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NEW TECHNOLOGIES FOR FUTURE OF SURGERY IN IRELAND

RCSI Working Group Report 2024

SEPTEMBER 2024

NEW TECHNOLOGIES FOR FUTURE OF SURGERY IN IRELAND
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PRESIDENTS INTRODUCTION

The adoption and integration of new technology is a core characteristic of surgery and surgeons have always innovated their practice and skills by leveraging the advantages that new technologies can bring. However, the pace of new technologies coming into surgery has never been faster and RCSI needs to continue to lead and support our surgeons to ensure that they are competent and proficient in this fast changing landscape.

I was incredibly impressed with the findings in this important report. Irish surgeons have very clear and optimistic views on new technologies for surgical practice. There is unanimous opinion that the likes of Robotics and Artificial Intelligence will become commonplace in future surgical practice. We see that surgeons and RCSI should collaborate with industry partners so that there is a full understanding of the potential of these new technologies, how to introduce them properly and the training that will be needed to ensure that the benefits are properly realised. I believe this important report will help RCSI set the right direction to take our training programmes. I am most grateful to Prof Ronan Cahill and his team who coordinated the various workshops, surveys and analysis which informed this report. I wish to thank all the members of the Working Group Committee for their time and expertise.

Professor Laura Viani

President, Royal College of Surgeons In Ireland.

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EXECUTIVE SUMMARY

New technologies matter to surgeons and surgical practice for patients as evidenced by the high level of engagement with, and rich perspectives provided to, the RCSI New Technologies for Future of Surgery in Ireland Working Group. However, there is concern, particularly evident among academic surgeons, that we could be better positioned for the opportunities inherent in new technologies broadly and better prepared strategically too regarding stakeholder alignment as well as with respect to collaboration between clinical units, healthcare organisations and universities and with our national representative body (namely the Surgical Affairs unit at RCSI) as well as, and indeed perhaps especially, with the executive management structures of our health service at regional and governmental levels. Investment levels are felt to be insufficient to maximally leverage new technology effectively and this includes in training and education for both emerging and established surgeons as new ways of learning are needed for technologies such as artificial intelligence and data and analytics as they become more important to surgical practice. While there is high energy, clear ambition and confidence in the role of new and potentially disruptive technologies in the now and near future of Irish Surgery, there is also great opportunity to demonstrate more effective leadership, synergise stakeholders for better healthcare and, overall, make better sense of the next phase of surgical healthcare for our patients and population.

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WORKING GROUP CHAIRMAN'S FOREWORD

Surgery is a cognitive discipline that often includes operations and technology to provide better patient care and health. *Bernard Dallemagne, IRCAD, France.*

While the word surgery etymologically derives from chirourgiki (cheir=hand, ergon=action or work) and conveys "working or doing by hand", contemporary surgical practice goes far beyond the performance of operations alone, encompassing patient care and disease management broadly. Indeed surgeons themselves identify more often as disease specialists then solely technical practitioners or technologists. Notwithstanding the new chemo- and immunotherapeutics aimed at reducing the incidence of surgery for some diseases, surgery remains the majority curative therapy for many cancers, an essential part of trauma and emergency care (including for inflammatory and infectious conditions) and cardiovascular diseases and, increasingly, a means for risk reduction while continuing to find new roles in diseases traditionally treated medically (e.g. obesity). At its heart, surgery is about the surgeon as a decision maker both during and around operations transcending specialty and subspecialty categorisation.

Like everywhere else in society, technology is embedded in surgery with increasing capability coming onstream through powered networks and computational capability. In today's operations, surgeons often routinely deploy smart tools around and during procedures to enhance operative progress with some surgeries now being performed in majority part with the surgeon physically removed from the patient and even the operating table (instead directing an electromechanical system or 'robot' to effect tissue dissection, reconstruction and haemostasis). With advances in computing power alongside improved patient diagnostics including imaging and genomics analysis, the role of technology in surgery is set to accelerate further into the 21st century encouraged by multinational industry investment meaning intraoperative decision guidance systems and even potentially component automation are in prospect. While there remain issues re regulatory and liability aspects of deployment, surgery can benefit greatly from such augmentation. Rather than centralized, specialist healthcare, artificial intelligence methods too promise potentially distributed expertise wherever and whenever it is needed to generally raise standards. Such capabilities require consideration of new ways of training, working, implementation and administration.

It is within this context that Professor Laura Viani, RCSI President, has sought the views of surgeons in Ireland regarding the current and near future role and impact of new technologies in surgery via this working group, constituted via RCSI Surgical Affairs. It has been a pleasure and a privilege to commend them now in this report to promote dialogue, debate and, hopefully, in time, advance. While there may be clear overlap in the considerations herein with all image-guided, wire-based, endoluminal and other medical interventionalists and of course other societal stakeholders (including naturally patients but also the general public and government), the work represents a first step of engagement.

Prof Ronan Cahill

Chair, Committee on New Technologies in Surgery in Ireland

RCSI WORKING GROUP COMMITTEE:

Prof Ronan Cahill (chair), Consultant General and Colorectal Surgeon, Mater Misericordiae University Hospital and Full Professor, University College Dublin.

Prof David Healy, Consultant Transplant Surgeon, Mater Misericordiae University Hospital and St Vincents University Hospital.

Prof Carmel Malone, Consultant General and Breast Surgeon, University Hospital Galway.

Mr Enda Mulvany, Digital Surgery Lead, Medtronic Ireland.

Prof Fergal O'Brien, Deputy Vice Chancellor for Research and Innovation, Royal College of Surgeons in Ireland.

Prof Paul Ridgway, Consultant Surgeon, Tallaght University Hospital.

Mr Kieran Ryan, Director, Surgical Affairs, Royal College of Surgeons In Ireland.

Chair of RCSI Committee for Surgical Affairs, Ms Bridget Egan, Consultant Vascular Surgeon, Tallaght University Hospital.

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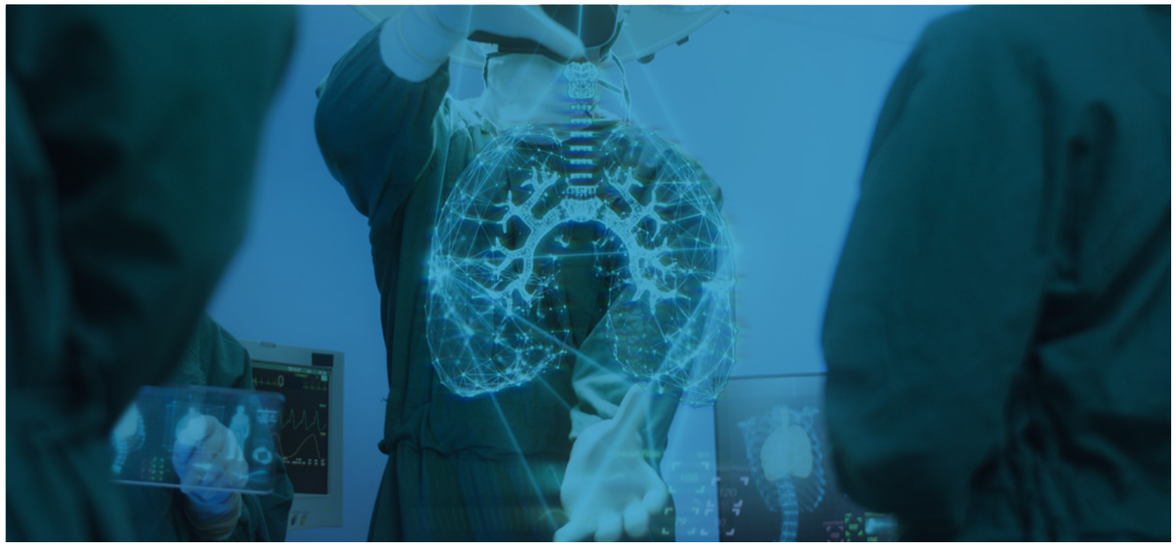
The following representative groups were identified and invited to participate in the report.

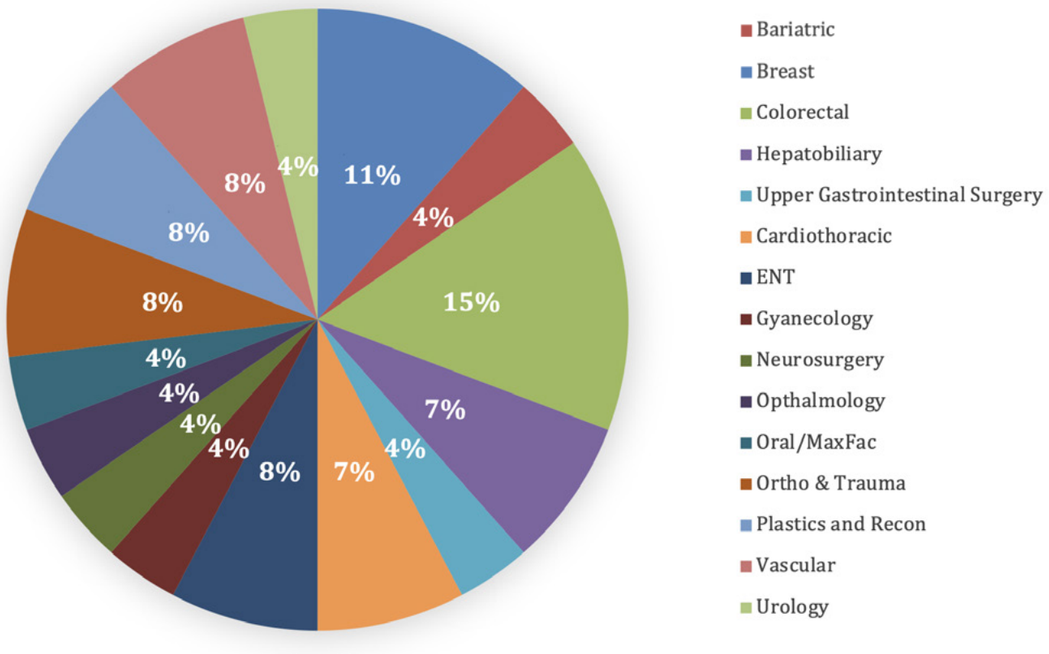
National Representative Surgical Specialty Groups (n=13)	
Great Britain & Ireland Hepatobiliary Surgery Group	Irish Orthopaedic Association
Irish Association of Plastic Surgeons	Irish Society of Coloproctology
Irish Association of Vascular Surgeons	Irish Society of Gynaecological Surgery
Irish Cardiothoracic Surgeons	Irish Society of Oral & Maxillofacial Surgery
Irish Hand Surgery Society	Irish Society of Urology
Irish Institute of Clinical Neuroscience	Society of Irish Breast Surgeons
Irish Institute of Otolaryngology	

