strongly supported in an educational role and were viewed by second-year medical students to have equivalent collaborative power to orthopaedic doctors in this CoP model.
Implications: This study adds to the evidence base by evaluating the interprofessional educational skills of APPs and has implications for formal development. This has the potential to enhance the student experience and available learning opportunities during medical placements. Future studies could explore the Community of Practice model to guide the description and evaluation of other interprofessional placements.
Conflict of Interest: Nothing to disclose

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MANAGEMENT OF TENNIS ELBOW: A SURVEY OF UK CLINICAL PRACTICE
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Background: Tennis elbow is a common condition in the UK but there are no guidelines on how best to manage the condition. The purpose of this study was to establish the current UK practice in managing patients with chronic tennis elbow (symptoms over six months).
Methods: A cross sectional online survey of UK surgeons and therapists was conducted in June

2017, remaining active for one month. This was comprised of 17 questions and was hosted by Google Forms. The questionnaire was distributed to professional contacts and was sent directly to members of the British Society for Surgery of the Hand following review by their research committee. In addition it was advertised via social media and the Chartered Society of Physiotherapy online message board.
Results: 275 responses were received from a wide geographical area, the majority from consultant surgeons and experienced physiotherapists. 81% recommended exercise-based physiotherapy as the first line intervention, with 9% recommending corticosteroid injection. Second line treatments varied widely with corticosteroid injections the most popular (27%) followed by shockwave therapy, Platelet-Rich Plasma injection, surgery, acupuncture and a wait-and-see policy. Surgery was advised by 1% as a first line option and 10% as second line.
Discussion: There is wide variability of treatments offered when physiotherapy fails patients with tennis elbow. The majority of second line interventions lack evidence to support their use and in the case of corticosteroid injections may even be harmful in the long term. There is a clear need for national guidance based on best evidence to aid clinicians in their treatment approach.
Conflict of Interest: Nothing to disclose

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SURGERY FOR TENNIS ELBOW: A SYSTEMATIC REVIEW
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Background: There is no consensus on the most suitable treatment for tennis elbow but surgical intervention is increasing despite a lack of supportive research evidence. The aim of this systematic review was to provide a balanced update based on all relevant published RCTs to date.
Methods: An electronic search of MEDLINE, EMBASE, CINAHL, BNI, AMED, PsycINFO, HBE, HMIC, PubMed, TRIP, Dynamed Plus and The Cochrane Library was performed using a pre-defined search protocol (www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42016050849). This was complemented by hand searching. Risk of bias was assessed using the Cochrane Risk of Bias Tool and data was synthesised narratively, based on levels of evidence, due to heterogeneity.
Results: 12 studies of poor methodological quality were included. The lack of consistent methods of outcome measurement prevented a meta-analysis of results. Four studies compared surgery to a non-surgical (Botox injection, shockwave therapy or platelet-rich plasma injection) or sham surgical intervention. The other eight studies compared open release against an alternative surgical technique such as a percutaneous method, arthroscopic release or radiofrequency microtenotomy. The available data suggest that surgical interventions for tennis elbow are not more effective than non-surgical and sham interventions. Surgical technique modifications may enhance effectiveness compared with traditional methods but have not been tested against placebo.
Conclusions: Current research evidence suggests surgery for tennis elbow is no more effective than non-surgical treatment based on evidence with significant methodological limitations. Given the recalcitrant nature of tennis elbow for some patients, further research in the form of a high quality placebo-controlled surgical trial with additional conservative arm, is required to usefully inform clinical practice.
Conflict of Interest: Nothing to disclose

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MANAGEMENT OF ATRAUMATIC SHOULDER INSTABILITY - UPDATED RESULTS OF A STRUCTURED PHYSIOTHERAPY PROGRAMME
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Background: There is limited published evidence to guide physiotherapists when treating patients with atraumatic shoulder instability. The aim of this study was to update the results of a previous small service evaluation investigating the outcomes for patients following a specific structured physiotherapy programme.
Method: A service evaluation was conducted at our unit from August 2013, when the programme was introduced, up until December 2017. Patient reported outcome data was compared from final follow up to baseline using the Western Ontario Shoulder Index (WOSI) and the Oxford Instability Shoulder Score (OISS) analysed using the Wilcoxon Signed Rank Test.
Results: 51 patients were treated during this period. There were 16 males and 35 females with mean age 21.6 years. Mean symptom duration was 29 months prior to treatment. One patient had a

congenital hand deformity so could not perform the exercises and another likewise due to multiple joint pathologies. Both were excluded from the analysis. 9 failed to complete treatment but their OISS data could be included in analysis. The 40 patients who completed treatment attended on average 6 times (3-16) over 26 weeks (6-80). Mean WOSI score improved from 42.04 to 82.91 ($p< 0.001$). Mean OISS improved from 39.27 to 23.47 ($p< 0.001$). For the 9 patients that failed to complete treatment mean OISS improved from 41.89 to 33.86 ($p< 0.05$) with 6/9 showing improvement. 2/9 failed to attend after the first session. Only one patient who attended 3 times over 11 weeks failed to improve on the OISS.
Conclusion: For patients with atraumatic shoulder instability this structured physiotherapy programme results in improved levels of pain, stability and function but does require adherence from patients. Long term outcomes for this treatment regime still need to be investigated.
Conflict of Interest: Nothing to disclose

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CURRENT PHYSIOTHERAPY PRACTICE IN THE MANAGEMENT OF TENNIS ELBOW: A SERVICE EVALUATION

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Background: Tennis elbow is a common painful condition that may affect daily function and ability to work. Physiotherapy is the most commonly used primary intervention but there is a wide range of treatment options within the umbrella of physiotherapy. Our aim was to report which treatments are currently used by physiotherapists in a UK National Health Service setting.
Method: A retrospective service evaluation was conducted at two NHS hospital trusts by reviewing patient attendance records over a one year period. All patients with tennis elbow were included, except those referred for post-operative rehabilitation. Patient notes were analysed using a pre-defined assessment template.
Results: 65 patient records were identified with mean age 48 years and mean symptom duration of 5.4 months. Mean treatment duration was 64 days over 3.7 sessions. The most commonly used treatments were education and exercise however the type and dosing of exercise varied greatly. Passive modalities lacking evidence for efficacy, such as ice, taping, manual therapy, acupuncture and electrotherapy, were still used.
Conclusion: Wide variations in treatment approaches were identified. There was no consistency in either the choice of modality used, the type of exercise or the dose of exercise prescribed. The use of passive modalities and corticosteroid injections remains commonplace despite a lack of supportive research evidence. There is a clear need for evidence-based guidance for physiotherapists treating patients with tennis elbow to ensure a consistent approach that is most likely to benefit patients.
Conflict of Interest: Nothing to disclose

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USING THE D+R THERAPY SMARTPHONE APPLICATION TO ASSESS RANGE OF MOVEMENT FOLLOWING TOTAL KNEE REPLACEMENT

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Background: Range of motion (ROM) is an important component of the therapy assessment of total knee replacement (TKR) outcome. Patients that cannot flex greater than 90 degrees or extend to a neutral position can experience difficulty with routine activities such as rising from a chair or walking. Traditionally, ROM is measured using a goniometer. The results may be variable however, depending the experience of the tester.
The D+R Therapy application can potentially ensure a more accurate ROM reading, leading to an improved functional assessment and outcome.
Objectives: The objective of this study is to assess the validity of the D+R Therapy smartphone application as a novel tool for assessing ROM and acceleration in patients undergoing rehabilitation following TKR, by comparing the application to the standard ROM assessments using a goniometer.
Study Design & Methods: 20 patients of age 50 or older who received TKR under the care of Medway NHS Foundation Trust, who required home-based rehabilitation were invited to participate in the study.
Participants received the standard home-based rehabilitation programme and their ROM was measured using a standard goniometer.
In addition, participants had a smartphone attached to their body. A member of the SPET team used

the D+R therapy application installed on the smartphone to measure the participant's ROM and acceleration. The app on the phone then allowed one to keep a log of the number of exercises being performed and ROM on a daily basis.
Results: There was a significant improvement in compliance and patients were able to keep a track of their ROM and exercises performed.
Conclusions: The study showed reliable and reproducible results of ROM and acceleration measured with the D+R Therapy application, in comparison to the standard method. This proved a successful pilot for the intervention, in preparation for a larger statistically powered trial.
Conflict of Interest: Nothing to disclose

