Evidence Brief: Robotics

Contents

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

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Key publications – the big picture

Tech to save time: how the NHS can realise the benefits
The Health Foundation, February 2025
Robotic-assisted surgery may initially cost staff time as they undertake training, ensure it is properly integrated into practice and maintain the technology. But over time, increased surgical quality could shorten recovery time, reduce length of stay and reduce readmissions.

See also: Which technologies offer the biggest opportunities to save time in the NHS?

A helping hand: robotics in surgery
Reform, February 2025
Hospitals worldwide are increasingly adopting robotic assisted surgery for a range of different procedures, but their use still remains niche in England and significant obstacles remain in ensuring they are scaled across the system. This short briefing paper explores the advantages of robotic assisted surgery and steps that can be taken to ensure their rollout.

The Digital, Data and Technology Playbook
UK Government, June 2023
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
The King's Fund, April 2021
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.

Building our future digital workforce
Health Education England (no date)
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
NHS Long Term Plan, 2019
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 Topol Review: Preparing the healthcare workforce to deliver the digital future
Health Education England, February 2019
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

Perception on Robotic Surgery
Journal of Surgery and Research 7 (4), September 2024
Despite the increasing prevalence of RS, studies conducted in the UK and Saudi Arabia indicate that many patients may not be fully aware of these advancements. Our study aims to investigate the awareness, perception, knowledge, and attitudes towards RS among attendees and staff at University Hospitals Coventry and Warwickshire (UHCW). This research seeks to inform future educational initiatives and policy decisions.

Robotic surgery to be expanded to help more patients
Barts Health NHS Trust, April 2024
The additional investment will bring the benefits of robotic surgery to even more patients, not just across East London, but patients from surrounding areas of London who will be eligible for referral. In some cases, patients may be referred nationally.

UK's first robotic surgery training programme for surgical trainees launched in the North East
The Newcastle upon Tyne Hospitals NHS Foundation Trust, June 2023
More than 30 surgical trainees in urology, colorectal, HPB and upper GI from trusts across the North East are enrolled in the programme designed to create early exposure to robotic surgery sooner in a surgeon's career.

Robotic Process Automation to improve manual recruitment processes
NHS England, October 2022
Robotic Process Automation (RPA) uses software to complete repetitive, rules-based tasks such as administration to optimise the productivity of the existing NHS workforce and improve staff morale by enhancing human value and reducing task inundation, whilst also providing near-zero error rates, increased data quality, and reduced operational costs. The technology also enables data-driven decision making, improving patient and staff experience, clinical outcomes, and regulatory compliance.

Robotic oncologic colorectal surgery with a new robotic platform (CMR Versius): hope or hype? A preliminary experience from a full-robotic case-series
Techniques in Coloproctology, May 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
Irish Journal of Medical Science, May 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
Annals of the Royal College of Surgeons of England, July 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.

The Star for workforce redesign

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

National Data Programme

Workforce, Training and Education 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

Advances in Robotic Surgery: A Review of New Surgical Platforms
Electronics 13 (23), September 2024
The emergence of new robotic surgery platforms marks a significant evolution in the field, introducing innovations such as modular designs, haptic feedback, and enhanced portability. However, widespread adoption remains hindered by high costs, limited access in resource-constrained regions, and the lack of standardized training frameworks. Addressing these challenges through collaboration among the industry, regulators, and healthcare providers is essential.

Artificial intelligence: revolutionizing robotic surgery: review
Annals of Medicine & Surgery 86 (9), September 2024
By enhancing precision, efficiency, and accessibility, AI has the potential to improve patient outcomes, reduce complications, and democratize access to specialized surgical expertise. However, addressing challenges related to cost, data quality, ethical considerations, and regulatory hurdles is crucial for the responsible and widespread adoption of this transformative technology. As AI continues to evolve, the future of robotic surgery is poised to become even more remarkable, paving the way for a new era of personalized, precise, and patient-centered surgical care.

Efficiency and productivity gains of robotic surgery: The case of the English National Health Service
Health Economics 33 (8), May 2024
This paper examines the effect of new medical technology (robotic surgery) on efficiency gains and productivity changes for surgical treatment in patients with prostate cancer from the perspective of a public health sector organization. In particular, we consider three interrelated surgical technologies within the English National Health System: robotic, laparoscopic and open radical prostatectomy.