Academic Surgical Units (n=6) and Clinical Subunits (n=9)	
Royal College of Surgeons in Ireland	Beaumont Hospital
Trinity College Dublin	St James's Hospital Tallaght University Hospital
University College Cork	Cork University Hospital University Hospital Waterford
University College Dublin	Mater Misericordiae University Hospital St Vincent's University Hospital
University of Galway	University Hospital Galway
University of Limerick	University Hospital Limerick



Overall, specialty inputs (n) denotes number of participants] represented General Surgery (11) [Bariatric (1), Breast (3), Colorectal (4), Hepatobiliary Surgery (2), Upper Gastrointestinal Surgery (1)], Cardiothoracic Surgery (2), Ear, Nose and Throat (ENT) Surgery (2), Gynaecology (1), Neurosurgery (1), Ophthalmology (1), Oral and Maxillofacial Surgery (1), Orthopaedics and Trauma Surgery (2), Plastics and Reconstructive Surgery (2), Vascular Surgery (2) and Urology (1). Among the contributors, approximately 40% are general surgeons with 35% overall being abdominopelvic surgeons, 23% each operate primarily in the limbs and the thorax and 19% predominantly perform surgery in the head and neck area. The core speciality of contributing academic representatives was General Surgery including the following subspecialities: Bariatric Surgery, Breast Surgery (3), Colorectal Surgery (n=3), Hepatobiliary Surgery and Upper Gastrointestinal Surgery. Two specialty leads have academic positions. Higher Surgical Trainee Leads represented the following specialities: Cardiothoracic Surgery, ENT (2), General Surgery, Orthopaedics and Trauma Surgery, Vascular Surgery and Urology.

Contributing specialties and subspecialties



This report is based on the submitted views of the following 30 individuals (see Appendix 1) representing the above groups and we acknowledge their inputs with great thanks: Mary Barry, Donal Brennan, Ronan Cahill, John Caird, Calvin Coffey, Kevin Conlon, Kevin Cronin, Orla Cullivan, Aiden Devitt, Claire Donohoe, John Doris, Tom Gallagher, Michael Gilbride, Helen Heneghan, Arnie Hill, John Hinchion, Michael Kerin, Aoife Lowery, Kevin McElvanna, Alison McHugh, Nathaniel McHugh, Peter Neary, Sharjeel Paul, Megan Power Foley, Nicola Raftery, Darragh Rice, Fiachra Rowan, Patrick Sheahan, Danilo Vukanic, Mark Wilson.

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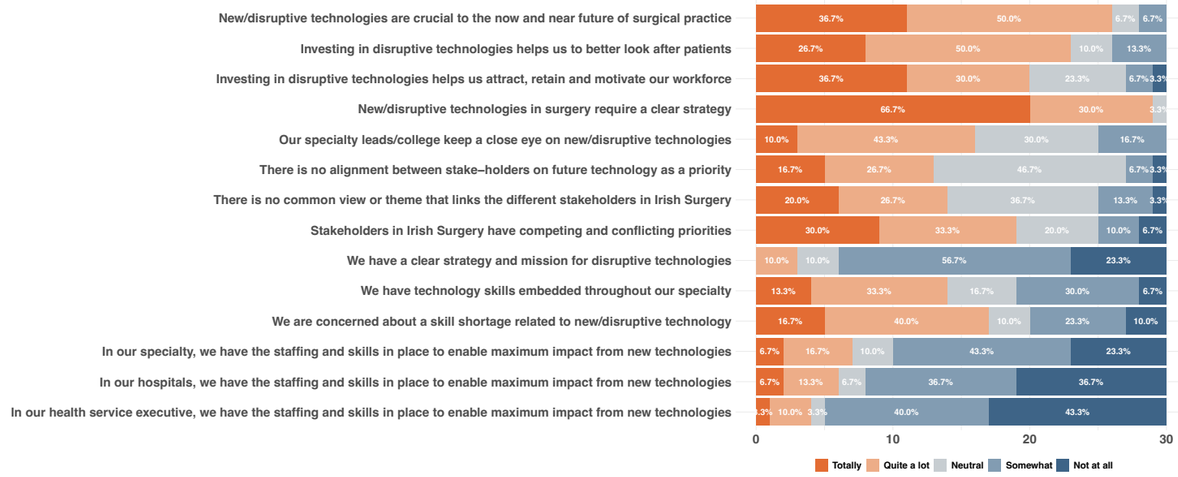
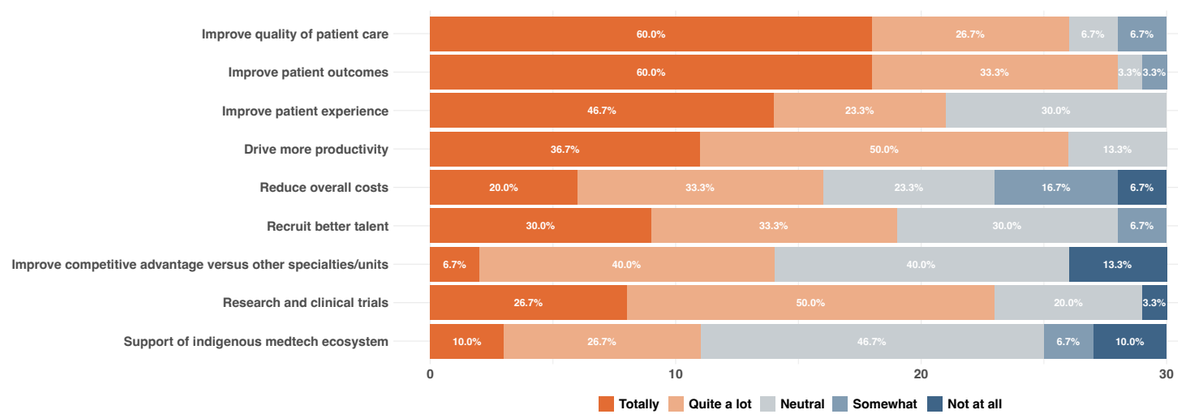
THE FOLLOWING FIGURES SHOW EXTENT OF SURVEY RESPONDENT AGREEMENT WITH EACH OF THE ASSOCIATED STATEMENTS.

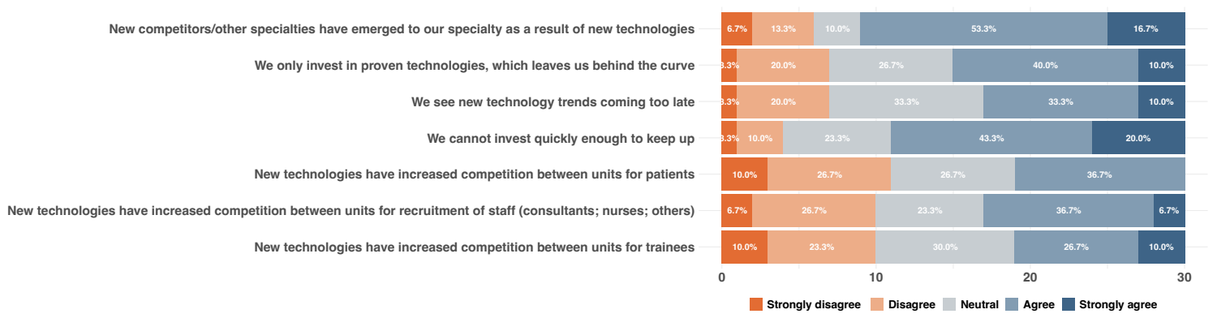
Sentiments regarding new technology in surgery



To what extent do these factors drive your interest in new disruptive technologies?



Knock-on effects of new technology-



COMMENTARY ON RESPONSES:

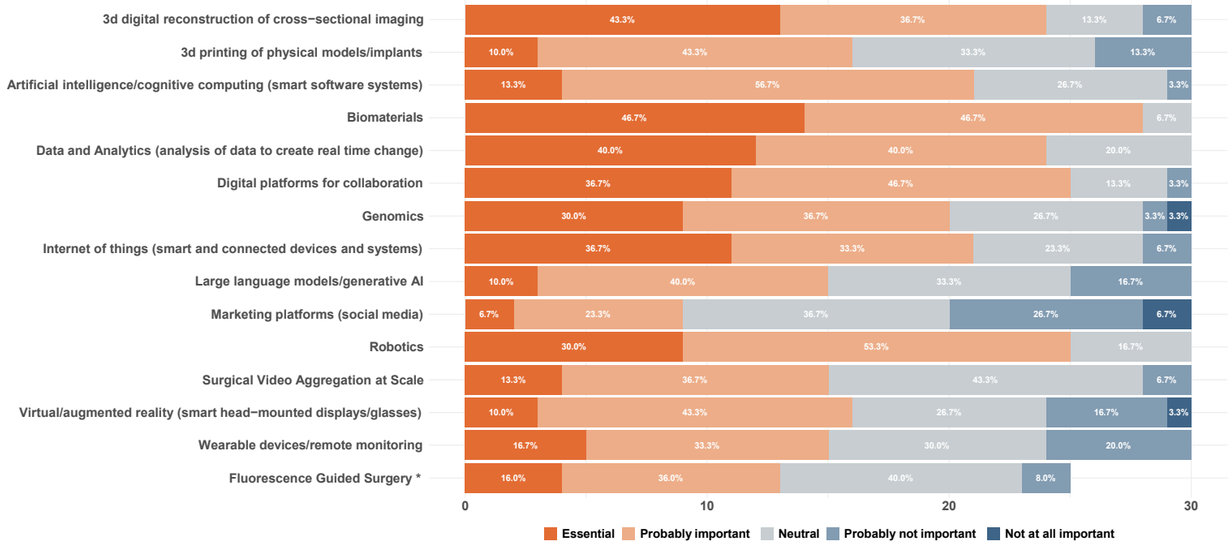
Sentiments re new technology in surgery: There is very high agreement in all groups that new/disruptive technologies are crucial to the now and near future of surgical practice with notably 100% of trainees holding this view. Investing in disruptive technologies is felt important especially to better look after patients and also to attract, retain and motivate our workforce although notably these views are somewhat less strongly held by academic surgeons and more trainees prioritised patient benefit over workforce considerations. There is high agreement overall and between all groups that new/disruptive technologies require a clear strategy and that generally specialty leads/college keep a close eye on developments in this area but also concern among academic and clinical specialists especially regarding alignment between stake holders on future technology as a priority and that there may be no common view or theme that links them and in fact that there may be competing and conflicting priorities. Trainees are more optimistic regarding stakeholder alignment but also feel strongly regarding competing priorities.