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A PRELIMINARY REPORT: A FEASIBILITY STUDY CONSIDERING THE USE OF A NEW MEDICAL STRETCHING DEVICE (STAK TOOL) IN 8 PATIENTS WITH ARTHROFIBROSIS FOLLOWING TOTAL KNEE REPLACEMENT (TKR), BEING CONSIDERED FOR MANIPULATION UNDER ANAESTHETIC (MUA)

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Background: Whilst medical stretching devices for home use in the treatment of arthrofibrosis are commonly used in the USA none are currently available in the NHS.
Around 90,000 TKR's are performed each year in the UK. Due to obesity and longevity this is expected to increase six-fold by 2030 (Culliford 2015). Approximately 10% of cases develop arthrofibrosis, which has debilitating effects on patients' basic everyday activities.
Method: 8 patients following TKR (mean 10.5 weeks) who failed routine postoperative rehabilitation, having less than 80° ROM (mean 64.57°, range 44°-75°) were recruited. Patients received 8 weeks standard treatment plus independent stretching using a STAK Tool at home for up to 60 mins a day.
Results: 7 patients completed the treatment period using the STAK achieving both a mean and median increase in ROM of 33° (mean 97.85°, range 88°-107°). No patients suffered any complications as a result of using the STAK. One patient withdrew from the study at an early stage. Patients found treatment acceptable and all patients said they would recommend it to a friend. Patients reported improvement in function and a feeling of being in control of their rehabilitation. No patients have required MUA following use of the STAK Tool.
Conclusions: Improvements in ROM compare favourably with Bonutti´s (2010) research using the JAS Device in USA where patients achieved a mean increase in ROM of 25° (range 8°-82°). It compares favourably with patients treated with MUA. Published results following MUA demonstrate mean increases in ROM of 26.5 (range 0°-80°) (Ipach 2011). However MUA is not without risk and can result in complications (Yercan 2006).
Implications: We are encouraged by this study's early results and will report later the longer term follow up to see if ROM increase is maintained. A randomised study comparing STAK tool to standard physiotherapy is planned.
Conflict of Interest: Nothing to disclose

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MUSCULOSKELETAL INJECTIONS: ANALYIS OF HEALTHCARE PROVIDERS UNDERSTANDING OF INDICATIONS, RISKS AND REHABILITATION

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Introduction: This study analyses the indications, understanding of complications and rehabilitation protocol followed by different healthcare providers who perform musculoskeletal injections in the outpatient setting.
Methodology: A questionnaire was used to analyse current understanding of musculoskeletal injections, in particular; indications, risk of infection, frequency of repeat injections and rehabilitation. These questionnaires were distributed to general practitioners (GPs) and physiotherapists attending musculoskeletal injection seminars. Further questionnaires were sent to orthopaedic surgeons randomly selected from the British Orthopaedic Association member's book. There was an 80% response rate; with replies from 205 GPs, 117 physiotherapists and 49 surgeons.
Results: Across the three groups, subacromial injections were felt to be the most effective based on

knowledge of scientific evidence. There was no significant difference found between the groups when looking at their understanding of estimated risk of infection and steroid flare. A significant difference was seen with obtaining written consent; with the majority of physiotherapists feeling this was not applicable and majority of surgeons not obtaining written consent. With regards to activities after injection, most healthcare providers advised avoidance of vigorous activities for a minimum of three days but normal activities were allowed. Whilst the majority of surgeons felt that patients could drive immediately, most GPs and physiotherapists advised driving by the following day. There were significant differences seen when analyzing whether patients should have physiotherapy and when this should start, the maximum number of injections to one area deemed appropriate and the minimum interval between injections.
Conclusion: This study highlights significant differences in the practices of healthcare providers when administering musculoskeletal injections in the outpatient setting. Whilst complications are rare, the administering practitioner should understand the risks and counsel the patients with written documentation. The use of an agreed guidance may help to produce universal practice and help independent practitioners with decision-making.
Conflict of Interest: Nothing to disclose

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DO ANKLE FOOT ORTHOSES IMPROVE BALANCE IN CHILDREN WITH SPASTIC DIPLEGIA?
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Purpose: In neuromuscular conditions, ankle foot orthoses (AFO) improve functional balance, gait efficiency, facilitate skills training and prevent deformity. This study assessed whether AFOs confer additional functional benefit compared to shoes alone.
Methods: 10 GMFCS II/III spastic diplegic children (5M:5F), mean age 11.7 years (range 7-15yrs), were recruited. Every child was their own control in a same subject experimental design.
Each child walked the GAITRite electronic mat at their preferred speed; barefoot, in shoes, and in AFOs with shoes. Walk order was randomized to limit fatigue/confidence effects. All data was collected by one therapist.
Normalized velocity, cadence, stride length and percentage time in single leg support (SLS%) were selected as surrogate measures of stability. The paediatric balance scale (PBS) assessed balance during other activities.
A two-way analysis of variance (ANOVA) explored differences in gait between the various trials. Post hoc comparisons tested where these differences lay. Friedman's test tested differences between subjects and between conditions.
Results: For all objective measures, the confidence intervals were large due to group heterogeneity. Barefoot mean velocity increased with shoewear and increased further with AFOs (Barefoot:AFO ($p=0.02$)). Cadence did not change. Increased stride length increased velocity ($p< 0.01$) with shoes alone and shoes/AFO.
Significant improvements in SLS% ($p< 0.01$) were seen in footwear and AFOs. SLS% was significantly shorter on the more affected leg ($p< 0.01$).
The improved stability suggested by GAITRite results was not confirmed by PBS where neither shoes nor AFOs significantly affected functional balance. Clinical improvements were seen in AFOs: improvements in some items were negated by reduced scores in others.
Conclusions: In patients, the shoe-AFO combination significantly improved surrogate measures for gait stability: velocity, stride length and SLS%. AFOs did not affect PBS scores.
Significance: Shoes alone have a positive effect on gait and consideration should be given to footwear choice.
Conflict of Interest: Nothing to disclose

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CONSTRAINTS ON EARLY REHABILITATION AFTER SURGERY FOR HIP FRACTURE - FINDINGS OF THE NATIONAL PHYSIOTHERAPY 'HIP SPRINT' AUDIT IN 2017
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Introduction: Modern anaesthesia and surgery are now so successful that nearly all patients with hip fracture have prompt and effective repair of their injury. Recovery from this injury serves as an excellent example of the challenges faced by frail and older patients and by the multidisciplinary teams

who seek to restore them to their previous mobility, independence and quality of life.
Methodology: The Chartered Society of Physiotherapy led work by over 580 physiotherapists - collecting rehabilitation data for 5,989 (78.6%) of the 7,621 people who presented to 127 participating hospitals between May and June 2017. 'Hip Sprint' analysed these data along with those provided to the National Hip Fracture Dataset (NHFD) over the same period.
Results: 68.4% of patients were mobilised out of bed on the day following their surgery. But 'Hip Sprint' found significant variation in performance; nine hospitals (7%) achieved this for fewer than half of patients. 9.4% of patients were unable to get up as a result pain or hypotension - factors which might have been anticipated by clear peri-operative protocols and closer working with surgical and anaesthetic colleagues. On average each patient received two hours of physiotherapy (118 minutes) in the first week after operation.
Discussion: Patients should be helped to get up as soon as possible after surgery - such 'mobilisation' is key to their wellbeing and avoidance of complications such as delirium. Nearly all are now seen by a physiotherapist of the day after surgery, but collaborative multidisciplinary working is needed to ensure that pain, hypotension and delirium do not delay the start of rehabilitation.
Implications: Individual teams should review the picture of their hospital's immediate post-op. management provided at www.fffap.org.uk/phfsa.
Conflict of Interest: Nothing to disclose

