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WEB BASED PATIENT EDUCATION AND SUPPORT PROGRAM IN LOWER LIMB ARTHROPLASTY IMPROVES CLINICAL OUTCOMES

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Background: There are significant inconsistencies in the content, timing and format of advice and information delivered to patients undergoing total joint replacement. This ongoing service evaluation assesses a locally developed web-based electronic resource system for patients undergoing TKR/THR surgery against clinical outcomes measured by the GIRFT program.

Methods: Patients are given access to a web-based program, which was developed in collaboration with an industry partner (GoWellHealth), as part of a prospective ongoing service evaluation. The program delivers information in a time-lined format, which includes written, audiovisual and interactive content supporting PROMs collection and consent. Data gathered includes the number of patients registering, their engagement, and results from interactive forms.

Results: Over a period of one year, 771 patients had been registered on the program. Of those registered, 595 (77%) had activated their accounts (79% TKR, 76% THR). The average age was 66 years (range 32 - 94). A total of 330 patients have undergone surgery with patients spending an average of one hour 41 minutes on the system. Overall, 6,303 separate 'hits' were recorded with each person viewing an average of 25 pieces of content (range one to 91). For patients that had surgery the mean length of stay (LOS) and 30-day readmission rate were significantly lower for patients on the program (3.3 days and 3.6% respectively) when compared to patient not on the program (4.5 days and 5.6% respectively) (both $p < 0.05$).

Conclusions: Our web-based electronic education platform allows surgical teams to deliver clear and consistent information to patients, supports data collection including PROMs measurement, and is associated with a reduced LOS and readmission rate.

Implications: Patients will engage with an online system and engagement from both patients and staff is helping to standardise pathways, and most importantly drive improvements in clinical outcomes measured by the GIRFT initiative.

Disclosure: Nothing to disclose

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ASSESSING THE EFFICACY OF EDUCATING PATIENTS ON A DAY-TO-DAY BASIS WITH A SMARTPHONE OR TABLET APP IN THE FIRST 4 WEEKS AFTER TOTAL KNEE REPLACEMENT SURGERY

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Background: In modern medicine patients are often being discharged from the hospital within two to three days of their total knee replacement surgery. In order for patients to be able to manage their new home situation, they are provided with information about pain management, physiotherapy exercises, wound care and everyday things like taking a shower.

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This information is provided to patients by doctors, nurses and physiotherapists. Patients however are merely capable of processing all the information and therefor often leave the hospital with limited knowledge and confidence to take care for themselves. Using an app to offer patients day-to-day education might allow them to be better capable of managing themselves.

Methods: Multicentre (five hospitals) RCT, totalling 202 patients who have had primary total knee replacement surgery. Patients in the intervention group receive, in addition to standard of care, an app that educated them on a day-to-day basis in the first four weeks after discharge from the hospital.

Results: At baseline, two weeks prior to surgery, there were no significant differences in patient characteristics. Patients received questionnaires on a weekly base to see differences in self-management (primary outcome), pain management, performing physio therapy exercises and perceived involvement by the hospital in the patients' recovery.

From week one onwards, patients in the app group had significantly higher scores for self-management and perceived involvement. From week two onwards, significant differences in favour of the app group were also present in pain management and physio therapy exercises. Finally, after four weeks, patients in the app group had a significantly higher KOOS PS score, as well as a higher EQ5D score.

Conclusions and implications: Providing patients with an app to offer them day-to-day education and coaching after total knee replacement surgery, seems to be a valuable addition to the standard of care.

Disclosure: The first author, Thomas Timmers, is co-founder of the company that delivered the app used as an intervention in this study.

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THE MASS KNEE CLINIC - CONCEPT AND RESULTS OF A NEW 18-WEEK CARE MODEL

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Background: The Mass Knee Clinic is an example of clinician-driven change in delivering safe, effective and high-quality healthcare. It highlights how a pragmatic approach to streamlining the patient pathway can help a department meet its rising demands more appropriately. It is an innovative, cost-friendly, and highly-effective clinic introduced into our Trust in 2017. This new care model differs from the conventional outpatient model by multidisciplinary processing of a large volume of referrals in a single day (up to 200) in a one-stop multiple-consultant-led clinic. Every patient benefits from consultant-led review and same-day MDT review of complex cases. Pre-assessment, scheduling of surgery, and physiotherapy appointments on the day reduces the need for further appointments and lowers patient-anxiety about treatment.