Generally a small majority see a clear strategy exists for disruptive technologies with again trainees being most positive in this regard. All groups, and especially academics, are generally concerned about a skill shortage related to new/disruptive technologies (with trainees notably less concerned than academic surgeons) Academic surgeons and trainees are most positive regarding the staffing and skills in place to enable maximum impact from new technologies in both their own specialties and hospitals but have less confidence in our health service executive in this regard. Interestingly, clinical specialties have more confidence in their own specialty staffing and skills versus both hospital and HSE level.

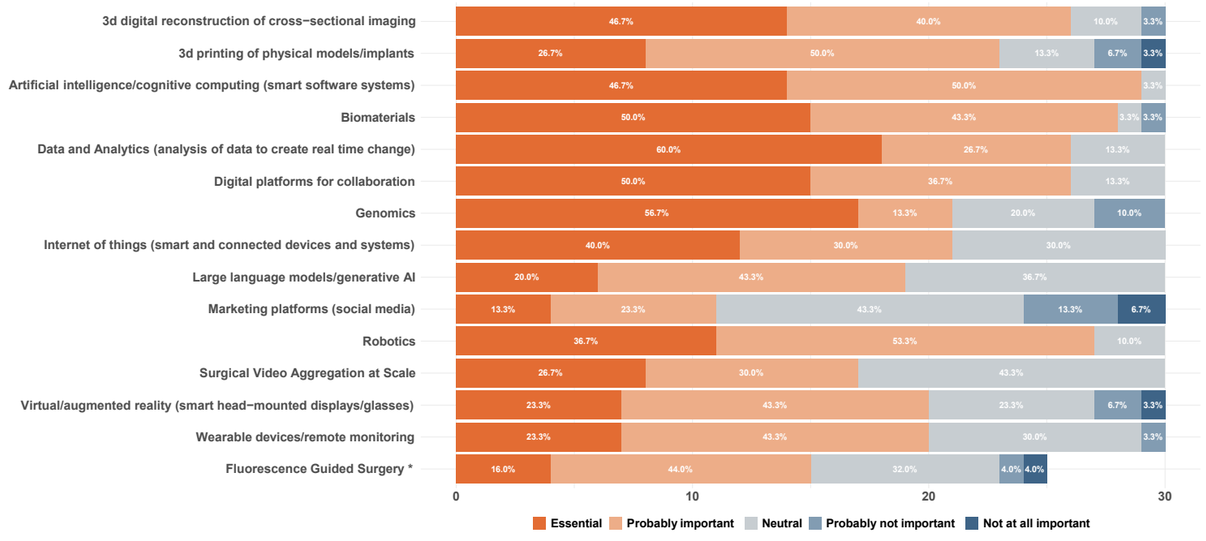
Drivers of interest in new/disruptive technologies: The predominant driver of interest in new technologies in all groups is patient care and outcomes and, to a somewhat lesser extent, improved patient experience. Using new technologies to drive greater productivity and reduce overall costs is also important, especially among trainees. Recruitment of better talent, research and clinical trials and support of Ireland's medtech ecosystem was especially important to academics but all groups value the role of new technologies for recruitment and research with less importance ascribed to improving competitive advantage between specialties and units.

Knock on effects of new technology: All groups, and especially academic surgeons, feel new competitors/other specialities have emerged to their speciality as a result of new technologies with academics, but not clinical specialists or trainees, worrying in the majority that investment only in proven technologies leaves us behind the curve and that we only see new technologies trends coming too late. All groups, and especially academics, express concern regarding investment level. There was less concern generally that new technologies are increasing competition between units for patients, staff and trainees with small differences between the groups in each of these with, for example, academics being somewhat more concerned re staff and patient competition then clinical specialists and trainees while clinical specialists were relatively more mindful re competition for trainees as a result of new technologies.

What new technologies are important now?

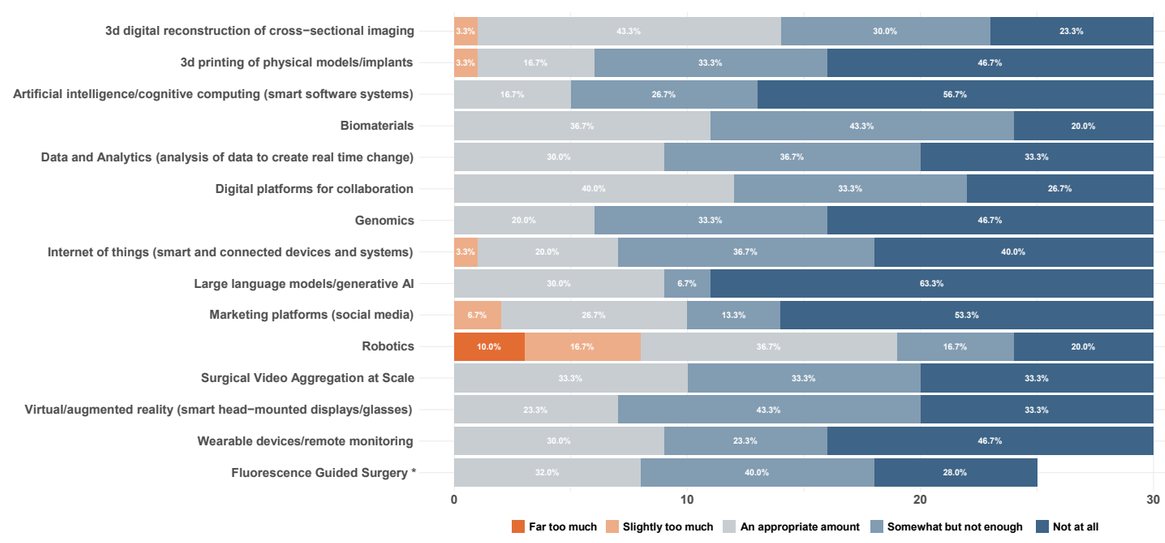


What new technologies are important in the next 10 years?



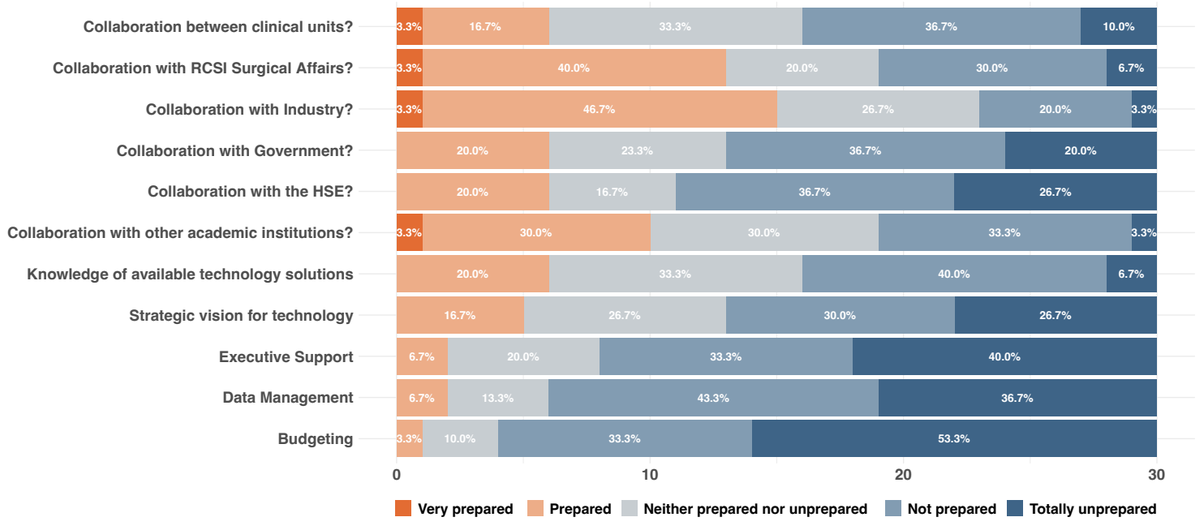
* Fluorescence Guided Surgery was surveyed in 25/30 participants (9 academics, 9 consultants and 7 trainees).

To what extent is your specialty investing sufficiently in each of the following technologies?