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INTRODUCING DAYCASE SURGERY INTO AN EXISTING ENHANCED RECOVERY PROGRAMME FOR UNICOMPARTMENTAL KNEE REPLACEMENT WITHIN THE NHS SETTING: SUITABLE FOR ALL? THE RESULTS OF A SERVICE IMPROVEMENT PROJECT AND LESSONS LEARNED

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Background: In the current NHS climate with an emphasis on reducing the number of days patients spend in hospital there is a need for more shorter stay procedures. Our aim was to introduce a new daycase pathway into an existing enhanced recovery programme to reduce the length of stay for all unicompartmental knee replacements (UKRs) in our institution.
Methods: In September 2016 a daycase pathway with an innovative rehabilitation protocol, delaying post-operative knee flexion, was introduced. Eleven orthopaedic consultants and their teams performed 436 primary unilateral UKRs in the 12 months to August 2017.
Results: 130 patients (30%) went home on the day of surgery, 180 (41%) on day 1 and 126 (29%) stayed in 2 or more days (range 2-28 days). The average length of stay reduced from 2.6 to 1.5 days (median of 1 day). The pathway was safe and acceptable to patients. Average knee flexion was 109° (60-135) at 6 weeks with no manipulations under anaesthesia required. A saving of 480 bed days and £144,000 was made in 12 months.
Conclusion: Multiple small changes, rather than one single change, facilitated the successful adoption of this new care pathway. These small changes took place in numerous hospital departments and incorporated various members of the interdisciplinary team. For example, some factors that facilitated this success were: the consistent team message, patient education, delayed knee flexion and physiotherapists working late evening shifts.
Implications: We have shown daycase UKR surgery can be safely introduced into an enhanced recovery programme within the NHS. This pathway's success lay in the expertise and commitment of the staff involved and additional refinements will decrease length of stay for more patients.
Conflict of Interest: One or more of the authors have received or will receive benefits for personal or professional use from a commercial party related directly or indirectly to the subject of this article.

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WHAT INTERVENTIONS ARE USED TO IMPROVE EXERCISE ADHERENCE IN OLDER PEOPLE AND WHAT BEHAVIOURAL TECHNIQUES ARE THEY BASED ON? A SYSTEMATIC REVIEW

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Background: Prescribed exercise is a common treatment modality for various conditions. A number

of factors that affect exercise adherence in older people have been identified. Adherence to exercise can affect treatment outcomes. Therefore improving adherence for older people should be an important consideration. Study aims were to systematically review interventions tested in randomised controlled trials aiming to improve exercise adherence in older people, to assess the effectiveness of these interventions, and to assess the behaviour change techniques underlying them using the Behaviour Change Technique Taxonomy (BCTT).
Methods: A search was conducted on the following databases: AMED, BNI, CINAHL, EMBASE, MEDLINE and PsychINFO. Randomised controlled trials that used an exercise adherence intervention and outcome for older people were included. Data were extracted with the use of a pre-prepared standardised form. Risk of bias was evaluated with the Cochrane Collaboration's tool for assessing risk of bias. Interventions were classified according to the BCTT.
Results: Eleven studies were included in the review. Risk of bias was found to be moderate to high. Interventions were classified into the following categories based on the BCTT: 'comparison of behaviour', 'feedback and monitoring', 'social support', 'natural consequences', 'identity' and 'goals and planning'. Four studies reported a positive adherence outcome following their intervention. Three of these were categorised in the feedback and monitoring category. Four studies utilised a behavioural approach within their study. These were Social Learning Theory, Socioemotional Selectivity Theory, Cognitive Behavioural Therapy and Self-efficacy.
Conclusions: Interventions in the feedback and monitoring category demonstrated positive outcomes; however, there is insufficient evidence to recommend their use currently. It would be beneficial if there was better reporting, use and the development of theoretically derived interventions in the field of exercise adherence for older people.
Implications: Future research should focus on testing theoretically derived exercise adherence interventions for older people.
Conflict of Interest: Nothing to disclose

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COULD A SMART PHONE APPLICATION REPLACE THE UNIVERSAL GONIOMETER FOR MEASURING KNEE RANGE OF MOVEMENT? A PILOT STUDY
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Background: The universal goniometer is commonly used to measure range of movement (ROM) in clinical practice - it is widely available, portable, easy to use and cheap. However research shows that it is neither a valid or reliable instrument to measure ROM. Trappler (2009) found 22% of measurement differed by 5˚ or greater, more than the 5˚ error acceptable in clinical practice.
The electrogoniometer is the gold standard measuring instrument (Berryman Reese and Bandy 2009), but its disadvantages including expense, complexity of use and set-up make it difficult to use in the clinical setting.
The advent of smart phones accompanied by new ranges of applications creates the potential for a valid, reliable, cheap and efficient measuring instrument.
Methods: 20 joint angle measurements were each taken using an electrogoniometer and the Hudl Ubersense App (App) on one subject. The concurrent validity of the App was assessed using the Bland and Altman (1995) method which indicates the level of agreement between the instruments rather than correlation coefficients which may produce a distorted picture.
Results: Results demonstrated a high concurrent validity and intra-rater reliability of the App as an instrument for measuring ROM in a standardised procedure. The mean difference between the electrogoniometer and App measurements in the two trials were 1.75˚ and 0.80˚ (less than 1˚ (0.95˚) difference, indicating high concurrent validity and intra-rater reliability.
Conclusions: The App compares favourably with the electrogoniometer so may have a wider clinical application. Future research should test concurrent validity and reliability of the App when used in a less formal manner as in clinical practice.
Implications: The App is likely to be more accurate than the universal goniometer enhancing record keeping and reproducibility of results.
The free App could facilitate tele-medicine and be used as a motivational tool to give patients feedback on their progress.
Conflict of Interest: Nothing to disclose

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SHORT-TERM OUTCOME OF APOS THERAPY - A BIOMECHANICAL PERTURBATION BASED

SHOE

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Purpose: We sought to evaluate APOS therapy, a novel on-operative treatment for knee osteoarthritis which works by reducing loads from the affected joint and training of the neuromuscular system by perturbation. This system is comprised of convex adjustable biomechanical elements (pertupods) placed under the hind-foot and fore-foot regions of each foot. The elements are attached via and the positioning of the pods (customised location for each patient) changes the location of the centre of pressure (COP), which in turn causes changes the moments acting within the kinetic chain.
Methods: Consecutive patients who met our CCG criteria to be eligible for a Total Knee Replacement (TKR) were recruited. All patients had isolated Knee osteoarthritis whose symptoms were refractory to non-operative management for a least 6 months. Patients were placed on APOS treatment for a minimum duration of 6 months. Pre and post- treatment Oxford knee Scores (OKS) were taken and surgical conversion rates were monitored.
Results: 68 patients met the inclusion criteria were recruited during October 2015 to September 2016. (3 patients were lost to follow-up). There were 30 Male; 35 female. Mean age was 68 years (SD 9.5). 31 patients had unilateral and 24 bilateral bi-compartmental OA; 3 isolated Patello-femoral OA; 6 unilateral and 2 isolated medial compartment OA. Median pre-operative OKS was 20 (range 13-35). At mean 6 months treatment duration Median post-operative OKS for all patients was 37 (range 13-46). In patients that improved the Median Increase in OKS was 9 points and in patients that worsened (n=4) median reduction in OKS was 3 points. 25% (16) patients during the follow up period subsequently were converted to a TKR.
Conclusion: Early results of APOS therapy are promising demonstrating at least a six months delay in conversion to a TKR in eligible patients and OKS improvement reaching the MCID.
Conflict of Interest: Nothing to disclose

