Health Education England

Evidence Brief: Robotics

Contents

Produced by the HEE Knowledge Management team Evidence Briefs offer a quick overview of the published reports, research, and evidence on a workforce-related topic.

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- Complete Evidence Brief list – link for HEE staff
- Complete Evidence Brief list – link for External staff

Key publications – the big picture

Building our future digital workforce
Source: Health Education England
Key to our work is establishing a workforce planning model for our health informatics workforce – those who work in data, digital, technology and knowledge - so we can understand both our current workforce, the demand for our future workforce and to develop a comprehensive plan to bridge the gaps.

Digitally-enabled primary and outpatient care will go mainstream across the NHS
Source: NHS Long Term Plan
Digital technology will provide convenient ways for patients to access advice and care. For patients and staff the starting point is interoperability of data and systems, as set out in Chapter Five. Then, building on progress already made on digitising appointments and prescriptions, a digital NHS 'front door' through the NHS App will provide advice, check symptoms and connect people with healthcare professionals – including through telephone and video consultations.

The Digital, Data and Technology Playbook
Source: UK Government
This document sets out key policies and guidance for how digital projects and programmes are assessed, procured and delivered.

Shaping the future of digital technology in health and social care
Source: The King's Fund
The potential of digital technology to transform the health and social care system has still not been realised, though the Covid-19 pandemic has caused a rapid shift towards the remote delivery of care through online technologies.

The Topol Review
Source: Health Education England
The Topol Review outlined recommendations to ensure the NHS is the world leader in using digital technologies to benefit patients. It will involve implementing technologies such as genomics, digital medicine, artificial intelligence and robotics at a faster pace and on a greater scale than anywhere else in the world.

Case Studies

Robotic oncologic colorectal surgery with a new robotic platform (CMR Versius): hope or hype? A preliminary experience from a full-robotic case-series
Publication date: 2022
The present series confirms the feasibility of full-robotic colorectal resections while highlighting the strengths and the limitations of the CMR Versius platform in colorectal surgery. New devices will need more clinical development to be comparable to the current standard.

The first robotic transanal minimally invasive surgery in Ireland: a case-based review
Publication date: 2021
Robotic platforms offer improved ergonomics that are valuable in operative fields with limited space. Robotic TAMIS represents an exciting new development that may be more versatile than traditional TAMIS. In this review, we describe the first case of robotic TAMIS performed in our country and a review of current literature on the technique.

Transoral robotic surgery for the benefit of patients with head and neck cancer of unknown primary: our experience at St George's University Hospital, London
Publication date: 2020
Transoral robotic base of tongue mucosectomy (or lingual tonsillectomy) is a promising technique that offers a high yield of positive identification for the primary tumour. It is well tolerated with minimal associated morbidity. Our findings are comparable with those in the current literature.

HEE Star

More resources and tools are available by searching for 'technology' in the HEE Star

HEE National Data Programme

HEE staff can look at the National Data Warehouse (NDL) SharePoint site to find out more about datasets and Tableau products.

Published Peer Reviewed Research

Surgery: implementation and effectiveness

Comparative assessment of current robotic-assisted systems in primary total knee arthroplasty
Publication date: 2023
This review compares characteristics and performance of five currently available systems, focusing on the information and feedback each system provides to the surgeon, what the systems allow the surgeon to modify during the operation, and how each system then aids execution of the surgical plan.

Robotics and cybersurgery in ophthalmology: a current perspective
Publication date: 2023
The cybernetic revolution in surgery supported by artificial intelligence could enable surgeons to perform surgeries remotely. Tele-surgery can provide urgent medical services and allows highly skilled doctors to operate globally.

Robotic Assisted Total Knee Arthroplasty
Publication date: 2022
The term "robotic surgery" refers to the use of programmable devices to perform a wide variety of surgical tasks. These are not intended to replace the surgeon but rather to provide assistance. This activity reviews the role of the interprofessional team in evaluation and treatment using robotic assistance to perform knee arthroplasty.