What new technologies are important now and in the new future and how appropriate is the investment at specialty level?: Taken together, these tables indicate survey participants' ranking of importance of specific new technologies now and in the next ten years and their perspective on the appropriateness of investment at specialty level. Overall, all of the technologies felt important now are also felt to be more important in ten years with social media platforms being the lowest rated new technology overall. While biomaterials, robotics and digital platforms for collaboration are felt to be the most important technologies now followed by 3d reconstructive models for operative planning and data analytics, in ten years time artificial intelligence is felt to be the most important new technology. Trainees are particularly invested in data analytics now as well as, like academic surgeons, robotics. Academics also especially rate artificial intelligence and aggregation of surgical videos at scale now while rating the internet of things and wearables lower both now and in ten years' time. Clinical specialists and trainees feel wearables and virtual/augmented reality displays will be more important in ten years' time. Clinical specialists rate fluorescence guided surgery lower now than academics and trainees with more importance rated for this in ten years' time. Genomics is felt to be especially of increasing importance over ten years by trainees. Overall most categories of new technologies are felt to be subject to insufficient investment with the exception of the trainees view regarding robotics and biomaterials and to a lesser extent marketing platforms, wearable and remote technologies and 3d reconstruction digital technologies.

How prepared are we to address the following issues as they relate to new technologies?



Preparedness for new technologies: In general and in each category of participant, there is a general feeling of under preparedness regarding collaboration between clinical units, government and the HSE with trainees feeling more prepared in terms of collaboration with RCSI Surgical Affairs and Industry then either academic or clinical surgeons (with the former feeling less prepared than the latter as a similar trend to how academics feels re preparedness with government and the HSE versus clinical specialists). Preparedness for collaboration with academic units was rather low for academic surgeons and indeed especially low for trainees and clinical specialists. Especially low uniformly is any feeling of preparedness regarding strategic vision, executive supports, data management and budgeting and, especially for academics, knowledge of available technology solutions.

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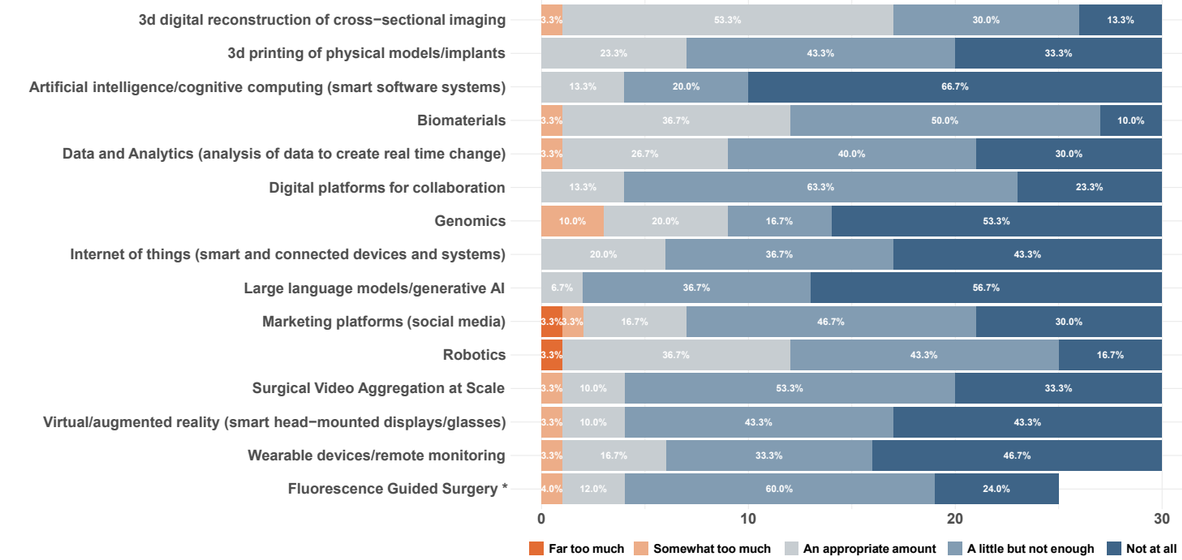
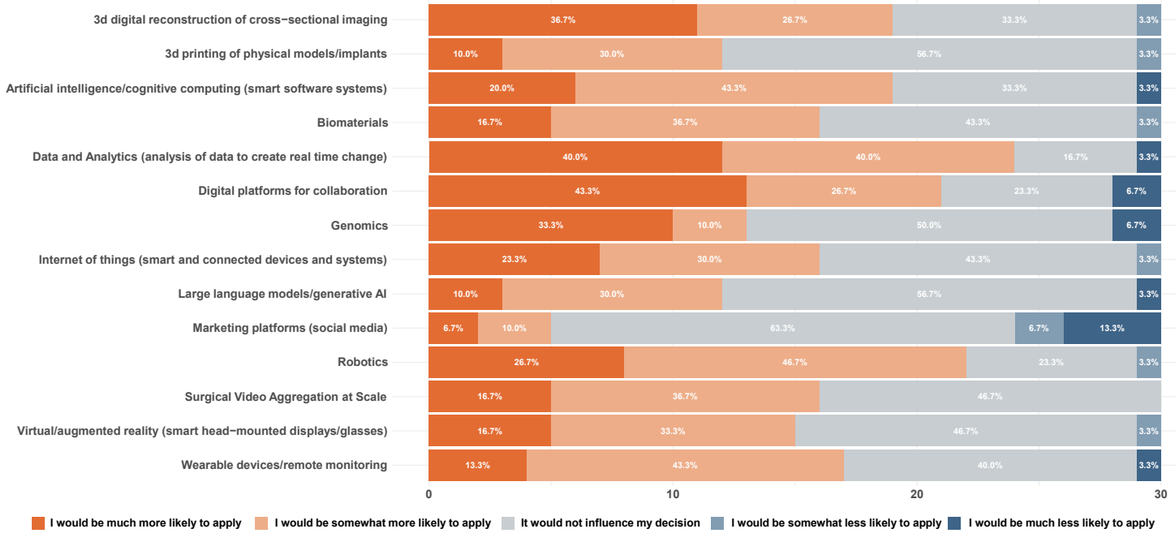
To what extent have you been exposed to the following technologies during surgical training/consultant practice?

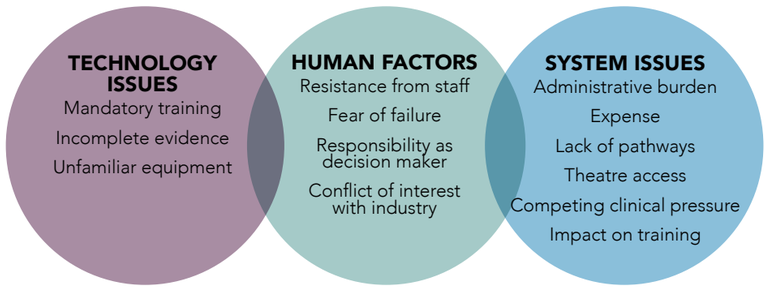


Would access to the following technologies influence your decision to apply for a consultant post?



Exposure to and importance of new technologies in surgical career in Ireland: Overall academics, clinical speciality leads and trainees all feel insufficiently exposed to new technologies with the possible exception of 3d reconstruction digital models for clinical specialists and trainees and biomaterials for trainees. New technologies are felt as an important influence on decisions regarding where to apply for a consultant post especially with regard to robotics and surgical video aggregation at scale for academics, 3d digital reconstruction of cross sectional imaging and data/analytics for clinical specialists and data/analytics, digital platforms for collaboration, artificial intelligence and biomaterials for trainees.

Interview thematic analysis: Of the thirty questionnaire respondents, seventeen (11 male, 6 female) accepted the invitation for interview. Of these, seven held academic consultant surgeon positions, five were clinical surgeons and four were surgical specialist registrars. Interviewees were representative of twelve surgical specialties, five subspecialties within general surgery (bariatric, breast, colorectal, hepatopancreaticobiliary and upper gastrointestinal surgery) along with ENT, gynaecological oncology, neurosurgery, ophthalmology, orthopaedics, urology and vascular surgery. Interviews lasted for a mean of 51 minutes (range 37-63). In one case the interview transcript was unavailable due to technical issues with the Zoom app, themes were identified from this interview from notes taken during the interview. The following represents the summarised views of the interviewed surgeons.

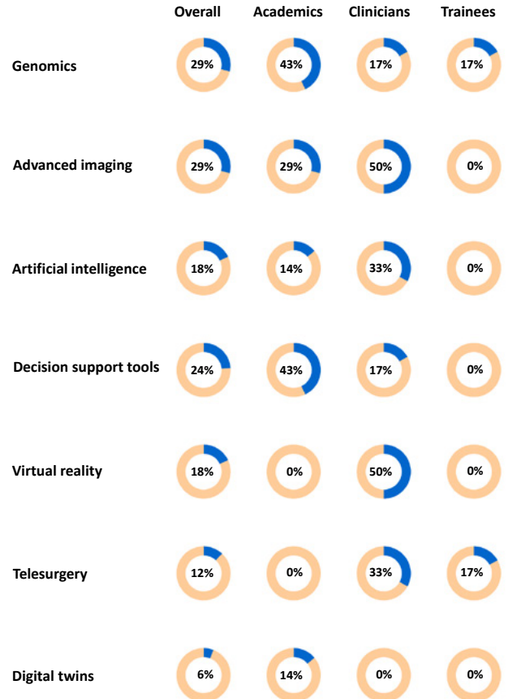


Figures: Top 100 words used by surgeons to describe both Future Technology in Surgery as well graphic detailing the main Challenges and Obstacles they associate with introduction of new technologies.

Broad ambitions for new technology in surgery: Surgeons spoke very positively regarding the future of technology in surgery. There was an acknowledgement that as surgery advances further, with the aid of technology, and as more radical operative approaches become available there is a need to ensure this is being done in a safe manner with the appropriate training in place. Surgeons were excited by the opportunities for more personalised and less destructive surgeries, this was particularly apparent in relation to breast surgery and endoluminal surgery. There was optimism towards better preoperative patient selection with artificial intelligence and advances in genomics both proposed to improve patient selection. While surgeons accepted the challenges associated with conducting surgical research, and randomised controlled trials in particular, they felt this was a worthwhile and necessary pursuit in the interest of delivering highest standards of care. However it was also voiced that research or the implementation of national policies alone are not enough, the necessity to continuously measure the impact of surgical advances and technologies was felt to be crucial to the oversight of technology in surgery in the coming decades- "if we're going to be implementing technology, we have to measure the impact of that technology. And the only way we can do that is putting research way up the ladder of importance". Surgeons proposed that adoption of an electronic healthcare record with the ability to conduct thorough national audits would further support this need.