Clinical applications of artificial intelligence in robotic surgery
Journal of Robotic Surgery 18 (102), March 2024
AI also shows promise for the generation and delivery of highly specialized intraoperative surgical feedback for training surgeons. Although the adoption and integration of AI show promise in robotic surgery, it raises important, complex ethical questions. Frameworks for thinking through ethical dilemmas raised by AI are outlined in this review. AI enhancements in robotic surgery is some of the most groundbreaking research happening today, and the studies outlined in this review represent some of the most exciting innovations in recent years.

Advancements in robotic surgery: innovations, challenges and future prospects Abstract only*
Journal of Robotic Surgery 18 (28), January 2024
Implementation of advanced materials and designs along with the integration of imaging and visualization technologies have enhanced surgical accuracy and made robots safer and more adaptable to various procedures. However, the substantial cost of robotic systems, their maintenance, the size of the systems and proper surgeon training pose major challenges.

Robotic Revolution in Surgery: Diverse Applications Across Specialties and Future Prospects Review Article
Cureus 16 (1), January 2024
The integration of robotic-assisted surgery has highlighted the need for the development of specialized training programs. Surgeons require new skills, such as hand-eye coordination and three dimensional visualization and interpretation, to operate robotic platforms effectively. Training programs and courses play a crucial role in providing surgeons with the necessary knowledge and skills through lectures, simulation-based training, and hands-on experience. Ongoing education is essential to ensure surgeons stay updated with advancements in the field and optimize patient care. These training programs are vital in equipping surgeons with the expertise needed to navigate the complexities of robotic-assisted surgery.

Robotic Surgery: A Comprehensive Review of the Literature and Current Trends
Cureus 15 (7), July 2023
The use of specialized robotic platforms during surgery improves precision and flexibility and minimizes complications such as infections, pain, and blood loss. Over the years, RS has evolved and found applications beyond urology, including neurosurgery, orthopedics, gynecology, ENT, cardiac surgery, and general surgery. The advancement of robotic technology has led to the development of various models and features, such as 3D imaging, touchscreen displays, real-time navigation feedback, and haptic feedback, among others. There are also limitations and challenges to its widespread adoption such as financial barriers as well as the need for further studies and evidence in certain surgical subspecialties.

Comparative assessment of current robotic-assisted systems in primary total knee arthroplasty
Bone & Joint Open 4 (1), January 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 Abstract only*
Journal of Robotic Surgery, 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.

Establishing and integrating a transoral robotic surgery programme into routine oncological management of head and neck cancer – a UK perspective
The Journal of Laryngology & Otology 136 (12), December 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.

Using a modified Delphi process to explore international surgeon-reported benefits of robotic-assisted surgery to perform abdominal rectopexy
Techniques in Coloproctology 26, December 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.

Robotic Surgery: A Narrative Review
Cureus 14 (9), September 2022
In a quickly growing and dynamic environment of research and development, the goal of this review is to explore the present and emerging surgical robotic technologies. Future progress in robotics will focus primarily on more durable haptic systems that would provide tactile and kinesthetic input, miniaturisation and micro-robotics, better visual feedback with higher fidelity detail and magnification, and autonomous robots. It is recommended to develop a structured training course with benchmarks for success and evidence-based training strategies.

Cost-utility analysis of robotic-assisted radical cystectomy for bladder cancer compared to open radical cystectomy in the United Kingdom
PLoS ONE 17 (9), September 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.

Starting CT-guided robotic interventional oncology at a UK centre
British Journal of Radiology 95 (1134), June 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.

Cost-effectiveness of Robotic-Assisted Prostatectomy in the UK – Are We Doing Enough?
JAMA Network Open 5 (4), April 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.

Cost-effectiveness of Robotic-Assisted Radical Prostatectomy for Localized Prostate Cancer in the UK
JAMA Network Open 5 (4), April 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.

Comparison of Retzius-sparing and conventional robot-assisted laparoscopic radical prostatectomy regarding continence and sexual function: an updated meta-analysis
Prostate Cancer and Prostatic Diseases 25, March 2022
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.

Transoral robotic surgery in Ireland: the beginning
Irish Journal of Medical Science 191 (1), February 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.

An observational study of volume-outcome effects for robot-assisted radical prostatectomy in England
BJU International 129 (1), January 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.

Early Economic Analysis of Robotic-Assisted Unicondylar Knee Arthroplasty May Be Cost Effective in Patients with End-Stage Osteoarthritis
Journal of Knee Surgery 35 (1), January 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.