Establishing and integrating a transoral robotic surgery programme into routine oncological management of head and neck cancer – a UK perspective
Publication date: 2022
Implementation of a new transoral robotic surgery service has led to: the development of a dedicated transoral robotic surgery patient care protocol, the performance of progressively more complex procedures, the inclusion of transoral robotic surgery training and the establishment of several research projects.

Comparison of FreeHand® robot-assisted with human-assisted laparoscopic fundoplication
Publication date: 2022
Robot-assisted fundoplication is safe, feasible and reduces operative time. Furthermore, this negates need of assistant.

Mean operative time for robot-assisted fundoplication was 36 min less than for conventional fundoplication. Advantages also include fewer adverse events, shorter length of stay and less post-operative clinic visits.

Uptake and outcomes of robotic gynaecological surgery in England (2006-2018): an account of Hospital Episodes Statistics (HES)
Publication date: 2022
Robotic gynaecological procedures are increasingly being used in the English NHS, predominantly for hysterectomy, although in small proportions (2.6% in the most recent study year). There was wide geographical variation in robotic uptake across England and overall, outcomes were comparable to those reported in other countries.

Cost-effectiveness of Robotic-Assisted Prostatectomy in the UK—Are We Doing Enough?
Publication date: 2022
To drive value, the question we should be asking is not robotic vs open. It is time to accept robotic prostatectomy as a fixture in a urologist's armamentarium. Instead, we should ask ourselves how we can continue to innovate and transform health care delivery.

An observational study of volume-outcome effects for robot-assisted radical prostatectomy in England
Publication date: 2022
There is evidence of a volume-outcome relationship for RARP in England and minimising low-volume RARP will improve patient outcomes. Nevertheless, the observed effect size was relatively modest, and stakeholders should be realistic when evaluating the likely impact of further centralisation at a population level.

Cost-effectiveness of Robotic-Assisted Radical Prostatectomy for Localized Prostate Cancer in the UK
Publication date: 2022
These findings suggest that in the UK, RARP has an ICER lower than the willingness-to-pay threshold and thus is likely a cost-effective surgical treatment option for patients with localized prostate cancer compared with ORP and LRP. The results were mainly driven by the lower risk of BCR for RARP.

Using a modified Delphi process to explore international surgeon-reported benefits of robotic-assisted surgery to perform abdominal rectopexy
Publication date: 2022
A panel of surgeons who had published on RAS view that it positively improves performance of rectopexy in terms of technical skills, improved dexterity and visualisation and ergonomics.

Transoral robotic surgery in Ireland: the beginning
Publication date: 2022
The aim of this study was to report our cases of the newly introduced TORS, particularly its role in identifying primary of unknown origin and the potential implications for patients. A literature review and our early experience should begin to debunk some of the criticisms of TORS including setup times and cost.

Early Economic Analysis of Robotic-Assisted Unicondylar Knee Arthroplasty May Be Cost Effective in Patients with End-Stage Osteoarthritis
Publication date: 2022
Cost-effectiveness analyses demonstrated that the use of r-UKA is an effective alternative to t-UKA in patients with single-compartment knee osteoarthritis. While this study could benefit from longer follow-up clinical studies to illustrate the benefits of

r-UKAs beyond the current 2 years time horizon, r-UKAs remained cost-effective, even after investigating several different assumptions.

Cost-utility analysis of robotic-assisted radical cystectomy for bladder cancer compared to open radical cystectomy in the United Kingdom
Publication date: 2022
As the resultant ICER did not fall below the £20,000/QALY threshold, our study did not provide a definitive recommendation for RARC for bladder cancer. Negative values for the NMB at the lower threshold indicated the intervention was not feasible from a cost perspective. At the upper threshold of £30,000/QALY, this situation was reversed. The intervention became cost-effective.

Neurovascular structure-adjacent frozen-section examination robotic-assisted radical prostatectomy: outcomes from 500 consecutive cases in the UK
Publication date: 2022
The purpose is to report the United Kingdom's largest single-centre experience of robotically assisted laparoscopic radical prostatectomies (RALP), using the neurovascular structure-adjacent frozen-section (NeuroSAFE) technique. We describe the utilisation and outcomes of this technique.