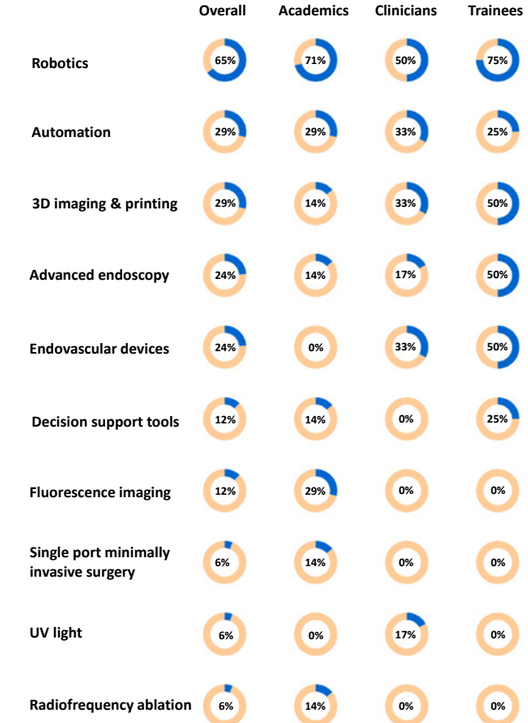
Examples of new technology: Surgeons described utilising new technologies across the entire spectrum of patient care from pre-operative planning and patient counselling through to intraoperative devices, post operative care and systems management. Broadly the examples cited are categorisable as perioperative tools, intra-operative tools and healthcare system tools.

Use of new tech: perioperperative tools



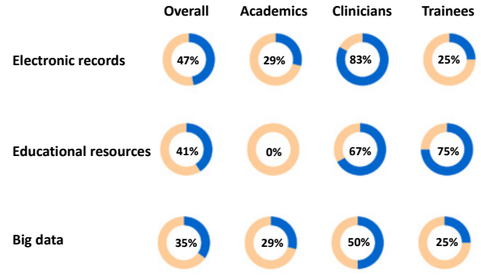
Graphic illustrating peri-operative technologies as highlighted by participants

Use of new tech: intraoperperative tools



Graphic illustrating intra-operative technologies as highlighted by participants

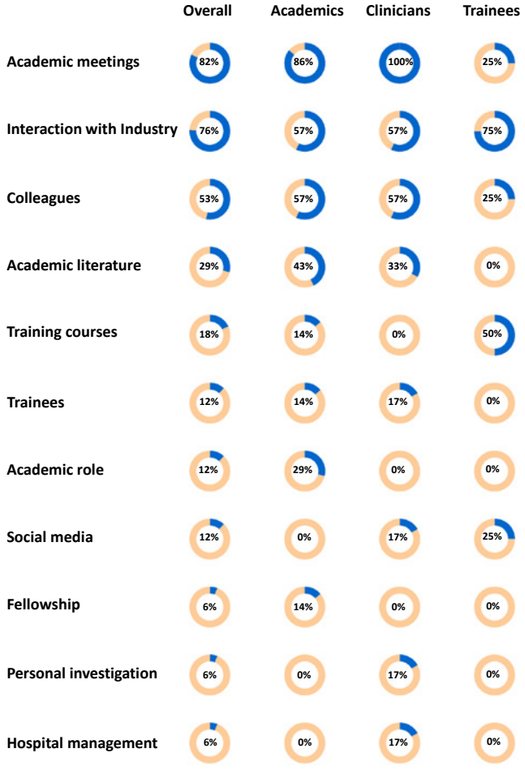
Healthcare system tools



Graphic illustrating healthcare system management technologies as highlighted by participants

Identification of new technology: Surgeons overall most commonly identify new technology via academic meetings, industry interaction and through colleagues. Trainees however were significantly less likely to do so through academic meetings being instead more likely to find out via industry representatives (75%) and training courses (50%).

Finding out about new tech



Surgeons highly value exposure to new technologies through colleagues ("I think things really take off when a local individual starts to use a piece of equipment, and we all kind of then follow suit, and so the local meetings are as important as the international meetings") and also value the influence of peers when exploring the practicalities of introducing a new technology with the opportunity to visit sites already using a technology cited as a key step in their own adoption. While highlighting the benefits of a close relationship with industry including early access to new technologies and opportunities to contribute to the early stages of device development, surgeons have concerns about the relationship with industry when learning about new technologies ("I'm quite uncomfortable being approached […] it feels like a commercial interaction […]I don't know why I'm distrusting of industry but I think it's maybe just inherent in me and in some people who trained me, I seem to have inherited their inherent distrust of industry") specifically citing motivations ("they don't care about patients and benefit, it's all about the buck and whether it makes money for them or not") and accuracy of information ("I take the reps information with a pinch of salt […] I always double verify what they tell me").

Benefits of using new technologies: When questioned on motivations for implementing new technologies into practice, four themes were similarly recurrent: i) better patient outcomes, ii) surgeon benefits, iii) healthcare system benefits and iv) training benefits. The primary motivation was improving patient outcomes with improved perioperative safety, reduced length of stay and improved functional status and quality of life being the most commonly referenced benefits.

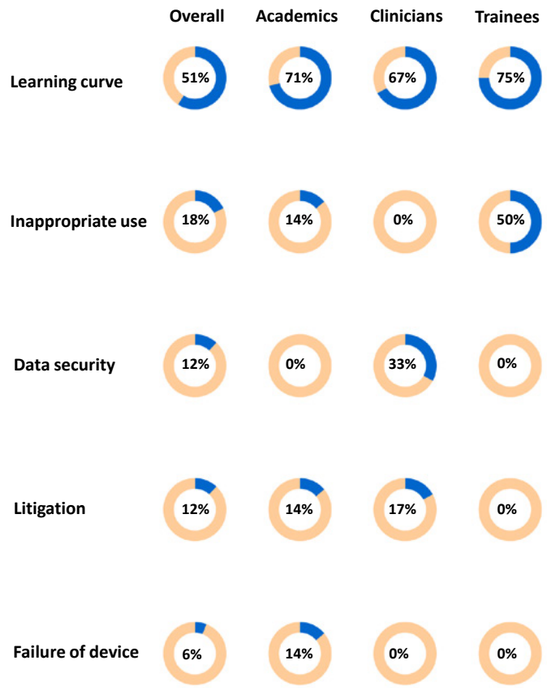
Benefits of new tech

Graphic illustrating the motivations for utilising new technologies by participant group
*trainees were more likely to cite training benefits of new technologies than academic surgeons

A number of surgeons referenced the need to lessen the overall injury that surgery causes to patients be that physical, psychological or social (i.e. surgical treatment that is "kinder, safer and better") with improved functional outcomes and quality of life being prominent motivational factors for the use of new technologies. Surgeon benefit considerations include the surgeons physical well-being with regard to ergonomics and safety within the operating room as well as their psychological well-being (for example the use of virtual planning software for complex cases was credited- "it literally gave me confidence before I did the operation that the movements in this were achievable"). Others referenced the positivity generated by new technologies and the academic pursuit of applying technology with one getting "hugely interested and excited by that alone". When discussing the benefits that new technologies may have to the hospital system as a whole, the opportunity to improve efficiency, particularly through the implementation of electronic health records, was the dominant advantage proposed. Surgeons however expressed their frustration at the slow implementation of this technology nationally with some delays being described as "criminal" and "backdated" while another emphasised "I really do strongly believe that digital patient record management is the ultimate goal of best benefit [to patients] in the long term". However, some moved beyond the need for simple electronic storage of health records to voice the need for more integrated systems incorporating artificial intelligence that may allow for processing of data to identify patients at risk of complications, better streamline outpatient services and even assist in determining the best treatment pathway for patients.

Risks, challenges & obstacles of new technology: Surgeons acknowledged the inherent risk associated with the introduction of many new technologies. Most commonly cited was the intraoperative risks that may be associated with the surgeons learning curve with other concerns including those of inappropriate use, data security, litigation, over-reliance and device failure. The challenges of collating high level evidence in emerging technologies was mentioned in two thirds of all interviews although surgeons held differing perspectives on the evidential threshold for incorporating a new technology into their standard practice being roughly split between sufficient safety and equivalence data alone versus needing higher level evidence, such as a randomised controlled trial, before adoption for routine care. However, all acknowledged the balance between the risk of proceeding with a lower level of evidence compared to missing out potential advance while waiting for higher level evidence.

Perioperative tools: perceived risks, challenges & obstacles



Graphic illustrating the challenges of new technologies as voiced by participants

Beyond the inherent risks of a technology, a number of challenges and obstacles were identified by surgeons in relation to the adoption of new technologies with no significant differences apparent between the groups interviewed. These obstacles are complex and encompass factors relating to the technology, to the hospital system and also to human factors with many elements potentially bridging across these areas. In contrast to the positive psychological impact surgeons felt that new technologies delivered them, the process of implementation could at times have the opposite effect with one surgeon stating "I certainly felt like I was met with just resistance and barriers that seemed to need too much energy to overcome, so I didn't pursue it any further". Of some concern too was the perceived inequalities between the distribution of resources when it comes to new technologies with some surgeons stating "Anyone who does robotic surgery seems to get exactly what they want […] I think we feel quite neglected" and "whoever shouts loudest gets the most". Seven surgeons (41%) identified the lack of a transparent or standardised implementation pathway as a problem when integrating a new technology and felt that a centralised process or pathway would be a strong pull factor when it comes to implementing a new technology and avoid replication of work across different clinical sites. Five surgeons recognised that support from their hospital CEO or General Manager had been instrumental in the successful implementation of a new technology in their hospital.