Methods: We present the results of prospectively collected data on wait times to clinic, time to treatment, outsourcing, and number of appointments per patient one year after the initiation of the clinic. This data was compared to a cohort of data one year previously.

Results: Time to be seen in clinic from general practitioner referral was reduced from 15 weeks on average to 11 weeks (statically significant ($p = 0.00512$)). Time to treatment was dramatically reduced from on average 35 weeks to 16 weeks ($p < 0.0001$). Number of appointments per patient fell from 4.57 to 2.41 (statistically significant $p < 0.00001$).

Conclusions: The new Mass Knee Clinic with focused consultant-led care and a multi-disciplinary approach has led to dramatic reductions in patient wait-times and cost-savings. Although the financial penalty for breaches has been removed, by removing the dependence on outsourcing initiatives, the trust gains financially.

Short RTT times also adds to a trust's reputational value. We believe this new care model can be the 18-week passport to success. It can easily be adapted to accommodate all hospital specialities and revolutionise the patient journey.

Disclosure: Nothing to disclose.

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SURGICAL PERFORMANCE ANXIETY IN TRAUMA AND ORTHOPAEDIC SURGEONS

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Background: Situational anxiety and stress can exist amongst orthopaedic surgeons at all levels. Operating is comparable to elite sport, when looking at skill level, both in dexterity and mentality. This study uses a modified version of the validated sports competition anxiety test (SCAT), to make it relevant to operating, rather than to sport, in order to evaluate peri-operative stress and anxiety in orthopaedic surgeons.

Methods: The SCAT questionnaire was sent to trainees across three UK deaneries via email. A score of < 17 suggests low levels of anxiety, 17 to 24 suggests medium levels of anxiety and >24 suggest high levels of anxiety. Data was anonymised except from training grade and sex.

Results: Ninety-seven of 253 (38.3%) responded to the survey. Responders were grouped into four categories: core surgical trainees (CST), ST3-5 trainees, ST6-8 trainees and consultants. The mean SCAT score in CST was 16.8 (n = 18, range 12 - 23), ST3-5 was 18.3 (n = 43, range 12 - 28), ST6-8 was 16.8 (n = 25, range 11 - 24) and consultant was 16.4 (n= 11, range 11 - 28). Gender subdivisions showed females averaging higher SCAT scores in all groups. 43.3% (n = 42) of responders “often” worry about making mistakes, 22.7% (n = 22) “often” worry about not performing well and 16.5% (n = 16) “often” feel nervous before operating.

Conclusions: This survey highlights that surgical performance anxiety exists amongst orthopaedic surgeons. Although the mean results only show the ST3-5 group to suffer from “medium levels of anxiety”, five responders scored “high levels of anxiety” including two consultant-level surgeons. This suggests experience does not necessarily reduce anxiety. Stress and anxiety are known causes of surgical mistakes and “burnout” amongst doctors. This is a significant issue in the current climate which needs to be highlighted in order to protect the safety of patients and surgeons. We suggest this study is taken forward as a nationwide survey to evaluate further.

Disclosure: Nothing to disclose.

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IMPROVING ORTHOPAEDIC SERVICE USING AN ELECTRONIC PREOPERATIVE ASSESSMENT (EPOA) PLATFORM: A MULTIFACETED APPROACH TO DIGITAL TRANSFORMATION

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Background: Preoperative assessment (POA) is fundamental in delivering safe perioperative care. We aimed to evaluate patient education, quality of assessment, complications and cost effectiveness of a digital pre-assessment service in Orthopaedics.

Methods: From April 2018 to January 2019 all orthopaedic patients where pre-assessed using the LifeBox ePOA system with embedded AV education media. Knowledge retention of TKR and THR surgery, anaesthesia and consent were assessed between the traditional and the new ePOA service. One hundred and ten consecutive patients had their procedures classified on ASA grade, complexity of surgery and were prospectively observed for complications. The cost of the ePOA service was evaluated.