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A COHORT STUDY TO ASSESS PATIENT OUTCOMES FOLLOWING COMPLEX MUSCULOSKELETAL INJURY AND HOW THE REHABILITATION PATHWAY IMPACTS ON THEIR RECOVERY

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Background: Patients who sustain complex musculoskeletal (CMSK) injury account for over half of hospital admissions following major trauma. Yet, the evidence suggests a lack of provision in rehabilitation services and inequalities in access for this patient group. The aim of this pilot study was to assess patient outcomes following traumatic CMSK injury and compare these against the amount of rehabilitation they received.
Methods: The inclusion criteria were adults (18 years+) with CMSK injuries as defined by their injury severity score and rehabilitation complexity score, who were 18 months post major trauma. All participants were asked to complete a series of outcome measures to determine pain, level of function, employment status and rehabilitation experience. Complications documented in their orthopaedic clinic notes were recorded.
Results: 28 participants were included in the study. 16 participants felt they received the right amount of rehabilitation following discharge from hospital and 12 participants felt they received too little. The latter group reported higher pain levels, worse functional outcomes and the majority had either not returned to work or become unemployed since their accident. This group also had a slightly higher complication rate. There was no difference in age, gender or injury severity between the two groups. The study was unable to determine what the 'right amount' of rehabilitation equates to. There was no difference between the two groups in terms of type of therapy, frequency, length of sessions or duration of the rehabilitation they received.
Conclusion: Patients who receive the appropriate rehabilitation achieve better outcomes and return to work sooner following CMSK injury. The findings of this study suggest that effective rehabilitation is not related to quantity or duration. The participants' highlighted intensity, quality and expertise as the main factors. Further research is required to ascertain how rehabilitation should be best provided for this patient group.
Conflict of Interest: Nothing to disclose

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SPECIALIST SHOULDER AND ELBOW PHYSIOTHERAPY LED ARTHROPLASTY SURVEILLANCE - MAKING A DIFFERENCE

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Background: The number of shoulder arthroplasties is increasing. Follow-up of these patients within our upper limb unit, was variable and recording of outcomes limited. A physiotherapy specialist/arthroplasty practitioner was appointed in 2013 to develop a consistent pathway for follow-up of upper limb arthroplasty patients.
Method: Changes in patient follow-up procedures and data from the physiotherapy upper limb database were reviewed. Patient numbers seen were estimated from clinic lists.
Results: Since introduction of the specialist arthroplasty physiotherapy post a consistent pathway for the follow-up of upper limb arthroplasties has been developed. This involves clinical and radiographic review of all patients at 3 months, 1,2,5 and 10 years as a minimum. All patients have post-operative Oxford Shoulder Scores and Constant Scores recorded at each visit. Pre-operative scores are recorded at the point of listing for arthroplasty. All scoring is done independently, reducing bias. As of January 2018, 420 reverse total shoulder replacements, 135 anatomical total shoulder replacements, 54 stemless total shoulder replacements, 206 Copeland hemiarthroplasties and 189 total elbow replacements are logged on the upper limb database. Approximately 1000 arthroplasty reviews are provided each year, creating greater capacity within the main elective clinics. An enhanced recovery package in accordance with the principles of GIRFT, has been developed in the last 12 months within the specialist physiotherapist role.
Conclusions: The arthroplasty specialist physiotherapy clinic has created a consistent and streamlined service for our arthroplasty patients, allowing ongoing surveillance clinically and radiographically and early identification of any problems. Collection of PROMs and objective data allows local monitoring of our arthroplasty outcomes, within the wider aims of the NJR. The arthroplasty clinic has created improved capacity within the existing elective upper limb clinics.
Conflict of Interest: Nothing to disclose

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PERIPHERAL NERVE SURGERY - OUR PROGRESS OVER THE LAST 100 YEARS
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Over the last century, Peripheral Nerve Surgery in the UK has been led by the Orthopaedic community uniting surgeons from across the Orthopaedic, Plastic and Neurosurgical disciplines in the development of novel surgical techniques for the treatment of a complex, heterogeneous pathology. Recently, peripheral nerve regeneration has flourished as a field of regenerative medicine emerging at the forefront of pharmaceuticals, bio-cellular engineering and surgical science.
This submission examines original historical literature that has realised the growth of peripheral nerve surgery over the past century and the challenges that it affords to clinicians, researchers and patients. Following WWII, the prevalence of traumatic nerve injury reached a critical mass such that patients were referred to specialist centres. This ensured that patients received optimal treatment from specialists in the field and provided a concentration of patients with peripheral nerve injury for further study and investigation. This promoted a paradigm shift in the field of peripheral nerve surgery. During this time period, BOA alumni Sir Herbert Seddon, proposed what is widely considered to be the first ever prognostic classification of nerve injury. Seddon described three types of nerve injury; neurapraxia, axonotmesis and neurotmesis based upon the severity of tissue injury, prognosis and time for functional recovery. Indeed, this system continues to inform prognosis following nerve injury in clinical practice today. This understanding continued to catalyse surgical advancements in the UK under the BOA through Bonney, Birch and others.
The last decade has seen nerve repair and complex nerve injuries crystallise as a specialist surgical and research field in its own right. This has been encapsulated by the publishing of agreed standards. For example, the “blue book” published by BOA and the BOAST5 (a combined statement between Plastics and Orthopaedics) both encompass the historic contributions of Orthopaedic surgeons and scientists synonymous with peripheral nerve repair.
Conflict of Interest: Nothing to disclose

18 Medical Student Submissions

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SPECIALTY TEACHING OF ORTHOPAEDIC SURGERY TO MEDICAL UNDERGRADUATES

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Introduction: Medical undergraduates have a limited period in which to cover an extensive and ever expanding curriculum and appropriate exposure to each specialty is difficult to organise. To detect and quantify deficits in orthopaedic education, British Orthopaedic Association (BOA) guidelines were compared to feedback from students undertaking the new C21 undergraduate curriculum delivered at Cardiff University.
Methods: Year 3 and 4 medical undergraduates were surveyed to investigate whether orthopaedic speciality exposure met their expectations and current guidelines. They were also invited to define an appropriate format for additional resources. After demonstrating that teaching was sub-optimal, a series of near-peer, case-based video tutorials were developed and evaluated by the same student cohort.
Results: 83% of students reported that they were unprepared for their F1 year and felt they had not reached a core level of competency, as defined by BOA guidelines, because of a lack of exposure to orthopaedic surgery and 98% considered additional learning resources to be beneficial. Video based presentation was identified by 80% as an appropriate medium to deliver this material and a series of tutorials was developed as part of this project. Prior to exposure to this learning resource, 80% did not feel confident, with a simple, single-best-answer orthopaedic surgery specialty question. After viewing the video-tutorial, 100% felt more confident with 75% feeling 'confident' or 'very confident' of their knowledge of orthopaedic surgery.
Conclusion: Clinical students at Cardiff University Medical School are exposed to hospital-specific teaching with placements throughout rural and urban Wales. In this context, some students are not provided adequate speciality teaching. There is a demand for accessible teaching, to ensure that the transition from student to doctor is facilitated effectively.
Implications: We have demonstrated that video-tutorials are a potentially useful teaching resource in orthopaedic surgery, providing students with an appropriate knowledge base.
Conflict of Interest: Nothing to disclose