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Surgeons typically found writing business cases to be a further obstacle when introducing a new technology, however two surgeons (one academic surgeon and one trainee) who had completed formal business qualifications felt this was indeed useful preparation. While surgeons acknowledged the importance of ethical oversight in the introduction of any new technique or technology, many cited concerns over the lack of surgical input into such committees with one surgeon stating "You need surgeons making decisions for surgeons, because we understand what's needed for surgical care and patients more than anybody else does". Obtaining the buy-in of colleagues once a technology was in place was also considered a challenge by many people. In particular the learning curve (both for the surgeon and for other theatre staff) of a new technology was considered a hurdle – "just getting people through that phase of everything being slow" while another surgeon felt "still heavily scrutinised in terms of the time it takes" for complex cases, discouraging them from adopting further new technologies. Departmental financial incentives were suggested as one strategy for addressing this issue.

Impact on training: Contrasting views were evident with regards to the impact of technology in training. Strong support was given by trainees (4/4) to the use of technological resources for the purposes of training. However, when it came to the influence of new technologies on the training opportunities in theatre, only one consultant and trainee each felt there to be a training benefit with more trainees indicating technology had negatively impacted their intra-operative training opportunities. Reasons put forward for this included trainers navigating the learning curve period themselves and the requirement for formal courses prior to commencement of a new technology. While trainees, like consultants, felt positively regarding the need for these courses, they cited financial, availability and time barriers to accessing them. All trainees wished to gain opportunities to learn more about technologies relevant to their specialties with technology training days, higher degree programmes such as MDs and fellowships proposed as opportunities for greater training in technologies.

Patient perspectives: Generally surgeons felt that patients had both a limited understanding of the role that technology plays in healthcare today and also a high level of trust in their surgeons. No surgeon had experienced a patient questioning either the involvement or absence of technology in their clinical care. However, two surgeons had experience of technology improving their communication with their patients through electronic healthcare records and virtual planning software. The trust patients place in their surgeon was a factor that surgeons noted when discussing the responsibility that comes with deciding to use a new technology, particularly when a strong evidence basis is yet to be established – "You're the decision maker. Ultimately you say you're making a shared decision with them, but actually, you know, they very rarely go against what they perceive to be your expert opinion". A number of surgeons mentioned the importance of acting as patient advocates when it comes to new technologies and ensuring that the motivations behind the implementation of a new technology are valid – "we're patient advocates you know, we speak for those who can't speak for themselves. We're aware of what's available, and we can sift out what doesn't work and we can point money towards things that do work […] and paint that picture of the future so that others can then benefit from the innovations that we have".

Role of the surgeon: Interviewees felt that the role of the surgeon with respect to technology was multifaceted and included the surgeon as innovator, as governor and as a leader. Some surgeons felt that "by our [surgeon's] nature, we do tend to be innovative", but there was a recognition that it should not be a requirement of the surgeon and that, in fact, an environment in which each surgeon innovates completely independently would not be desirable. There was the opinion that the system should better adapt to allow surgeons to embrace the differing facets of their roles with stage of career also considered relevant regarding this. Access to operating lists was repeatedly cited as a challenge for newly appointed surgeons as, where theatre time is at a premium, the action of prolonging a case further due to the time necessary to adopt a new technology poses an obstacle– "I do think actually, the stage in your career is really important too. I think getting a service up and running to a certain volume, once that's achieved, the thought of taking a step back and being slow again…it shouldn't be a deterrent, but it is for now". There was also an acknowledged difference between academic and general clinical practice with one academic surgeon putting forward the idea that "in general academics are more likely to try and take projects and innovate them whereas the non-academics in clinical practice are more likely to take off the shelf technology", while another stated that "if you're an academic surgeon you probably shouldn't have the model of operating five mornings a week " while also advocating that new surgeons should have greater access to operating theatres. Implementation of new technologies was noted to need support, with the potential of a CME fund as part of the Sláintecare contract being cited as a good example. Whether academic or non-academic, surgeons felt that this innovative element of the surgeons role should also be collaborative with universities, industry and other disciplines as all were felt to enhance the creativity, practicality and feasibility of technology innovation. Surgeons spoke mostly positively of past experiences collaborating with these groups, feeling that their expertise helped drive forward innovation in the hands of industry, with industry providing resources to bring a project to completion. One surgeon, in particular, had been impressed by their experiences of collaborating with a "bio-innovation team" comprised of engineering, healthcare and business professionals which they found to be an effective way of instigating small improvements in technology development.

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WORKING GROUP CONTRIBUTORS' CASE NOTES

Mary Barry, Consultant Vascular Surgeon

"Establishing hybrid theatres as standard" Ms. Barry has been advocating for hybrid theatres at her hospital to facilitate the safer management of both patients and staff. She sees hybrid theatres as a critical necessity in delivering safe, modern vascular surgery allowing for improved patient throughput, increased training opportunities, improved quality of training and improved patient and staff safety. She would like to see minimum technological infrastructure standards rolled out nationally.

Donal Brennan, Consultant Gynaecologist

"Digital twins for cancer" Prof Brennan sees the future of technology in surgery in the move towards more personalised care. One way he envisions this is through the use of digital twins in the decision-making process for cancer patients. As permutations of treatment options for patients with cancers have expanded, Prof. Brennan is currently undertaking a study of how digital twins can be used to select the optimum treatment options for patients with ovarian cancer, maximising oncological outcomes while causing least harm to the patient.

Kevin Conlon, Upper GI & HPB Surgeon

"Past and future of surgical technology" Throughout his career, Prof. Conlon has been involved in the development phases of multiple surgical technologies, from the J-needle used so often in laparoscopic port closure to early robotic consoles. He sees the role of academic surgeons, in particular, as guiding the direction of surgical innovation and technology. Looking to the future he sees a role for artificial intelligence as a decision-making aid for surgeons in both the peri-operative and intra-operative environments.

Orla Cullivan, ISTG Urology Representative

"Expanding academic opportunities for research" Ms. Cullivan considers robotics a key element of her future career. While her robotic training has been supported through courses she would like to see robotic training become a more formalised aspect of the surgical curriculum. Beyond robotics, Ms. Cullivan is conscious of the expanding opportunities technology brings to surgery and sees the incorporation of new technologies as a integral part of the surgeon of the future. MD and PhD programmes grounded in technological advances are among the ideas that she has for ensuring the surgeons of the future are appropriately equipped.

Claire Donohoe, Consultant Upper GI Surgeon

"Addressing quality of life" Ms. Donohoe sees the future of surgery as doing more but with improved safety rather than changing our approach to things per se. She sees robotic surgery as one facet of this and believes it will continue to evolve and prove its benefit to patients. In particular, she is part of the academic group in her hospital looking to establish robotic oesophagectomy. She is particularly interested in harnessing new technologies to improve quality of life outcomes for patients and allowing them to move beyond their treatment, back to their own lives.

John Doris, Consultant Ophthalmologist, University Hospital, Waterford

"Disease specific micro-pulse lasers" Among the many technologies that Mr. Doris has introduced to his service is micro-pulse laser for the treatment of retinal diseases. He sees a major advantage of this device being its specificity towards disease and limitation of damage to adjacent tissues. He also sees a role for artificial intelligence in the early detection of ophthalmic disease allowing surgeons to intervene earlier and improve outcome for patients.

Helen Heneghan, Consultant Bariatric Surgeon

"Advanced endoscopy for bariatric care" Prof. Heneghan is excited by advanced endoscopic therapies and sees them as a new frontier in bariatric care, with the potential for effective outcomes with a lower risk profile than traditional bariatric surgery. As some of these platforms are in their infancy, she sees great value in surgeons playing a role in the development of these technologies and would like to see clearer pathways for surgeons to participate in this.

Arnie Hill, Consultant Breast Surgeon

"Robotics for new applications" Prof. Hill is looking at the role of robotic surgery in breast surgery through his involvement in a randomised controlled trial of robotic mastectomy including via a transaxillary access. He hopes to find that robotic mastectomy coupled with DIEP reconstruction offers patients superior cosmetic and functional outcomes through preservation of nipple sensitivity. While he acknowledges the large volume of work required by hospitals and individual surgeons in establishing robotic programs, he believes it worthwhile to facilitate operating in a "nicer and more controlled way".

Aoife Lowry, Consultant Breast Surgeon

"Precision in breast cancer surgery" Prof. Lowry sees a bright future for 3D virtual planning in oncoplastic breast surgery. For her, 3D reconstruction of mammographic images gives the advantage of enabling the surgeon to not only better localise a breast lesion but also visualise the true dimensions of the breast outside of the supine position in which patients undergo surgery, therefore achieving superior oncoplastic outcomes. She sees a technology capable of assessing the margins of the resection in real-time intraoperatively as the next major leap forward in operative breast cancer management.

Kevin McElvanna, Consultant Colorectal Surgeon

"Surgical video for training" Since being introduced to it by a trainee surgeon working with him, Mr. McElvanna has adopted Proximie (an operative video storage and management system) to improve the experience of trainees in his department. He values both the trainee and surgeon's ability to use this system to impart training knowledge and allow for opportunities for reflection and performance review. He is further excited for the possibilities a technology such as this has for live operative input across multiple surgical sites.

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Barry McGuire, Consultant Urologist

"Establishing robotics systems" Prof McGuire has recently established his second robotic program on his hospital's campus with the introduction of the Hugo robot by Medtronic, following on from his success in the Intuitive da Vinci system program some years ago. He has had positive experiences of moving from one system to another and back, finding the skills to be transferable. Ultimately he sees robotic surgery as a pathway that allows more urological operations to be done in a minimally invasive way, resulting in "less of a bump in the road" for his patients. Given his experience in establishing these programs he would like to see investment in the peripheral workflow paths around robots to ensure that their value is being optimised and views the absence of a national body capable of authorising new technologies in multiple hospitals as the biggest challenge to adopting these programs.

Nathaniel McHugh, ISTG ENT Representative

"Progressing simulation in surgical training" Mr. McHugh has initiated simulation teaching for students based in University Hospital Galway having had previous positive experiences of it himself. He would like to see additional simulation resources available to surgical trainees including incorporating both high and low fidelity models.