Results: Knowledge testing showed an overall increase in patient knowledge of 25% in surgical procedure, 51% in anaesthesia knowledge and 53% in consent knowledge, when comparing AV media to traditional paper handouts. Cumulative knowledge score of 13.45 [SD 3.78] in the LifeBox cohort was better than 8.50 [SD 1.85] of traditional group, $p = 0.0002$. Variance was greatest in consent and anaesthetic knowledge (one-way-ANOVA $p < 0.1$).

Of the 110 patients who underwent LifeBox pre-assessment, mean age was 68.8 years (SD 7.33) with an average ASA of 1.99 (SD 0.58). Two developed minor post-operative complications and one on-the-day cancellation due to low preoperative haemoglobin. The ePOA preoperative PROMS completion rate was 98% compared with 62% using the current online service. Cost of traditional-POA service was £36.26 vs £15.13 per ePOA patient saving of £94K per 5,000 patients, whilst digital transformation of service led to a separate £73K saving.

Conclusions: The five-year NHS plan calls for safe innovative technology. The LifeBox ePOA system provided accurate assessment through unique task driven actions, whilst patient understanding of surgery, anaesthesia and consent significantly improved. There was no significant increase in complication rates and LifeBox could result in significant savings for the NHS.

Disclosure: Nothing to disclose.

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PEALS OF WISDOM (POW) - AN INNOVATIVE DAILY TEACHING IN TRAUMA & ORTHOPAEDICS

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Aims: To improve trainee satisfaction and outcomes through short, formalised, daily teaching sessions within the Torbay Hospital Trauma and Orthopaedic Department.

Background: In 2015, the General Medical Council (GMC) National Training Survey (NTS) highlighted that bleep-free teaching within the Trauma and Orthopaedic department was inadequate. With increasing demand, service provision took precedent over teaching, and as a result, education suffered. The daily trauma meeting was thought to be an optimal time for teaching, when most juniors are present and unlikely to be distracted by bleeps. We introduced short, frequent, teaching sessions (Pearls of Wisdom, POWs) following the idea of TED talks.

Methods: From 2015, POW presentations were introduced to the Trauma Meeting. They are 10 minutes long and are presented by a different trainee daily. Topics are broad; from basic orthopaedics to complex medical issues and journal articles. Since their introduction, over 700 POW talks have been delivered. The teaching changes were evaluated by the GMC survey and a qualitative survey to assess impact on trainee satisfaction and outcomes.

Results: Survey distributed to 72 staff members within orthopaedic department, with 58 responses.

- Results from GMC NTS: satisfaction with local teaching improved from 46.8 in 2016 to 84.8 in 2018
- Seventy-nine percent report POW presentations are very good or excellent
- Eighty-two percent report POW presentations cover an excellent range of topics
- Sixty-eight percent trainees report POW presentations were very good or excellent help at improving presentation skills.

Conclusions: POW presentations are an innovative and effective method of introducing teaching into the daily routine of the Trauma and Orthopaedic department. They have improved departmental education by delivering teaching across a broad range of topics. POWs give trainees opportunity to improve their presenting skills, and their introduction has contributed to improved teaching satisfaction.

Disclosure: Nothing to disclose.

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REHAB-YOUR-OWN-KNEE: IMPROVING THE OUTCOME OF KNEE INJURIES USING A TIMELY, PATIENT-CENTRED, LOW COST HOME EXERCISE PROGRAM

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Background: Historically, acute knee injuries have been treated with immobilisation, functional bracing, and physiotherapy, but scientific literature is sparse.

Methods: Prospectively, over a three-month period, new patients attending an acute knee injury clinic were treated using a simple four step home exercise program designed by the author (straight-leg raise; knee bends; hamstring stretch; wall squat). Technical demonstration of the exercises, emphasising the benefits of early rehabilitation, was aimed at optimising patient participation and compliance. Data was recorded at time zero (first clinic visit) and after four weeks of home exercise program (second clinic visit).

Results: Thirty consecutive patients were entered into the study, over a three-month period July to October 2018. Eighty percent had a traumatic knee joint effusion, were unable to bear weight through the injured leg, unable to walk without aid, and unable to perform the wall-squat test. At time zero, the average range of knee-joint motion (ROM) was 75.5 degrees (70 +/- 20 degrees). After four weeks the average ROM was 128.5 degrees (130 +/- 10 degrees). The average increase ROM was 60 +/- 20 degrees, which constitutes an 85% (60/70) increase in ROM using the HEP for four weeks. All patients (100%) were able to bear full weight through the injured limb, walk unaided, perform the wall-squat test and achieve full knee extension. In a control group (knee brace immobilisation without HEP) the average ROM after four weeks was unchanged at 78 degrees.