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THE LEARNING CURVES OF A VIRTUAL REALITY HIP ARTHROSCOPY SIMULATOR

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Background: Decreases in trainees' working hours, coupled with evidence of worse outcomes when hip arthroscopies are performed by inexperienced surgeons, mandate the development of additional means of training. Though virtual-reality simulation has been adopted by other surgical specialities, its slow uptake in arthroscopic training is due to a lack of evidence as to its benefits. These benefits can be demonstrated through learning curves associated with simulator training - with practice reflecting measurable increases in validated performance metrics.
Methods: Twenty-five medical students completed seven simulated arthroscopies of a healthy virtual hip joint in the supine position on a previously validated simulator. Twelve targets were visualised within the central compartment; six via the anterior portal, three via the anterolateral portal and three via the posterolateral portal. Eight students proceeded to complete seven probe examinations of a healthy virtual hip joint. Eight targets were probed via the anterolateral portal. Task duration, number of collisions with soft-tissue and bone, and distance travelled by arthroscope were measured by the simulator for every session.
Results: A learning curve was demonstrated by the students, with significant improvements in time taken ($P < 0.01$), number of collisions ($P < 0.01$), collision severity ($P < 0.01$), and efficiency of movement ($P < 0.01$). The largest difference between consecutive sessions was seen between sessions 1 and 2, with sessions thereafter showing only minimal rates of improvement. Similar improvements were found in the probe examination with students showing significant improvements in time taken ($P < 0.01$), number of collisions ($P < 0.01$), collision severity ($P < 0.01$) and distance travelled by arthroscope ($P < 0.01$).
Conclusions: The results of this study demonstrate the learning curves for a previously validated hip arthroscopy simulator, confirming improved performance with repeated use.
Implications: These results support the use of virtual-reality as a potential means of developing basic

hip arthroscopic skills.
Conflict of Interest: Nothing to disclose

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THE VALIDITY OF THE MIRELS SCORE FOR PREDICTING IMPENDING PATHOLOGICAL FRACTURES
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Background: The Mirels score is a common clinical tool used to predict impending pathological fractures, but few studies have attempted to validate it.
Methods: Plain radiographs of 76 patients with confirmed metastatic lower limb disease were scored using Mirels system by the four authors. The pain parameter was determined by electronic patient records rather than observer scoring. Radiographs were anonymised and randomised. Radiographs were rescored 2 weeks after initial scoring. Inter and intra observer reliability was calculated using Cohen's Kappa and the Kappa Fleiss test.
Results: The kappa values for the inter-observer reliability of the parameters of the Mirels score were k = 0.554 for site, k = 0.342 for size, k = 0.443 for lesion, and k = 0.294 for the total score. Kappa values of the site and lesion parameters showed moderate agreement between investigators, and fair agreement between investigators for the size parameter and total score. Kappa values for the intra-observer reliability were k = 0.608 for site, k = 0.579 for size, k = 0.614 for lesion and k = 0.323 for the total score. For site and lesion parameters, there was substantial agreement of the authors when rescoring the radiographs, moderate agreement for the size parameter, and fair agreement for the total score.
Conclusions: Our study has shown fair to moderate agreement between authors when using the Mirels score, and moderate to substantial agreement when authors rescore radiographs. Even the supposed objective parameters of the Mirels score are highly subjective. The Mirels score cannot be considered a reproducible and accurate tool in predicting impending pathological fractures clinically.
Implications: More objective tools are required to accurately predict pathological fractures in the clinical setting.
Conflict of Interest: Nothing to disclose

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TESTING THE FACE VALIDITY OF A VIRTUAL REALITY HIP ARTHROSCOPY SIMULATOR
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Background: Though virtual-reality simulators have been adopted in other specialities, their uptake in orthopaedics is limited by a lack of validation. We therefore sought to demonstrate face validity - verisimilitude and appropriateness of the simulator's psychomotor fidelity - for a virtual-reality hip arthroscopic simulator.
Methods: A total of twenty-five orthopaedic surgeons performed diagnostic supine hip arthroscopies of a healthy virtual-reality joint using a 70˚ arthroscope. Twelve targets were visualised within the central compartment; six via the anterior portal, three via the anterolateral portal and three via the posterolateral portal. This task was followed by a questionnaire regarding the system. This consisted of eight questions addressing the realism of: the simulator's external appearance, the visual experience of simulation, the tactile feel of the instruments, the tactile feel of the bone and soft tissue, the procedure, and the overall experience. Five questions addressed: if the simulator provided a non-threatening learning environment, if it was enjoyable to use, and who would benefit from its use. Each question consisted of a statement stem and 10-point Likert scale. Following similar work, we considered a rating of 7 or above as an acceptable level of realism.
Results: We found the diagnostic hip arthroscopy module to have an acceptable level of realism in all domains apart from the tactile feedback received from the soft tissue. We also found that 92% of participants felt the simulator provided a non-threatening learning environment and 88% enjoyed using the simulator. It was most frequently agreed that the level of trainees who would benefit most from the simulator were registrars and fellows (88%).
Conclusions: This VR hip arthroscopy simulation was demonstrated to have sufficient realism, thus establishing face validity.
Implications: These results support the use of virtual-reality as a potential means of developing basic hip arthroscopic skills.
Conflict of Interest: Nothing to disclose

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ANALYSIS OF THE RELATIONSHIP BETWEEN VITAMIN D LEVELS AND INFECTION IN ORTHOPAEDIC PATIENTS

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Background: One in four of the United Kingdom population suffers from low Vitamin D levels. Vitamin D has immunomodulatory properties but its precise role in Orthopaedic infection is unclear. This study aimed to quantify average Vitamin D levels among Orthopaedic patients and elucidate the relationship between Vitamin D levels and incidence of infection.
Methods: A convenience sample of 164 Orthopaedic patients was taken in our institution, which is a tertiary referral centre for Orthopaedic infection. 25OHD concentration and infection status were recorded, and a Mann-Whitney U test for non-parametric data was performed on the means. The relationship was then validated through a bivariate correlation analysis (Spearman´s rho).
Results: 91 patients had infection. Mean ages were 63.9 years in patients with infection and 61.7 years in patients without infection. Gender split was approximately equal in both groups. There was no significant difference in age or gender between both groups. Mean 25OHD concentration was 41.10nmol/L for patients with infection and 56.04nmol/L for patients without infection (p=0.001). Overall mean 25OHD concentration for Orthopaedic patients was 47.75nmol/L. The correlation coefficient between 25OHD levels and infection incidence was -0.248 (p=0.001).
Conclusion: There was a negative correlation between 25OHD concentration and infection, suggesting that Vitamin D could have a protective effect against infection. Furthermore, patients without infection had a mean of 14.94nmol/L higher concentration of 25OHD than patients with infection. Patients with infection had 25OHD insufficiency, whilst patients without infection had normal 25OHD levels. Future RCTs are needed to determine whether Vitamin D supplementation reduces incidence of infection and leads to improved outcomes in Orthopaedic patients.
Implications: These findings suggest a potential future role for prophylactic Vitamin D supplementation to help combat the Vitamin D insufficiency prevalent in Orthopaedic patients, as well as in the prevention of infection during the hospital stay.
Conflict of Interest: Nothing to disclose

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OPTIMISING THE PRE-OPERATIVE CONSENTING PROCESS FOR ELECTIVE SPINAL PROCEDURES