Sharjeel Paul, Consultant General & Endocrine Surgeon

"RFA for micropapillary thyroid cancer" Mr. Paul is establishing radiofrequency ablation for micropapillary thyroid cancer in his hospital, the first service of its kind in the country. Having visited centres abroad offering this service, he is passionate about introducing it in Ireland and has taken the initiative to train in the technique.

Megan Power Foley, ISTG Vascular Representative

"Apps for remote patient supervision" Ms. Power Foley is developing an app to allow for remote supervised exercise therapy for patients with peripheral vascular disease. A challenge she has encountered in this process is access to the appropriate software and marketing specialist knowledge. She has had previous positive experiences with multi-disciplinary engineering teams and would like to see more widespread access to these resources to facilitate further surgeon lead innovation.

Danilo Vukanic, ISTG Orthopedic Representative

"Advanced healthcare record management" Having witnessed other healthcare systems take advantage of the large volumes of healthcare data available to them, Mr. Vukanic would like to see the Irish healthcare system adopt a similar approach. Of particular interest to him is the use of healthcare datasets to produce patient specific risk portfolios in advance of surgery and to then integrate this knowledge with healthcare management systems to allow for more tailored follow up and ease of communication in the post operative period.

Mark Wilson, Consultant Oral & Maxillofacial Surgeon

"3D virtual planning in maxillo-facial surgery" Mr. Wilson has found 3D virtual planning to be "revolutionary" to his practice, allowing for the input of accurate cephalometric data in complex reconstructive maxillofacial cases. Having pioneered the capability in his practice, he is in the process of establishing this as a service in University Hospital Galway. The biggest challenge he has faced to date is financial given that the technology is not currently covered by the HSE requiring patients to fund the planning themselves. In addition to improved pathways for funding of new technologies, Mr. Wilson would like to see more opportunities for cross-specialty collaboration when it comes to identifying new technologies.

TECHNOLOGY SPOTLIGHTS

Biomaterials innovation- Prof Fergal O'Brien

Biomaterials science, which typically involves biological or synthetic substances that can be introduced into body tissue as part of an implanted medical device or to restore organ or bodily function, was consistently highly ranked by contributors in this report as an important area now and over the next ten years. Major advances are taking place in material science for healthcare applications such as engineered biomedical materials and implants to restore function following disease or injury and advanced technologies providing improved diagnosis and treatment of patients with both acute and chronic conditions. Ongoing research is informing the next generation of medical technologies including the development of digitally enabled medical implants, systems and platforms and advanced therapy medicinal products which combine cells, genes, and biomaterials for treatment of a variety of conditions in regenerative medicine. Importantly, Ireland is a leading international hub for biomaterials innovation with world leading centres such as the SFI Advanced Materials and Bioengineering Research Centre, in which the RCSI Tissue Engineering Research Group has a major leadership role, driving advances in partnership with industry – particularly in the medical technology sector where Ireland has an established global leadership position, with 450 companies employing 42,000 people and contributing over €12 billion in export revenue. Ireland is now home to 14 of the top 15 global MedTech companies – spanning multiple sites across the country and ever-increasing R&D by the multi-national sector is now driving the formation of numerous new indigenous start-ups and SMEs. Closer partnerships between surgeons, engineers and industry are critical to ensure Ireland remains at the cutting edge of this sector and that clinically-informed research drives real innovation and development of technologies that will have true patient benefit. RCSI and indeed Ireland has a significant opportunity to position itself as a key global enabler of such advances.

Robotics in soft tissue surgery- Prof Barry McGuire

The first robotic assisted minimally invasive soft tissue operation performed in Ireland was in 2007, and since that time there has been widespread adoption of the technology with now 18 platforms nationwide. Most surgical specialties in Ireland currently use robotic assisted technology for operations in the surgical areas of urology, colorectal, upper gastrointestinal, hepatobiliary, gynaecology, thoracic and otolaryngology/head and neck. Currently there are three main robotic platform options in Ireland, and dominated by one vendor, however this landscape is likely to alter considerably due to a variety of new platforms coming onstream. To date, national and international bodies have approved 12 different robotic platforms for clinical use. Some robot designs share similarities and some have differences, with variations in the console (immersive or open), the hand/foot controls, docking/port placement technicalities and single/multi-port design. The physical appearance of the robot is one consideration, but we must also be cognisant that technology is moving at an exponential pace, and this evolution is a new challenge for surgeons, hospital governance structures and training bodies. Surgical procedures may look very different 50 years from now, and potentially we might witness developments in experimental robots e.g. autonomous robots, 'soft robots', 'origami' robots etc.

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This report identifies robotic surgery as an important component of the future surgical landscape for both surgeon and trainee. In fact, the trainees interviewed give resounding answers that positively affirm the role of technology in surgery and they are the group that will likely see radical changes in how surgery is delivered through their future careers. A large proportion of respondents identified learning curve as a risk to patients associated with new technologies. Having a system of governance and accreditation of these new technologies is important, as systems that lack these have demonstrated negative patient outcomes. Although most hospitals in Ireland have recognised the need for creating their own robotic governance committees, there is no national standard in how these functions. Robotic surgery remains in a position where training and accreditation is vendor led, and although this is considered to be of a high standard, consideration should be given to independent oversight. There are also specific considerations to ongoing surgeon training, accreditation, annual case volume and emergency scenario rehearsal for the broader surgical team, which apply to patient safety. As such, RCSI is working towards the development of a National Guideline on Robotic Surgery Governance and Accreditation.

Lastly, for such an important surgical instrument there is a need for formal education and curriculum design in the national surgical training program. There is currently no standardised postgraduate accredited curriculum for robotic surgery anywhere in the world, and robotic surgery training and exposure in Ireland is currently on an ad-hoc basis. RCSI are now developing a National Curriculum for Robotic Surgery, which will formally expose the trainee to robotic surgery from the time they begin their surgical journey. Introduction at as early a time point as possible will allow our trainees be the best robotic surgeons, which is something to be strived for.

Computer - assisted surgery- Prof Ronan Cahill

The importance of image guidance for safe and effective intervention is readily seen in the fields of interventional radiology and fluoroscopic procedures such as coronary artery angiography and orthopaedic operations. However, the increasing capability of other technologies for this role in surgery is readily appreciate by contributors to this working group. 3d reconstruction of saggital imaging is rated strongly amongst participants allowing the opportunity of digital twining and physical printing to enable preoperative and potentially intraoperative guidance of surgeons including in the navigation of anatomy and localisation of disease, resection extent and reconstructive options. Fluorescence guided surgery is also seen as an important technology especially by academic surgeons now but increasingly by trainee and clinical surgeons over the next ten years. Indeed in the field of colorectal perfusion assessment, fluorescence guided surgery now has the best evidence base supporting its use compared to other innovations in the field that have emerged over the past 15 years including robotics and single access surgical approaches. While data and data analysis are broadly projected to become increasingly important over the next ten years in this survey, a core component of such application to intraoperative surgical decision is likely to be surgical video aggregation at scale for the purposes of both testing and training algorithms in advance of clinical application although this was somewhat less appreciated relative to other technologies being considered by respondents. Harnessing full application of decision support methods will need a new way of deploying technologies in Ireland as such systems require network and computational investment and development broadly (different to single units equipping themselves with tools in isolation of the greater ecosystem) requiring connected thinking and development as we look into the 21st century.

Artificial intelligence- Dr Niall Hardy

Artificial Intelligence (AI) has seamlessly inserted itself into our everyday lives. From virtual assistants managing our calendars and schedules to personalized recommendations guiding (often unknown to us) our online experiences, almost all aspects of our daily routines are now influenced by AI methods. Beyond mundane tasks, AI's influence is steadily permeating the realm of healthcare with integration now widespread in many fields such as radiology (e.g. pulmonary embolism detection) and pharmacology (e.g. drug discovery).

Surgery too should embrace the integration of AI, heralding a new era of technological advancement within the field and in a manner beyond mere roboticization of movement but by means of true, digitally augmented, operator decision support. Such systems available now include computer-generated pre-planning models and intra-operative navigational aids in orthopaedics and plastics/reconstructive surgery and in general surgery. Exciting advances are being made in surgical video analysis, including for real-time tissue assessment. Of course, such disruption to traditional surgical workflows come with significant challenges including the acceptance of these technologies by the existing surgical workforce, balancing the pursuit of innovation with ethical considerations, privacy and data security, patient safety as well as the involvement of financially incentivized companies in the development and implementation of AI technologies.

In parallel, medical school teaching will also likely need to evolve to equip the next generation of doctors with the skills necessary to engage with and optimally interpret AI and machine learning based research, upon which their practice will likely be founded. Traditional scientific literature evaluation methods, although remaining generally important, feature less prominently in modern AI-based publications where familiarity with data analytics, machine learning fundamentals (including Deep Learning) and AI evaluation metrics (such as average training accuracy, validation accuracy and f-scores) are paramount.

Embracing the incorporation of new AI-based technologies in surgery will help to enhance the benefits listed as well as minimize challenges. It promises to be an exciting time of evolution in surgery with opportunities for all involved parties.

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INVITED PERSPECTIVES:

Embracing the future of surgical technologies.
Ozanan R. Meireles, MD, International Advisor

I commend the Royal College of Surgeons in Ireland (RCSI) for its visionary initiative in exploring the future of surgical technologies. The comprehensive approach taken by the New Technology for the Future of Surgery in Ireland working group underscores Ireland's commitment to advancing surgical practice through innovation and collaboration. Drawing from my experience in integrating innovations in surgical technologies at Massachusetts General Hospital, Duke University, and the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), I offer this international perspective to enhance the strategic outlook of this endeavor.

Global integration and technological adaptation: Ireland's proactive stance on integrating advanced technologies such as AI, digital health platforms, and image-guided surgery is highly commendable. The Health Service Executive (HSE) of Ireland has been increasingly adopting digital health solutions, such as the recent implementation of the eHealth Ireland initiative, which aims to improve patient care through digital innovation. These efforts are bolstered by initiatives like the Precision Oncology Ireland consortium, focusing on personalized cancer treatment. As highlighted in the report, the importance of technologies like 3D digital reconstruction for operative planning, data and analytics, and AI is expected to become even more critical in the next ten years .