Neurovascular structure-adjacent frozen-section examination robotic-assisted radical prostatectomy: outcomes from 500 consecutive cases in the UK
Journal of Robotic Surgery 16, 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.

Robotic Assisted Total Knee Arthroplasty
StatPearls, 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.

A systematic review of robotic surgery: From supervised paradigms to fully autonomous robotic approaches Abstract only*
International Journal of Medical Robotics and Computer Assisted Surgery 18 (2), December 2021
Although automated surgical systems remain conceptual, several research groups have developed supervised autonomous robotic surgical systems with increasing consideration for ethico-legal issues for automation. Automation paves the way for precision surgery and improved safety and opens new possibilities for deploying more robust artificial intelligence models, better imaging modalities and robotics to improve clinical outcomes.

Patterns of adoption of robotic radical prostatectomy in the United States and England
Health Services Research 56 (3), December 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.

Robotic Sacroiliac Fixation Technique for Triangular Titanium Implant in Adult Degenerative Scoliosis Surgery: 2-Dimensional Operative Video
Operative Neurosurgery 21(6), December 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
BMC Musculoskeletal Disorders 22, November 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.

Primary transoral robotic surgery +/- adjuvant therapy for oropharyngeal squamous cell carcinoma – A large observational single-centre series from the United Kingdom
Clinical Otolaryngology 46 (5), September 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.

Accuracy and Efficiency of Fusion Robotics™ Versus Mazor-X™ in Single-Level Lumbar Pedicle Screw Placement
Cureus 13 (6), June 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.

Uptake and outcomes of robotic gynaecological surgery in England (2006-2018): an account of Hospital Episodes Statistics (HES) Abstract only*
Journal of Robotic Surgery 16, February 2021
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.

Experiences of a “COVID protected” robotic surgical centre for colorectal and urological cancer in the COVID-19 pandemic
Journal of Robotic Surgery, February 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.

Robotic rectal cancer surgery with single side-docking technique: experience of a tertiary care university hospital
Journal of Robotic Surgery, February 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.

Uptake and accessibility of surgical robotics in England
The International Journal of Medical Robotics and Computer Assisted Surgery 17 (1), February 2021
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.

Transition from open and laparoscopic to robotic pancreaticoduodenectomy in a UK tertiary referral hepatobiliary and pancreatic centre - Early experience of robotic pancreaticoduodenectomy
HPB 22 (11), November 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
Journal of Robotic Surgery 15, November 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.

Establishing a "cold" elective unit for robotic colorectal and urological cancer surgery and regional vascular surgery following the initial COVID-19 surge
British Journal of Surgery 107 (11), October 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 Colostomy Takedown in a Patient with Extensive Ventral Hernias and Adhesive Disease
Journal of Minimally Invasive Gynecology 27 (6), September–October 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.

Comparison of FreeHand® robot-assisted with human-assisted laparoscopic fundoplication
Minimally Invasive Therapy & Allied Technologies 31 (1), June 2020
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.

Threshold for Computer- and Robot-Assisted Knee and Hip Replacements in the English National Health Service
Value in Health 23 (6), June 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.

Robotic radical hysterectomy for stage 1B1 cervical cancer: A case series of survival outcomes from a leading UK cancer centre
The International Journal of Medical Robotics and Computer Assisted Surgery 16 (4), August 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
Trials 21 (194), February 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
BMJ Open 9 (6), May 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

Development of an ethical framework for the use of social robots in the care of individuals with major neurocognitive disorders: a qualitative study
BMC Geriatrics 25 (260), April 2025
The use of social robots should be guided by the same ethical guidelines followed in all therapeutic interventions; however, healthcare professionals express a need for special training and preparation for SRIs in geriatric settings.

Strategies to Implement Pet Robots in Long-Term Care Facilities for Dementia Care: A Modified Delphi Study
Journal of the American Medical Directors Association 24 (1), January 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
Japan Journal of Nursing Science 20 (2), April 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?
Technological Forecasting and Social Change 187, February 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
Health & Social Care in the Community 30 (3), May 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
International Journal of Social Robotics 14, January 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
International Journal of Environmental Research and Public Health 17 (22), November 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
BMJ Open 9 (9), September 2029
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
Assistive Technology 31 (3), December 2017
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

Clinicians' Perceptions and Potential Applications of Robotics for Task Automation in Critical Care: Qualitative Study
Journal of Medical Internet Research 27, March 2025
This qualitative study aimed to explore ICU clinicians' perceptions of robotic technology and to identify the types of tasks that might benefit from robotic assistance. Clinicians largely view robots as supportive tools rather than substitutes for human expertise. However, concerns persist regarding privacy, patient safety, and the loss of human touch, particularly for tasks requiring high-level clinical decision-making.