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Introduction: Valid consent is a fundamental pre-operative requirement in almost all operative instances and in recent years has evolved following the Montgomery ruling. Given the nature of spinal orthopaedic surgery it carries a high risk of litigation; a significant proportion of negligence claims relate to invalid consent. As such, we sought to optimise the consent process at our large orthopaedic department in accordance with the British Association of Spinal Surgeons (BASS) guidelines.
Methods: We implemented BASS guidelines in our consent process for elective spinal orthopaedic surgery. Briefly, this included detailed pre-operative discussion with the patient in clinic, implementation of a ´cooling off´ period and the requirement of patients to sign a BASS consent form in addition to a standard hospital consent form pre-operatively in a following clinic. This was supported by dedicated sessions that educated spinal surgeons about BASS guidance on consent and simple operational measures to facilitate adherence. We designed a simple checklist to score the quality of the consent process; here we present the results of the consent process of the 25 most recent operations pre- and post-intervention.
Results: Following this intervention, 100% of patients were seen pre-operatively to obtain consent (versus 80% pre-intervention), 56% of patients were given a BASS information leaflet and signed a BASS consent form pre-operatively (versus 0% pre-intervention), with 100% documented evidence of discussion of operative risks and benefits in accordance to BASS recommendations (versus 60% pre-intervention). 68% of consenting was completed prior to admission (versus 24% pre-intervention).
Conclusions: Our initiative to improve the quality of consent for spinal surgery has demonstrated encouraging positive findings thus far. Whilst it requires time and effort, it is ensures protection of patients´ rights and the surgical team. Future work will involve continued observation and the identification of strategies to further optimise consent, and ascertaining patient opinion.

Conflict of Interest: Nothing to disclose

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THE ASSOCIATION BETWEEN IMAGING-BASED CHANGE AND KNEE SYMPTOMS 2-YEARS AFTER ACUTE KNEE INJURY

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Background: The association between imaging changes following joint injury and knee symptoms is poorly understood. We compared MRI and X-Ray as diagnostic tools for early indications of structural knee Osteoarthritis (OA) and knee symptoms after substantial knee injury/surgery.
Methods: Data regarding structural outcomes 2 years after traumatic knee injury was acquired from 36 participants of the Knee Injury Cohort at the Kennedy (KICK) Study. This included Hunter et al's OARSI MRI Score and Kellgren and Lawrence (KL) Grades on knee X-Ray (antero-posterior view). Kappa Statistic was calculated to determine the level of agreement between these tools. A composite measure of the Knee Injury and Osteoarthritis Score (KOOS), KOOS4, was obtained to quantify knee symptoms. Mann-Whitney U tests were used to determine associations between diagnostic outcome and KOOS4.
Results: More participants were diagnosed with OA when using KL Grading compared to OARSI Score: 4/70 (5.7%) using OARSI Score, 6/70 (8.6%) using KL3 threshold for OA and 27/70 (38.6%) using KL2 threshold. There was a weak kappa agreement between the radiographic (KL2 threshold) and MRI diagnostic tools (kappa=0.18; p=0.009).
The presence of OA by OARSI Score was associated with a lower/worse KOOS4 (p=0.015). The presence of PFJ OA alone was associated with a lower KOOS compared with an absence of PFJ OA (p=0.029). KL Grading showed no significant association with KOOS4 (p>0.05).
Conclusions: We provide evidence that at 2 years after acute knee injury, PFJ OA is more closely associated with knee symptoms than TFJ OA. KL Grading was more sensitive in detecting early TFJ OA change than OARSI Score, but did not have the same association with symptoms, perhaps as this method did not consider PFJ.
Implications: Our pilot data supports the use of patellofemoral view as well as antero-posterior view in the assessment of early knee OA in such cohorts.
Conflict of Interest: Nothing to disclose

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WHAT CONSTITUTES A "MATERIAL RISK" WHEN CONSENTING IN ACUTE ORTHOPAEDIC TRAUMA ADMISSIONS?

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Background: Following the Supreme Court Judgment in the case *Montgomery v Lanarkshire Health Board,* doctors must now ensure that patients are aware of any "material risks" involved in a proposed treatment, and of reasonable alternatives. Guidance from the General Medical Council states that a person consenting for a procedure should "be suitably trained and qualified" and "be knowledgeable about the proposed procedure and understand the risks involved". This study investigates whether junior doctors meet these criteria by evaluating their knowledge as to what constitutes a "material risk" and therefore warrants mention during the consent process for 4 routine trauma operations: dynamic hip screw, hemiarthroplasty, distal radius open reduction internal fixation (ORIF) and ankle ORIF.
Methods: Data were collected through a written survey. Actual consent forms completed on the orthopaedic wards were prospectively reviewed to determine if individuals were consistent in application of knowledge, and to determine if practice varied among the trainee cohort. Responses were compared with British Orthopaedic Association consent guidelines.
Results: This project demonstrated that 13 trainees who enrolled in the study had variable knowledge of the "material risks" of 4 routine trauma operations (67.8% overall compliance per questionnaire). Performance was not linked to seniority of trainee. Trainees were also not consistent in putting theory into practice, with many procedure-specific "material risks" missing on actual consent forms despite documenting the risks in the questionnaire (56.2% overall compliance in practice, P = 0.003).
Conclusions: Actual documentation on consent forms is poor, and trainees usually neglect to document several risks on each form despite knowing they are "material risks". This suggests trainees are either time pressured or do not consider the documentation of risks on the consent form to be clinically important.

Implications: Use of pre-printed forms where “material risks” are already stated is a possible solution.
Conflict of Interest: Nothing to disclose

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PRIMARY LOWER LIMB JOINT REPLACEMENT AND TRANEXAMIC ACID: AN OBSERVATIONAL COHORT STUDY

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Background: This work aimed to evaluate the efficacy and safety of routine tranexamic acid (TXA) use in elective orthopaedic lower limb joint replacement surgery. The primary aims were to identify if TXA use was associated with lower blood loss, reduced transfusion requirement and shorter post-operative length of hospital stay, with a secondary aim of reporting the coupled economic analysis.
Methods: This retrospective cohort study included all primary hip or knee replacement procedures by a single surgeon over a 6-year period. TXA was introduced during the study period as part of an enhanced recovery after surgery strategy.
Results: Of the 673 procedures, 446 cases (66.3%) received TXA. The median length of stay was 5 days (2-69) and 6 days (3-28) for the TXA and control groups, respectively ($P < .001$). Blood transfusion was required for 28 (6.3%) of the TXA cases versus 40 (17.6%) controls ($P < .001$). Complication rates were similar irrespective of TXA status. At multivariate analysis, TXA was significantly and independently associated with fewer blood transfusions (hazard ratio 0.309, 95% confidence interval: 0.168-0.568, $P < .001$), with a number needed to treat of 9 cases. TXA use was estimated to save between £67.89 and £155.90 per case.
Conclusion: Routine prophylactic TXA administration for elective primary hip and knee replacement reduces the likelihood of postoperative transfusion with a number needed to treat of 9. Cost savings may be as high as £155.90 per case, and no safety concerns were noted.
Implications: This study showed that routine TXA use has an effective role in an enhanced recovery after surgery strategy and is cost effective.
Conflict of Interest: Nothing to disclose

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EFFECTS OF PULSED ELECTROMAGNETIC FIELDS AND SUPER PARAMAGNETIC IRON OXIDE NANOPARTICLES ON OSTEOGENESIS