Starting CT-guided robotic interventional oncology at a UK centre
Publication date: 2022
Achieving highly accurate robotic biopsy is feasible within a very short time span. Further work is required to maximise the potential of robotic guidance in tumour ablation procedures, which is likely due to higher complexity giving a longer learning curve.

Experiences of a “COVID protected” robotic surgical centre for colorectal and urological cancer in the COVID-19 pandemic
Publication date: 2021
Robotic surgery can be undertaken in “COVID protected” units within acute hospitals in a safe way that mitigates the increased risk of undergoing major surgery in the current pandemic. Some benefits were seen such as reduced length of stay for colorectal patients that may be associated with having a dedicated unit for elective robotic surgical services.

Comparison of Retzius-sparing and conventional robot-assisted laparoscopic radical prostatectomy regarding continence and sexual function: an updated meta-analysis
Publication date: 2021
This meta-analysis found that RS-RARP had better postoperative continence recovery than C-RARP, while sexual function recovery rates were not significantly different. There were also no significant differences in operation time, intraoperative blood loss, length of stay, positive margin rate and complications.

Primary transoral robotic surgery +/- adjuvant therapy for oropharyngeal squamous cell carcinoma—A large observational single-centre series from the United Kingdom
Publication date: 2021
Whilst TORS has become a common practice in the management of OPSCC in the UK, these are the first reported oncological outcomes. For selected patients, TORS with or without adjuvant therapy is an appropriate treatment modality.

Robotic rectal cancer surgery with single side-docking technique: experience of a tertiary care university hospital
Publication date: 2021
This is a prospective, observational study. The procedures were undertaken in a Teaching hospital in United Kingdom, for 4

years period (11/2014-02/2019). The SI Davinci system was used. Technical and oncological outcomes were assessed.

Patterns of adoption of robotic radical prostatectomy in the United States and England
Publication date: 2021
Robotic surgery has become the standard approach for radical proctectomy in the United States and England, showing decreased length of stay and in 30-day readmissions compared to open surgery. Adoption rates and specialization differ across countries, likely a product of differences in cost-containment efforts.

Accuracy and Efficiency of Fusion Robotics™ Versus Mazor-X™ in Single-Level Lumbar Pedicle Screw Placement
Publication date: 2021
Based on our findings, the Fusion RoboticsTM platform had a significantly shorter procedure workflow duration while maintaining the same accuracy as the most commonly used robotic platform (Mazor-XTM). This is the first study to directly compare different spine surgery robotic systems.

Robotic Sacroiliac Fixation Technique for Triangular Titanium Implant in Adult Degenerative Scoliosis Surgery: 2-Dimensional Operative Video
Publication date: 2021
Here, we present a technique for placing triangular titanium sacroiliac implants (iFuse BedrockTM; SI-BONE Inc, Santa Clara, California) alongside S2AI screws using a robotic platform (Mazor X; Medtronic Sofamor Danek, Medtronic Inc, Dublin, Ireland). Navigated robotics allows reduction in human error with implant placement, and potentially decreased operative time/fluoroscopy.

Clinical application of robotic orthopedic surgery: a bibliometric study
Publication date: 2021
The journal with the most related and influential publications on robotic orthopedic surgery was the Journal of Arthroplasty. Fourteen types of robots were used, with the majority applied in knee and spinal surgery. MAKO was the most widely used robot in hip and knee surgery and Mazor in spinal surgery. Most studies were small sample populations of low-quality in this field.

Uptake and accessibility of surgical robotics in England
Publication date: 2020
National accessibility to robotic services and case volumes are variable and does not represent good value for the NHS. A national robotic surgery registry could improve the quality of robotic surgery and is needed to dynamically assess national provision of this technology.