Advances in the Application of AI Robots in Critical Care: Scoping Review
Journal of Medical Internet Research 26, May 2024
This review highlights the potential of AI robots to transform ICU care by improving patient treatment, support, and rehabilitation processes. However, it also recognizes the ethical complexities and operational challenges that come with their implementation,

offering possible solutions for future development and optimization.

Use of Robots in Critical Care: Systematic Review
Journal of Medical Internet Research 24 (5), May 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
European Journal of Hospital Pharmacy 30 (1), 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
American Journal of Ophthalmology 237, May 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
Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science 237 (14), January 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.

Robot-assisted rehabilitation for total knee or hip replacement surgery patients: A systematic review and meta-analysis
Medicine 101 (40), October 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.

Upper limb soft robotic wearable devices: a systematic review
Journal of NeuroEngineering and Rehabilitation 19 (87), August 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.

A Therapeutic Approach Using the Combined Application of Virtual Reality with Robotics for the Treatment of Patients with Spinal Cord Injury: A Systematic Review
International Journal of Environmental Research and Public Health 19 (4), July 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.

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
Disability and Rehabilitation 44, June 2022
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.

Use of Robotic Devices for Gait Training in Patients Diagnosed with Multiple Sclerosis: Current State of the Art
Sensors 22 (7), March 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.

Robot-assisted distal training improves upper limb dexterity and function after stroke: a systematic review and meta-regression
Neurological Sciences 43, January 2022
Robot-assisted distal training has a significant effect on motor function, dexterity and spasticity of the upper extremity, compared to conventional therapy.

Exoskeleton versus end-effector robot-assisted therapy for finger-hand motor recovery in stroke survivors: systematic review and meta-analysis
Topics in Stroke Rehabilitation 29 (8), August 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.

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
BMJ Open 11, May 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.

Robotic assistive and rehabilitation devices leading to motor recovery in upper limb: a systematic review
Disability and Rehabilitation: Assistive Technology 18 (5), April 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.

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
Operative Neurosurgery 19 (5), November 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
Health Technology Assessment 24 (54), November 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

Utilisation of robots in nursing practice: an umbrella review
BMC Nursing 24 (247), March 2025
Evidence shows that there is a perception that robots can support nurses in their work. However, there is not enough experiential evidence from nurses who work with robots in practice to support this. There are also perceived challenges that are of concern to nurses, particularly in relation to liability, ethical dilemmas and patient safety.

Developing, delivering, and evaluating an online course on socially assistive robots in culturally competent and compassionate healthcare: A sequential multiphase, mixed-method study
Digital Health, October 2024
The IENE 10 project pioneeringly addressed the training needs of health and social care professionals in the era of AI social robots. The collaborative and sequentially phased design proved useful in the integration of a care ethics model. This work reflects the holistic approach needed for preparing professionals for the complexities of contemporary healthcare.

A systematic review of collaborative robots for nurses: where are we now, and where is the evidence?
Frontiers in Robotics and AI 11, June 2024
This review highlights the need for further published studies on cobotic development and evaluation. A larger body of evidence is needed to recognize current limitations and pragmatic opportunities to assist nurses and patients using state-of-the-art robotics. Human-centered design can assist in discovering the right opportunities for cobotic assistance.

Is the robotic revolution stunting surgical skills?
Surgery Open Science 19, June 2024
This perspective piece aims to examine the impact of the growing utilization of robotic platforms in general and minimally invasive surgery on surgical trainee experience, skill level, and comfort in performing general surgical and minimally invasive procedures following completion of training.

Views about perceived training needs of health care professionals in relation to socially assistive robots: an international online survey
Contemporary Nurse 59 (4-5), August 2023
Training about socially assistive robots should be basic, thorough, spanning from practical aspects to ethical issues, and catering for the healthcare professionals' cultural values. Furthermore, training should be based on the principles of person-centred care, which has significantly emerged as a cross-cultural training exigency. Investment in research, education and training in this area should be a priority on the agenda of governmental, local and international organisations.

Utilising an accelerated Delphi process to develop consensus on the requirement and components of a pre-procedural core robotic surgery curriculum
Journal of Robotic Surgery 17, February 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.