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Background: Sir Charnley believed that any great advancement in orthopaedics would be through gaining “control of osteogenesis”. Current methods of bone regeneration while satisfactory still have drawbacks. New treatments target molecular level regeneration, aiming to overcome those disadvantages.
In this study, we used pulsed electromagnetic fields (PEMF) and super paramagnetic iron oxide nanoparticles (SPIONs), and measured the osteogenic effects in stem cells in terms of 1. cell proliferation 2. ALP activity and 3. calcium deposition. We hypothesised that PEMF alone would have piezoelectric effects while the combination of SPIONs under PEMF would cause mechanical stimulation.
Methods: Three experimental groups of primary rat mesenchymal stem cells were used (n=3) - group one was placed under PEMF stimulation, group two incubated with SPIONs and placed under PEMF stimulation, while group three acted as the control. All three groups were cultured in osteogenic and normal media. Analysis for cell proliferation was done via Alamar Blue, ALP activity through p-nitrophenol production and calcium deposition via Alizarin Red at days 7, 10 and 14 of culture.
Results: Calcium deposition was the highest in the PEMF group and the lowest in the control group in osteogenic media, with a significant difference found on day 14 (p=0.04). All groups recorded low levels in normal media. For cell proliferation, the highest values were in the PEMF group and the lowest in the SPION with PEMF group, though no statistical significance was found between any of the groups in both media types. ALP activity showed no significant difference between groups.
Conclusion: PEMF stimulation alone appeared to have a positive effect on osteogenesis while SPIONs with PEMF either had no effect or a detrimental effect. This was possibly due to the nanoparticles having a harmful effect. Future work should focus on more accurately targeting cytoskeletal structures involved in cellular tensegrity.
Conflict of Interest: Nothing to disclose

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DOES PREOPERATIVE PAIN CATASTROPHISATION PREDICT PATIENT PERCEIVED OUTCOME AFTER PRIMARY HIP ARTHROPLASTY?

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Background: The objective was to examine the relationship between pre-operative pain catastrophisation and patient reported outcome in patients undergoing primary total hip replacement (THR). This study was important in exploring rationale for patients with sub-optimal outcome measures, despite a technically successful surgical procedure.
Methods: A retrospective study was performed using data from the arthroplasty database at Wrightington Hospital, Wigan. 103 patients were identified who underwent primary THR and had completed a pre-operative Pain Catastrophising Scale (PCS) questionnaire and pre-operative/12-month post-operative Oxford Hip Scores (OHS). Patient demographics and clinical variables such as BMI, ASA grade, duration of surgery and length of stay were recorded. The correlation between PCS and post-operative change in OHS was assessed, including a regression analysis to assess the effect of PCS and other clinical variables on OHS change.
Results: Pre-operative PCS had a weak negative correlation with the post-operative change in the OHS (r=-0.248; P=0.0114). Univariate analyses found BMI, number of comorbidities, length of stay, ASA grade and PCS score to be negatively correlated with change in OHS post-operatively. The multiple linear regression analysis revealed that the only statistically significant predictor of post-operative OHS was the PCS (P=0.0207).
Conclusions: Pre-operative PCS has a negative correlation with the change in OHS following THR, demonstrating that in this cohort, higher pre-operative catastrophisation tends to correspond with poorer improvements in OHS pre- to post-operatively.
Implications: Use of the PCS in the pre-operative assessment may help identify patients who could benefit from clinical psychological support and assist in setting realistic expectations of THR by informing patients of possible outcomes. Further work is needed to determine if cognitive behavioural interventions can improve post-operative outcomes in patients with high pain catastophising tendencies.
Conflict of Interest: Nothing to disclose

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PATIENT-REPORTED FUNCTIONAL OUTCOMES FOLLOWING FRACTURES OF THE TALUS

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Background: Talar fractures are associated with significant morbidity including avascular necrosis (AVN), post-traumatic arthritis, wound complications, and nonunion. Interest in this injury generally focusses on fixation techniques or rates of re-intervention. There is a paucity of information regarding patient reported outcomes.
Aims: The primary aim of this study was to investigate patient-reported functional outcomes following talus fractures. The secondary aims were to characterize current trends in talar fracture patterns, to investigate general health amongst this patient population, and to investigate the incidence of avascular necrosis (AVN) and revision surgery.
Methods: This retrospective study identified 56 talar fractures over an eight-year period. Patient demographics, injury mechanism, comorbidites, and complications were recorded. PROMs included the Olerud-Molander (OMS) and Manchester-Oxford Foot and Ankle (MOXFQ) scores, and the Euroqol-5D score for health-related quality of life.
Results: The mean age of the study cohort was 35.2. 36 (64%) fractures resulted from high energy mechanisms, and 29 (51%) fractures occurred with multiple other orthopaedic injuries. There were five (8.9%) confirmed cases of AVN and one case of nonunion. PROMs data was available for 42 (75%) patients. Increased age at time of injury, open fractures, multiple injuries, and subsequent AVN were associated with worse OMS and MOXFQ ($p < 0.05$) on uni/bivariate analysis. Lower OMS and MOXFQ scores strongly correlated with worse Euroqol overall health and pain scores ($p < 0.05$).
Conclusion: Increasing age, AVN, open fractures, and associated orthopaedic injuries predict poorer functional outcomes following talar fractures. Patients with poorer functional outcomes post-injury are more likely to have a worse perception of their general health.
Implications: There are very few studies assessing functional outcome across all types of talar

fractures and this information is useful in informing patients of possible long-term implications of their injuries. In some cases, significant talar fractures may be treated non-operatively.
Conflict of Interest: Nothing to disclose

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SLEEP DISTURBANCE ON AN ACUTE TRAUMA WARD, THE THIRD HIT OF TRAUMA?
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Background: Inpatient sleep is known to be of poor quality and duration with frequent disruptions altering circadian rhythms and reducing the restorative sleep stages required for recovery.
Abnormal sleep has been strongly associated with chronic pain following elective and trauma surgery. Additionally, sleep disturbance correlates with higher incidents of delirium and longer hospital stays.
Method: A cross-sectional observational study was conducted over a four-month period with 135 trauma patients admitted to trauma and orthopaedic wards at a level 3 trauma centre. Patients completed the Pittsburgh Sleep Quality Index, assessing a range of parameters relating to pre and post admission sleep.
Results: Of the participants provided questionnaires; 80 were males and 55 females, with an average age of 59.5 and average inpatient stay length of 13 days.
Post admission, average sleep duration decreased from 6.89 hours to 5.46, a statistically significant difference of 1.44 hours ($P< 0.0001$). The average sleep latency increased from 24.0 minutes to 39.4 minutes, a significant increase of 15.4 minutes ($p< 0.0001$). Additionally, the mean subjective sleep quality score deteriorated from 'fairly good' to 'fairly bad'.
The impact of noise, other patients, staff interruptions, and pain on post admission sleep were quantified. Although pain was not found to have a significant impact on any of the assessed sleep parameters, all the factors had a moderate impact on patient sleep.
Conclusion: Our results demonstrate patients have significantly altered sleep on inpatient trauma wards. While 'Pain' and 'Staff interruptions' may be unavoidable, other factors that affect sleep are modifiable.
Sleep disturbance delays discharges and increases the occurrence of chronic pain, delirium and other pathologies. Conclusively, sleep deprivation should be more actively managed by ward staff.
Implications: All inpatient wards should utilise simple adjuncts (ear plugs, eye masks etc.) as well as considering protected sleeping times and standardised sleep protocols.
Conflict of Interest: Nothing to disclose

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QUANTIFYING MATERIAL LOSS IN RETRIEVED MAGNETICALLY CONTROLLED INTRAMEDULLARY NAILS
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Background: Severe leg length discrepancy may present with complications such as lower back pain. Distraction osteogenesis of the femur or tibia should be considered to improve quality of life. Intramedullary lengthening devices were developed as an improvement from the Ilizarov method. The PRECICE (MANUFACTURER NAME) nails are the only magnetically-controlled intramedullary nails currently available commercially. Currently, there is no protocol for the retrieval analysis of these implants to assess performance in the body. This study developed a retrieval analysis protocol for PRECICE nails. We aimed to understand material loss from their telescopic component and identify correlations between implant performance and patient factors.
Methods: This study involved 11 retrieved PRECICE nails of three design iterations from 9 consented patients. All nails achieved the targeted leg length and were routinely removed. They were assessed macroscopically and microscopically for material loss. Plain radiographs of the components were taken to assess their internal mechanism. A Talyrond-365 (Taylor Hobson, Leicester, UK), roundness measuring machine (RMM) was used to generate 3-dimensional surface maps of the telescopic component for measurement of material loss.
Results: Visual assessment showed evidence of material loss for all nails. Radiographs revealed intact internal mechanisms in all cases. The RMM showed that the amount of material loss was lowest in the latest PRECICE nail design ($p=0.03$). There was no significant correlation between material loss and the patient factors (duration of the lengthening phase, duration of implantation) included in this study.