Robotic Colostomy Takedown in a Patient with Extensive Ventral Hernias and Adhesive Disease
Publication date: 2020
Robot-assisted colostomy takedown and anastomosis of the descending colon to rectum were successfully performed. Although there is a paucity of literature examining this technique within gynecologic surgery, the literature on general surgery has supported laparoscopic Hartmann's reversal and has demonstrated improved rates of postoperative complications and incisional hernia and reduced duration of hospitalization. Minimally invasive technique is a feasible alternative to laparotomy for gynecologic oncology patients who undergo colostomy, as long as the patients are recurrence free.

Transition from open and laparoscopic to robotic pancreaticoduodenectomy in a UK tertiary referral hepatobiliary

and pancreatic centre - Early experience of robotic pancreaticoduodenectomy
Publication date: 2020
Pancreaticoduodenectomy is performed using an open technique (OPD) as the gold standard. An increase in those performed laparoscopically (LPD) and robotically (RPD) are now reported. We compared the short-term outcomes of RPD cases with LPD and OPD. RPD is safe to perform with comparable outcomes to LPD and OPD. Further evidence is provided that a randomised controlled trial for PD techniques is required.

Effective implementation and adaptation of structured robotic colorectal programme in a busy tertiary unit
Publication date: 2020
Implementation and integration of robotic colorectal surgery is safe and effective in a busy tertiary center through a structured training programme with comparable short-term survival and oncological outcomes during learning curve.

Threshold for Computer- and Robot-Assisted Knee and Hip Replacements in the English National Health Service
Publication date: 2020
At a cost-effectiveness threshold of £20 000 per additional quality-adjusted life-year (QALY), the threshold price for a 5% improvement in post-primary unrevised quality of life (approximately equivalent to an additional two points in postoperative Oxford Knee Score [OKS]/Oxford Hip Score [OHS]) would be £10 000. The threshold price for a 50% reduction in the risk of revision would be £1000 per procedure.

Establishing a "cold" elective unit for robotic colorectal and urological cancer surgery and regional vascular surgery following the initial COVID-19 surge
Publication date: 2020
The “cold” unit became operational on the 12th May 2020. 34 patients underwent surgery in the unit during the first three weeks. There was no evidence of coronavirus transmission. Three patients required readmission to the main hospital. Patient feedback was excellent with 94% of patients who completed the trust inpatient survey rating their care as “excellent”.

Robotic radical hysterectomy for stage 1B1 cervical cancer: A case series of survival outcomes from a leading UK cancer centre
Publication date: 2020
Ninety women had a robotic hysterectomy. Five-year follow-up data were available for 30%. The disease-free survival at 5 years was 89.6%. Overall survival at 3 and 5 years for death from any cause was 96.1% and 91.4%, respectively. The overall 5-year survival for death from disease only was 92.8%. Overall survival by tumour size alone showed that women with tumours less than 2 cm had a 98.3% 5-year survival compared to 83.4% for tumour size greater than 2 cm. Irrespective of tumour size, those that had no evidence of lymphovascular space invasion had a 100% 5-year survival.

A prospective double-blinded randomised control trial comparing robotic arm-assisted functionally aligned total knee arthroplasty versus robotic arm-assisted mechanically aligned total knee arthroplasty
Publication date: 2020
This is the first study to describe the use of robotic technology to achieve FA TKA, and the only existing clinical trial comparing robotic MA TKA versus robotic FA TKA. The findings of this study will enable an improved understanding of the optimal alignment technique in TKA for achieving high-levels of patient satisfaction, improving functional outcomes, increasing implant

survivorship, improving cost-effectiveness, and reducing complications.

Factors supporting and constraining the implementation of robot-assisted surgery: a realist interview study
Publication date: 2019
We captured accounts of how robot-assisted surgery has been introduced into a range of hospitals. Using a realist approach, we were also able to capture perceptions of the factors that support and constrain the integration of robot-assisted surgery into routine practice. We have translated these into recommendations that can inform future implementations of robot-assisted surgery.