The Atlantic divide: contrasting surgical robotics training in the USA, UK and Ireland
Journal of Robotic Surgery 17, February 2023
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.

Workforce planning: a trainee's perspective
Bulletin of the Royal College of Surgeons of England 104 (1), August 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.

The role of the bedside assistant in robot-assisted surgery: A critical synthesis
Journal of Perioperative Practice 32 (9), May 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.

The Role of the Robotics Coordinator: Improving Efficiency in a Robotic Surgery Program
The Official Voice of Perioperative Nursing 115 (3), March 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
Frontiers in Rehabilitation Sciences 3, 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.

Technology in care systems: Displacing, reshaping, reinstating or degrading roles?
New Technology, Work and Employment, 37 (1), June 2021
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’.

Robotic simulation experience in undergraduate medical education: a perspective
Journal of Robotic Surgery 14, March 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
Journal of Endourology 34 (3), March 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
Future Healthcare Journal 7 (1), February 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 general public's perception of robotic surgery – A scoping review Abstract only*
The Surgeon 23 (2), April 2025
Robotic surgery is perceived as a risky procedure by the general public. They have limited understanding of the modality, and low rates of acceptance to undergo it fearing greater complications.

Human–robot interactions and experiences of staff and service robots in aged care
Scientific Reports 15 (2495), January 2025
Findings suggest service robots benefit from more participatory or co-design methods to reflect end-users’ needs better. Considering service robots as social robots both in the design

and use of these robots for aged care will help overcome adoption, acceptance, and implementation challenges.

Public Perceptions of Artificial Intelligence and Robotics in Medicine
Journal of Endourology 34(10), October 2024
Most participants express confidence in AI providing medical diagnoses, sometimes even over human physicians. Participants generally express concern with surgical AI, but they mistakenly believe that it is already being performed. As AI applications increase in medical practice, health care providers should be cognizant of the potential amount of misinformation and sensitivity that patients have to how such technology is represented.

Exploring Acceptance Factors for Welfare Technology among Nurses in Non-Clinical Care for Older Adults: A Scoping Review
Health & Social Care in the Community 1, August 2024
This scoping study contributes to a better understanding of the broad spectrum of the acceptance factors for WT in the care of older adults in non-clinical settings. Five main groups of acceptance factors emerged: individual, organisational, patient-related, technological, and social influence. Patient-centeredness was a core theme, emphasising the importance of aligning WT with the varied capabilities, mindsets, and well-being of older adults. The review also illuminated the distinction between pre- and post-use acceptance factors and the evolving nature of attitudes, benefits, and drawbacks as nurses transition from anticipation to experience.

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
Journal of NeuroEngineering and Rehabilitation 20 (18), January 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.

Current issues and future considerations for the wider implementation of robotic-assisted surgery: a qualitative study
BMJ Open 12 (11), November 2022
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
Surgery Open Science 9, July 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.

The Opportunities and Challenges of Robotic Surgery: A Surgeon and Robotic Company Perspective
British Journal of Surgery 109 (S1), March 2022
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.

Patient, carer, and staff perceptions of robotics in motor rehabilitation: a systematic review and qualitative meta-synthesis
Journal of NeuroEngineering and Rehabilitation 18 (181), December 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
Journal of Robotic Surgery 14, November 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.

Caregivers' use of robots and their effect on work environment – a scoping review
Journal of Technology in Human Services 40 (3), November 2021
The analysis shows that the use of robots can affect both the physical and the psychosocial work environment, in positive as well as in negative ways. Robots are used in care settings to reduce physical and mental demands of the caregivers, but they can, in fact, increase caregivers' workload. Thus, the review indicates that robots can improve the quality of work, but that they seldom work as a shortcut to increased efficiency or time effectiveness.

How do team experience and relationships shape new divisions of labour in robot-assisted surgery? A realist investigation
Health 25 (2), March 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
Urology 149, March 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
BMJ Open 11 (2), February 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.

Competency Frameworks

Robotic-assisted surgery: A pathway to the future
Royal College of Surgeons of England, July 2023
This document discusses some of the challenges and promises of robotic surgery and the potential future application of robotics. It makes recommendations for sound governance practices that can lead to the safe adoption and expansion of robotic surgery in UK hospitals and proposes a structured pathway for established surgeons who want to transition to RAS. Finally, it aims to identify the relevant roles and responsibilities of key stakeholders for ensuring safe and sustainable independent practice in robotic surgery.