Conclusion: This study is the first to investigate the performance of the PRECICE system with a focus on material loss. Despite all the nails achieving the target length without early revisions, we found that the latest design had the best performance.
Implications: Our results are reassuring that the PRECICE system is successful in minimizing the amount of metal debris generated by distraction osteogenesis.
Conflict of Interest: Nothing to disclose

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ANABAS TESTUDINEUS OIL AS A POTENTIAL SUBSTANCE TO REDUCE TNF-α AND IL-6 CYTOKINES IN INFLAMMATORY RESPONSE IN OSTEOARTHRITIS-INDUCED WISTAR RATS

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Background: Osteoarthritis is a disease of joint mobility problem and structural changes of synovial. It has multiple etiologies such as trauma, aging, genetic and metabolic. The inflammatory responses such as TNF-α, IL-1, and IL-6 are increased in osteoarthritis. It will promote inflammatory cascading and induce structural changes of joints. *Anabas testudineus* is an endemic freshwater fish at Musi River, Palembang. The fish contains vitamin D, omega 3 and 6 fatty acids.
Methods: Research design is experimented with posttest-control group. It was conducted at Biotechnology Laboratory Faculty of Medicine Sriwijaya University Palembang. Rats were induced for Osteoarthritis by monoiodoacetic acid intraarticular (100 mg/kgBW). There were 5 groups (normal, negative control, treatment group 1,2 and 3, each group 6 rats).Treatment groups were given *Anabas testudineus* fish oil in various doses: 0,05 ml, 0,1 ml and 0,2 ml. Level of TNF-α and IL-6 were measured by ELISA. Data analysed with SPSS 20.0, p< 0,05, with Student T test analysis.
Results: TNF-α levels in treatment groups 1,2 and 3 (**Δ**: -29,32 pg/mL, -35,87 pg/mL and -56,87 pg/mL) decrease more than those in negative control group (**Δ**: +6,27 pg/mL) (p< 0,05). IL-6 levels in treatment group 1, 2 and 3 (**Δ**: -19,92 pg/mL, -25,61 pg/mL and -66,65 pg/mL) decrease more than those in negative control group (**Δ**: +9,71 pg/mL) (p< 0,05).
Conclusions: *Anabas testudineus* oil has a potential effect to reduce inflammatory response in osteoarthritis-induced wistar rats, with dose dependence.
Implication: Osteoarthritis is a degenerative joint disease which damages the slippery tissue in the joint. Based on this study, the oil of *Anabas testudienus* shows the potential ability to decrease inflammatory response in which it can manage pain and prevent the progressivity of osteoarthritis in high risk population.
Keywords: ***Anabas testudienus Oil - Osteoarthritis - Inflammatory Cytokines***
Conflict of Interest: None declared

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TOO MANY VIEWS AND TOO FEW SHIELDS: ARE CHILDREN BEING OVEREXPOSED TO RADIATION IN THE FOLLOW-UP OF DDH?

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Background: Follow-up for developmental dysplasia of the hip (DDH) aims to identify children requiring further intervention (RFI). Current practice involves regular pelvic radiographs but without evidence-based guidance to determine the number and frequency of views required. There is evidence suggesting variable rates of gonadal shield use. We aimed to determine the frequency of follow-up in DDH, number of radiographs taken and gonadal shield use in identifying those RFI, and evaluate overall exposure to ionising radiation.
Method: A pilot retrospective notes and imaging review of 10 DDH patients who underwent surgical management at a tertiary centre. Radiographs were assessed for the presence and placement of a gonadal shield. Records were evaluated for the number of radiographs taken in years 1, 2, 3-5 and 6-10 of follow-up.
Results: Ten patients (8F:2M) had 155 radiographs taken over an average of 7.2 years of follow-up. The most common view was AP pelvis (112). Only 36.5% of radiographs used a gonadal shield. Three patients were identified as RFI after a mean 4.2 years. On average 5.50 images/patient were taken in year 1 of follow-up (4.67 RFI vs. 5.86 NRFI), 2.10 in year 2 (2.00 RFI vs 1.86 NRFI), 4.33 in years 3-5 (8.00 RFI vs 2.5 NRFI), and 5.75 in years 6-10 (6.50 RFI vs 5.00 NRFI) (all NS). This equated to a mean 10.5mSv of radiation per child.
Conclusions: 63% of radiographs had no gonadal shield going against hospital protocol.

Radiographs were mostly taken in the first year of follow-up, before patients were identified as RFI. There was no correlation between the number of radiographs in the first year and the identification of patients as RFI.
Implications: Efforts should be made to reduce the number of pelvic radiographs in the first year of follow-up and to question the need for gonadal shielding.
Conflict of Interest: Nothing to disclose

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THE POTENTIAL EFFECT OF ANDROGRAPHIS PENICULATA AND SYZYGIUM POLYANTHUM COMBINATION EXTRACT ON GLUT 4 TRANSPORTERS IN SKELETAL MUSCLE OF DIABETIC-INDUCED RATS

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Background: Insulin resistance impairs insulin signal cascading to target cells in order to respons normally or elevates circulating insulin to the final cellular effect, such as translocation of vesicles containing GLUT4 glucose transporters, which is the major mediator of glucose removal from the circulation and a key regulator of whole-body glucose homeostasis. Among several plants, Andrographis peniculata and Syzygium polyanthum were chosen. Those plants have many biochemical compounds such as diterpene, lactone, essential oil, and flavonoids. In this study, a combination was made of Andrographis peniculata and Syzygium polyanthum to determine its effects on treatment of insulin resistance.
Methods: Male Wistar rats (weighted 200-300 grams) were randomized into five groups (6 rats/group).
Group 1: negative group.
Group 2: positive group (metformin 63 mg/kgBW).
Group 3, 4 and 5: treatment with extract combination, each group 250 mg/kgBW, 500 mg/kgBW and 1000 mg/kgBW. Rats were induced by high fat diet-glucocorticoid for insulin resistance. Insulin and GLUT-4 were assayed by ELISA.
Results: Treatment with extract combination (250, 500 and 1000 mg/kgBW) and metformin for 2 weeks shows a sigificant decrease in fasting plasma insulin compared to the negative control rats with a reduction of 11,2%, 33,6%, 20% and 19,4%, respectively. Two-weeks treatment of either extract combination or metformin in diabetic rats, significantly increases GLUT 4 level ($p < 0,05$) with an increased percentage of 6,68%, 15,21%, 12,76% and 1,77%.**Conclusion:** The extract combination of Andrographis peniculata and Syzygium polyanthum shows the ability of improving glucose uptake by increasing levels of GLUT 4 in skeletal muscle.
Implication: Insulin resistance impairs insulin signal cascading to cells in responding insulin. Based on the study, the extract combination of Andrographis peniculata and Syzygium polyanthum shows the ability of managing glucose level and helps to increase the effectiveness of insulin resistance therapy.
Conflict of Interest: Nothing to disclose