Social Care: implementation and effectiveness

Strategies to Implement Pet Robots in Long-Term Care Facilities for Dementia Care: A Modified Delphi Study
Publication date: 2023
This study identified the most relevant strategies that can be used by technology developers, care providers, and researchers to implement pet robots in long-term care facilities for dementia care. Further development, specification, and testing in real-world settings are needed.

Socially assistive robots (SARs) in health and social care: Acceptance and cultural factors. Results from an exploratory international online survey
Publication date: 2023
Most respondents were positive about the benefits of SARs, and similar concerns about their use were expressed both by those who strongly accepted the idea that they had benefits and those who did not. Some evidence was found to suggest that cultural factors were related to rejecting the idea that SARs had benefits.

How do care service managers and workers perceive care robot adoption in elderly care facilities?
Publication date: 2023
Core-periphery analysis revealed an apparent contrast between the two groups in their fundamental elements and structures: namely, the dominant social representation of care service managers was negative; that of care workers was positive. The difference in roles and responsibilities between the two groups yielded contrasting perceptions and attitudes toward care robots.

Home-care robots - Attitudes and perceptions among older people, carers and care professionals in Ireland: A questionnaire study
Publication date: 2022
There is generally positive interest in home-care robots among Irish respondents. Findings strongly suggest that the interest is generated partly by great need among people who deliver care. Should such robots be developed, then careful consideration must be given to user-centred design, ethical aspects and national care policy.

The CARESSES Randomised Controlled Trial: Exploring the Health-Related Impact of Culturally Competent Artificial Intelligence Embedded Into Socially Assistive Robots and Tested in Older Adult Care Homes
Publication date: 2022
This study brings new evidence which cautiously supports the value of culturally competent socially assistive robots in improving the psychological wellbeing of older adults residing in care settings.

The Perceptions of People with Dementia and Key Stakeholders Regarding the Use and Impact of the Social Robot MARIO
Publication date: 2020
The findings revealed that despite challenges in relation to voice recognition and the practicalities of conducting research involving robots in real-life settings, most participants were positive about MARIO. Through the robot's user-led design and personalized applications, MARIO provided a point of interest, social activities, and cognitive engagement increased. However, some formal carers and managers voiced concern that robots might replace care staff.

Companion robots for older people: importance of user-centred design demonstrated through observations and focus groups comparing preferences of older people and roboticists in South West England
Publication date: 2019
The observed misalignment of opinion between end users and developers on desirable design features of companion robots demonstrates the need for user-centred design during development. We found significant differences in design preferences between older people and roboticists. Older people desired soft, furry, interactive animals that were familiar and realistic, while unfamiliar forms were perceived as infantilising. By contrast, most roboticists eschewed familiar and realistic designs, thinking unfamiliar forms better suited older people. Older people also expressed desire for features not seen as important by developers.

What are the preferred characteristics of a service robot for the elderly? A multi-country focus group study with older adults and caregivers
Publication date: 2019
Overall, potential users expected the service robot to be customizable in order to match the users' needs and preferences. Also, high expectations concerning its functioning and behavior were expressed, which sometimes could even be compared to the qualities of a human being. This emphasizes the complexity of service robot development for older adults, and highlights the need for a personalized and flexible solution. One size does not fit all, and specific attention should be paid to the development of the robot's social behavior and skills beyond a mere functional support for the person.

Critical Care: implementation and effectiveness

Use of Robots in Critical Care: Systematic Review Year: 2022
Overall, our results show that robotic use in critical care settings is a beneficial, effective, and well-received intervention that delivers significant benefits to patients, staff, and hospitals.

Pharmacology and anaesthesia: implementation and effectiveness

Automatic dispensing cabinets and governance of controlled drugs: an exploratory study in an intensive care unit
Publication date: 2023
To explore whether and how storing CDs in an automated dispensing cabinet (ADC) in a children's hospital intensive care unit (ICU) contributes to the effectiveness and efficiency of CD governance.