Conclusions: Functional improvements are clearly identified in all patients within a short four-week time period. In the treatment of acute knee Injuries, the home exercise program is: effective (functional recovery), immediate, efficient (four weeks), patient-centred, safe, and low-cost (saving £66 per patient per physiotherapy session).

Disclosure: Nothing to disclose.

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ARTIFICIAL INTELLIGENCE IN ORTHOPAEDICS - TRENDS, OPPORTUNITIES, CHALLENGES AND THREATS

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Background: Artificial intelligence (AI) is expected to revolutionise medical care in the coming decade. Orthopaedic surgeons need to understand this technology in order to exploit it fully in their practice. We reviewed the current state of the artificial intelligence applications relevant for the orthopaedic surgeons, their future trends, potential uses and possible threats.

Methods: Deep learning is a subdomain of artificial intelligence that uses neural networks inspired by interconnected neurons of brain. These algorithms learn the patterns from large datasets with multiple variables without using explicit instructions.

Image recognising algorithms have huge potential to serve as screening, prioritising and double-checking tools for image based orthopaedic diagnostics such as x-rays, CT, MRI etc. and given enough number of samples they outperform the human counterparts. Early studies showed excellent promise in detecting hip fractures and wrist fractures from the x-rays and grading osteoarthritis from the MRI scans. Deep learning algorithms successfully performed target segmentation of tumour in the CT scans for directed radiotherapy. Deep learning can be further exploited to simultaneously analyse multitude of data types such as patient records, joint registry data, PROMs and follow-up radiographs and predict several patient outcomes including the failure of the implants.

Results: Reinforcement learning in AI involves the software agents learning form a task by maximising the reward. This is being successfully employed in robotic surgery by extracting the surgical skills of the experts. Combining this to deep learning based vision and other inputs, AI can be a game changer in the conception of "cognitive robots".

Conclusions: Developing large annotated data sets is the major challenge in developing these tools which need extensive involvement of the orthopaedic community and leadership from the data holding authorities. The common public fears of artificial intelligence are unfounded however data protection and sensible usage of these tools need robust ethical frameworks.

Disclosure: Authors are founders of IMERA.AI which develop artificial intelligence based tools.

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COMPARISON OF INTERFACES FOR THE MANIPULATION OF 3-DIMENSIONAL FRACTURE MODELS IN A VIRTUAL ENVIRONMENT

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Background: The robotic-assisted fracture system (RAFS) allows percutaneous manipulation of distal femoral fractures and can carry out real-time reductions in a cadaveric model using navigation based on pre-procedural CT scans. The RAFS system may be controlled with a variety of interface systems.

Methods: Three interface systems were presented to 19 orthopaedic surgeons of varying grades: mouse and keyboard (M+K), Xbox controller, and Leap Motion (non-touch hand gesture recognition). Each surgeon was asked to perform reduction manoeuvres in a virtual environment and their performance was recorded with regards to time taken to reduction and accuracy of reduction (rotational and translational) as well as their qualitative views on the interfaces.

Results: When comparing the Leap to the M+K, there was a significantly lower rotational error and time of reduction ($P < 0.01$). The time to reduction on the Xbox was also significantly lower that the M+K, but there was no significant difference in reduction accuracy. There was no difference in the time to reduction or the reduction accuracy when the Xbox was compared to the Leap Motion. The consultants had a lower overall time to reduction on two of three interfaces and this was significantly different ($p < 0.05$) when compared to trainees (core and specialist), but no difference in reduction accuracy. Most surgeons expressed a preference for the Xbox controller due to their familiarity but would consider the Leap if the learning curve was eliminated.

Conclusions: The Leap and Xbox outperformed the traditional M+K and were preferred by surgeons. The Leap may be of more utility if surgeons are allowed to overcome the "learning curve".

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Implications: With the increasing use of navigation and robotic assistance in all forms of surgery, this study presents novel data on surgeons' interaction with a virtual fracture model for implementation in future devices.

Disclosure: Nothing to disclose.