First-in-Human Robot-Assisted Subretinal Drug Delivery Under Local Anesthesia
Publication date: 2022
This first-in-human study demonstrates the feasibility and safety of high-precision robot-assisted subretinal drug delivery as part

of the surgical management of submacular hemorrhage, simulating its potential future application in gene or cell therapy.

Rehabilitation: implementation and effectiveness

Design of a portable ankle robot with reductive-burden layout and self-adjustable posture
Publication date: 2023
In this paper, a portable ankle robot with the design consideration of reducing the burden exerted on wearers and self-adjustable posture is presented. Results indicated the effectiveness of the system in generating adaptive reference joint trajectories and making the subject well track them.

Use of Robotic Devices for Gait Training in Patients Diagnosed with Multiple Sclerosis: Current State of the Art Year: 2022
Robot-assisted gait training is considered just as effective as conventional rehabilitation training for improving gait in people with MS. The aim of this study was to investigate the available scientific evidence on the benefits of the use of robotics in the physiotherapy treatment in people with MS. A systematic review of randomized controlled trials was performed.

A Therapeutic Approach Using the Combined Application of Virtual Reality with Robotics for the Treatment of Patients with Spinal Cord Injury: A Systematic Review Year: 2022
Combined rehabilitation may be a valuable approach to improve motor function in SCI patients. Nonetheless, further research is necessary, with a larger patient sample and a longer duration.

Upper limb soft robotic wearable devices: a systematic review
Year: 2022
Although few devices can be considered ready to reach the market, exosuits show very high potential for the assistance of daily activities. Clinical trials exploiting shared evaluation metrics are needed to assess the effectiveness of upper limb exosuits on target users.

Robot-assisted distal training improves upper limb dexterity and function after stroke: a systematic review and meta-regression
Year: 2022
Robot-assisted distal training has a significant effect on motor function, dexterity and spasticity of the upper extremity, compared to conventional therapy.

Robot-assisted rehabilitation for total knee or hip replacement surgery patients: A systematic review and meta-analysis Year: 2022
The result of this systematic review and meta-analysis suggest that RAR may be an effective treatment in TKR and THR patients. However, high-quality studies are needed to verify the long-term effect on their recovery.

Economic evaluation of robot-assisted training versus an enhanced upper limb therapy programme or usual care for patients with moderate or severe upper limb functional limitation due to stroke: results from the RATULS randomised controlled trial
Publication date: 2021
The cost-effectiveness analysis suggested that neither robot-assisted training nor EULT, as delivered in this trial, were likely to be cost-effective at any of the cost per QALY thresholds considered.

Clinical effects of assisted robotic gait training in walking distance, speed, and functionality are maintained over the long term in individuals with cerebral palsy: a systematic review and meta-analysis Year: 2021
Evidence from the present study demonstrated that RAGT can be an important intervention to improve gait parameters and

functionality, in children with CP, that are maintained over long-term.

Robotic assistive and rehabilitation devices leading to motor recovery in upper limb: a systematic review Year: 2021
It was concluded that with a good strategy and treatment plan; appropriate and regular use of these robotic rehabilitation and assistive devices do lead to improvements in current conditions of most of the subjects and prolonged use may lead to motor recovery.

Exoskeleton versus end-effector robot-assisted therapy for finger-hand motor recovery in stroke survivors: systematic review and meta-analysis Year: 2021
Despite the limited number of studies included, exoskeleton robotic devices might be a better option than end-effector devices in the treatment of fingers motor impairment in stroke patients.

Two Hundred Twenty-Six Consecutive Deep Brain Stimulation Electrodes Placed Using an “Asleep” Technique and the Neuro|MateTM Robot for the Treatment of Movement Disorders
Publication date: 2020
This report details our institution’s method for DBS lead placement in patients under general anaesthesia using anatomical targeting without microelectrode recordings or intraoperative test stimulation for the treatment of movement disorders. This is the largest reported dataset of accuracy results in DBS surgery performed asleep. This novel robot-assisted operative technique results in sub-millimeter accuracy in DBS electrode placement.

Robot-assisted training compared with an enhanced upper limb therapy programme and with usual care for upper limb functional limitation after stroke: the RATULS three-group RCT
Publication date: 2020
Robot-assisted training did not improve upper limb function after stroke when compared with an enhanced upper limb therapy programme, or usual care.

Educating the workforce and role development

Utilising an accelerated Delphi process to develop consensus on the requirement and components of a pre-procedural core robotic surgery curriculum
Publication date: 2023
This study aimed to provide educational stakeholders guidance on a pre-procedural core robotic surgery curriculum (PPCRC) from the perspective of the end user; the surgical trainee.

Workforce planning: a trainee’s perspective
Publication date: 2022
Use of robotic surgery in the NHS has also been increasing. However, implementation is variable across the country, and there is a need to create opportunities to enhance skill acquisition for both consultants and trainees. Adjustments in the surgical curriculum will therefore be necessary to facilitate the required exposure in order to nurture the future robotic surgical workforce.

Technology in care systems: Displacing, reshaping, reinstating or degrading roles?
Publication date: 2022
Through an exploration of the literature on robotics and empirical studies of telecare and mainstream ‘smart’ digital technology use in UK adult social care, this paper examines how these technologies are generating new forms of work and their implications for job quality, arguing the tendency to prioritise technology results in the creation ‘machine babysitters’ and ‘fauxtomatons’.

The Role of the Robotics Coordinator: Improving Efficiency in a Robotic Surgery Program
Publication date: 2022
This article discusses the role of a robotics program coordinator and how this coordinator used strategic management tools and techniques, including lean principles, to streamline processes, maximize efficiency, and decrease operational variances across the robotic surgery program at this institution.

Hopes and fears regarding care robots: Content analysis of newspapers in East Asia and Western Europe, 2001–2020
Publication date: 2022
Positive and negative narratives were teased out, alongside other key prominent themes identified, such as Japan as the land of robots, the pandemic, and the impact of robots on the economy. Furthermore, recent articles began to address the social and relational impact of care robots, while providing concrete examples of improvements in the quality of life for users.

The Atlantic divide: contrasting surgical robotics training in the USA, UK and Ireland
Publication date: 2022
Fifty UK trainees (86.21%) and 22 Irish trainees (91.67%) compared to 12 US trainees (35.29%) do not think they have had adequate robotics training ($p < 0.00001$). Surgical trainees in the USA have had significantly more exposure to training in robotic surgery than their UK and Irish counterparts.

The role of the bedside assistant in robot-assisted surgery: A critical synthesis
Publication date: 2022
The role, functions and skills of the bedside assistant in robot-assisted surgery vary across contexts. These were analysed and critically synthetised to produce several keys to the success of bedside assistants in robot-assisted surgery in the context of the United Kingdom and of its national regulations.

Robotic simulation experience in undergraduate medical education: a perspective
Publication date: 2020
As final-year medical students, our exposure to simulated robotic surgery gave us a greater appreciation of the associated challenges, such as depth perception, a lack of haptic feedback, and movement economy. Compared to other techniques, robotic simulators provide a greater range of performance measures, allowing one to better adapt to the learning curve. We believe that increasing the exposure of medical students to robotics will be beneficial, allowing future doctors to better inform patients and inspire the next generation of robotic surgeons.

Virtually Competent: A Comparative Analysis of Virtual Reality and Dry-Lab Robotic Simulation Training
Publication date: 2020
Both VR and dry-lab simulation were effective in improving robotic surgical skill but were not equal. For more advanced skill training, dry-lab training was found to be superior to VR simulation. Dry-lab training offers specific benefits to robotic surgical training and should remain a principal component of the simulation curriculum.

Surgery in the 2020s: Implications of advancing technology for patients and the workforce
Publication date: 2020
As the surgical workforce, surgical techniques and patient expectations change, the Royal College of Surgeons of England is actively engaged in taking forward the recommendations of its Future of Surgery Commission. Here

the commission's chair articulates the implications for smaller hospitals and the need for achieving interoperability and safe sharing of patient data across different systems, so enabling immediate access to patients' records across healthcare organisations; extension of regulation to surgical care practitioners, reflecting the recent decision to regulate physician associates and physician assistants; introducing a UK-wide registry of surgical devices, with tracking for implantable devices; implementing a robotics strategy to help the NHS plan and purchase new surgical robotics, as well as monitor their use and the effect on outcomes; and investing in genomic medicine and artificial intelligence for diagnostics, and in stem-cell research for treatment.

Workforce and service user perspective

The-state-of-the-art of soft robotics to assist mobility: a review of physiotherapist and patient identified limitations of current lower-limb exoskeletons and the potential soft-robotic solutions
Publication date: 2023
This review aimed to explore the literature on physiotherapist and patient perspectives of the longer-standing, and therefore greater evidenced, rigid exoskeleton limitations. It then offered potential solutions to these limitations, including soft robotics, from an engineering standpoint.

The Opportunities and Challenges of Robotic Surgery: A Surgeon and Robotic Company Perspective
Publication date: 2023
As an increasing number of specialties have begun to adopt robotic surgery (RS), its prevalence within the NHS is continually rising. This study aims to establish stakeholders' opinions on the opportunities and challenges of the widespread adoption of RS.

Current issues and future considerations for the wider implementation of robotic-assisted surgery: a qualitative study
Publication date: 2023
The results revealed a largely positive attitude towards the introduction of RAS technology and an expectation of continued rapid expansion. Areas perceived to be particularly pertinent and requiring ongoing attention were also highlighted, including the need to achieve improved quality control, expertise quantification and training issues and the need to educate the public. Issues of centralisation, service organisation and equity of access were also emphasised.

Attitudes and access of Irish general surgery trainees to robotic surgical training
Publication date: 2022
Irish general surgery trainees perceive robotic-assisted surgery to be highly relevant to their future practice. There is an unmet need to provide additional training in the skillset.

How do team experience and relationships shape new divisions of labour in robot-assisted surgery? A realist investigation
Publication date: 2021
Safe and successful surgery depends on effective teamwork between professional groups, each playing their part in a complex division of labour. This article reports the first empirical examination of how introduction of robot-assisted surgery changes the division of labour within surgical teams and impacts teamwork and patient safety.

Patient Satisfaction and Regret After Robot-assisted Radical Prostatectomy: A Decision Regret Analysis
Publication date: 2021
Higher regret was seen in one third of patients and was associated with worse disease-specific quality of life, sexual and erectile function measures. To minimize regret,

collaborative and detailed discussion should take place pre-operatively when counselling patients about RARP.

‘It's all about patient safety’: an ethnographic study of how pharmacy staff construct medicines safety in the context of polypharmacy
Publication date: 2021
Automation, robotics and technologies are positioned as key players in the elimination of medication error in the face of escalating demand, despite limited research illuminating how these innovations are taken up, used and adapted in practice. We explore how ‘safety’ is constructed and accomplished in community pharmacies in the context of polypharmacy.

Patient, carer, and staff perceptions of robotics in motor rehabilitation: a systematic review and qualitative meta-synthesis
Publication date: 2021
Despite experiencing technological and logistic challenges, participants found robotic devices acceptable, useful and beneficial (physically, psychologically, and socially), as well as fun and interesting. Having supportive relationships with significant others and positive therapeutic relationships with healthcare staff were considered the foundation for successful rehabilitation and recovery.

Surgical trainee experience and opinion of robotic surgery in surgical training and vision for the future: a snapshot study of pan-specialty surgical trainees
Publication date: 2021
Current surgical trainees desire greater access to robotic surgery in surgical training. Robotic surgery is developing an increasing role in current surgical practice and it is important that it is introduced in a timely, evidence-based fashion to surgical trainees at an appropriate stage of training.

*Help accessing articles or papers

Where a report/ journal article or resource is freely available the link has been provided. If an NHS OpenAthens account is required this has been indicated. It has also been highlighted if only the abstract is available. If you do not have an OpenAthens account you can self-register here.

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