Research and development: Ireland's collaborative ecosystem, which includes academia, healthcare institutions, and industry, is a significant asset. The collaboration between University College Dublin, the Royal College of Surgeon's in Ireland, the Mater Misericordiae University Hospital (MMUH) and IBM Research and an SME Deciphex on AI-driven healthcare analytics is a prime example of a successful partnership. Establishing dedicated innovation hubs, like the proposed National Institute for Health Research (NIHR) in Ireland, can facilitate the translation of research into clinical practice, ensuring that advancements benefit patients directly.

Regulatory and ethical frameworks: A robust regulatory environment is crucial for the safe integration of new technologies. Ireland's Health Products Regulatory Authority (HPRA) aligns well with European standards. However, adopting a flexible regulatory approach, akin to regulatory sandbox models used in other countries, could expedite the deployment of cutting-edge technologies while maintaining high standards of patient safety and ethical integrity. As highlighted in the report, ethical oversight and collaboration between regulatory bodies, industry, and healthcare providers are essential to ensure the responsible implementation of new technologies.

Education and training: Integrating advanced technologies into medical education is vital for preparing future surgeons. Ireland's medical institutions can benefit from adopting interdisciplinary training programs that combine surgical practice with engineering and data science. Initiatives similar to multidisciplinary and multi-institutional training programs, such as the Surgical Artificial Intelligence and Innovation Laboratory (SAIIL) at Massachusetts General Hospital, Massachusetts Institute of Technology, and Duke University, could serve as models for Ireland. Additionally, continuous professional development through comprehensive Continuing Medical Education (CME) programs will ensure that practicing surgeons can utilize the latest advancements. As highlighted in the report, structured training programs and integrating technologies like robotics and AI into the curriculum are crucial.

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Healthcare system integration: The seamless integration of new technologies into Ireland's healthcare system is essential for enhancing patient care. Implementing a unified digital health record system, integrating AI diagnostics and image-guided surgery platforms would improve data accessibility, operational efficiency, and, ultimately, patient outcomes. As highlighted in the report, Ireland can benefit from adopting integrated systems that incorporate AI and advanced imaging technologies, similar to successful models in other advanced healthcare systems. These integrated systems have demonstrated improvements in data accessibility, operational efficiency, and patient outcomes. Ireland's ongoing efforts, such as those in surgery at MMUH, demonstrate the potential for better patient outcomes and shorter hospital stays.

Patient outcomes and technology impact: Focusing on patient-centric outcomes, Ireland's technological adoption has shown promising trends in improving surgical precision and reducing recovery times. Conducting detailed case studies and long-term impact analyses, akin to those performed in other countries that have extensively studied the impact of various advanced surgical technologies, can provide deeper insights into the sustainability and effectiveness of these technologies. This data-driven approach will help refine strategies and ensure that technological integration continues to benefit patients. As highlighted in the report, the adoption of technologies like digital health records and advanced imaging techniques has already shown significant benefits in patient care and operational efficiency .

Future directions and strategic opportunities: Ireland is well-positioned to lead in specific niches such as personalized medicine, minimally invasive surgical techniques, and the ethical application of AI in surgery. By pioneering comprehensive guidelines for the ethical use of AI in surgery, Ireland can establish itself as a thought leader in responsible innovation. Developing a framework similar to the European Commission's Ethics Guidelines for Trustworthy AI can ensure that AI applications in surgery are used responsibly and effectively. As highlighted in the report, continuous evaluation and strategic investment in emerging technologies are essential to maintaining Ireland's leadership in surgical innovation .

Conclusion: Ireland's trajectory towards integrating advanced surgical technologies is on a commendable path. By leveraging international best practices and enhancing its strategic frameworks, Ireland can not only match global leaders but potentially become a pioneer in surgical innovation. The RCSI's initiative is a significant step in this direction, and I look forward to seeing the transformative impact it will have on surgical practice in Ireland and beyond.

New technologies and surgical training in Ireland, Mr Kieran Ryan on behalf of Irish Surgical Postgraduate Training Committee.

Technology and the digital world is and will continue to play a massive part in shaping Irish surgical practice, training and education. The pace of technological change in the delivery of surgery is however increasing all the time and as such the training programmes need to evolve to incorporate these technological changes in the delivery of care to patients. It also highlights that the training paradigm is one of continuous and lifelong learning and training. As well as achieving the standard of the day one consultant is the attainment of many phases of professional development for today's surgeons in training, for the rest of their remainder of their professional lives, change and development in accordance with the advancement of technology, research and evidence based care is clearly needed.

This report clearly lays out the crucial areas for such investment in the near future. In it, Prof Cahill and his team adopted the Stanford Design Thinking Process in the development of this report. This approach gives us valuable insight as a training body in the direction we should take Irish surgical training and education with respect to technological enhancements and developments in practice. From it, we take the following key recommendations for RCSI and Irish Surgical training

(1) New and disruptive technologies will and should play a crucial part in the development of surgical practice. There now needs to be greater alignment by key stakeholders on the role and integration of new technologies.

(2) There should be a clear training and educational strategy developed, resourced and implemented for surgeons and the wider surgical team to deal with the workforce and skills needs to maximise the positive impacts from new technologies.

(3) Research and research methodologies will be required to evaluate how these new technologies improve the quality of patient care, improve outcomes, reduce complications and adverse incidents, support productivity and manage costs.

(4) Surgical Training needs to develop to be more inclusive of other disciplines and professions, including digital and engineering expertise.

(5) Robotic Surgery is the current significant technological development in surgical practice and training and educational programmes need to integrate robotic training and clinical experience into the delivery of the curriculum

(6) The advancement of digital and data driven technology has presented a training paradigm we have not seen before. The digital ecosystem in surgery facilitates a more measurable environment with respect to acquisition of surgical skills, definition of proficiency and maintenance of skills. Understanding how we take these measurable elements of operative skills into the assessment of competence is required.

(7) The future technological environment for surgical training will be a continuous pursuit of assuring digital and artificial intelligence literacy among our trainers, trainees, researchers and educators.

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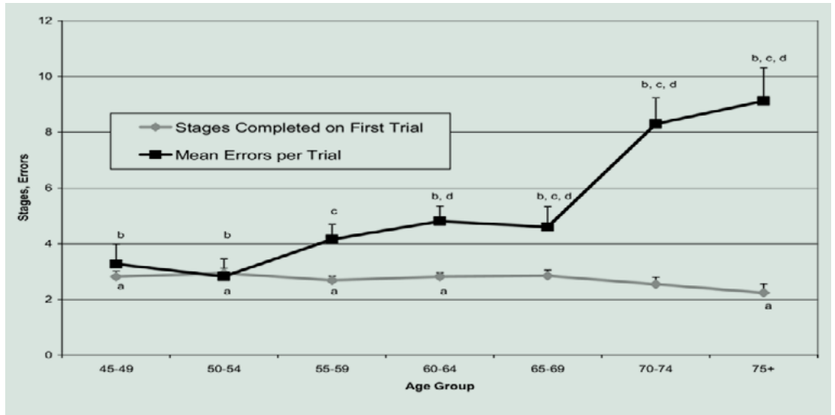
Alongside this, RCSI endorses the views of our sister college RCS England's (in conjunction with the Association of Surgeons in Training) own landmark report mapping out current thinking on the future direction of surgical training regarding new technologies in that:

- Research initiatives should evaluate the integration and application of technology into practice.
- Evidence-based technological solutions should be integrated into surgical training and training bodies need to have a clear educational and training outcomes framework for this.
- Equitable access to technologically enhanced training solutions should be sufficiently resourced.
- Trainers and trainees should be supported by their training bodies to develop digital literacy and proficiency in the use of technologies including the fundamentals and applications of robotics, artificial intelligence, imaging based diagnostics, prognostic modelling, genomics and digital consent.
- Collaboration with technological and industry providers is needed as well as with other stakeholders in relation to service delivery, funding and regulation to assure that the training of technology is objective, curriculae anchored and evidence-based re effectiveness.
- The ethical matters of any new technology must be considered and explored to ensure that patients are safeguarded and not disadvantaged by its use.

In all of this, surgical training in Ireland is of course anchored in the delivery of surgical services to Irish patients and therefore all of our training activities have to have the best interests of patient care and outcomes at its heart. RCSI and Irish Surgery have a global reputation for excellence in training and education. Taking necessary steps to assure the integration of new and emerging technologies into our training programmes will be vital to ensure that this reputation endures. It is also crucial to ensure that Irish patients can receive the best and most up to date surgical care from the best trained surgeons and surgical teams.

Career-long adaptation to new technologies by surgeons- Prof Paul Ridgway.

Although this report clearly shows adoption of new technologies is central to a surgical career, there has been relative paucity of studies looking at how new technologies have been adopted by surgeons at different stages of their career. While learning curve analysis has been performed post hoc in a range of surgeries, too often the new technology has been embraced enthusiastically and not always efficaciously, leading to undesired outcomes.[2] This, among other factors, has led postgraduate training bodies and industry alike to advocate for credentialling prior to clinical use of a new technology. Age adds an additional factor. On balance, adopting new methodologies/ technologies with advancing years of even experienced surgeons may represent an even greater challenge. Most of our understanding is based on a few studies looking at psychometric testing relating to specific surgeries in a range of age groups. The largest longitudinal generic study was published in 2008 and evaluated cognitive changes over a six year period in a 359 surgeons attending the American College of Surgeons meeting (see Figure).[3] Although surgeons performed better than age appropriate norms, they were not super human and had objective age related declines in attention, reaction time and visual learning. In addition, subjective perspectives regarding when objective declines may prompt clinical retirement consideration did not correlate. Surgeons so may not be the best judge of their technical skills diminution.



From Bieliauskas et al, Separation in psychomotor performance was noted for those after late 50s but did not correlate with subjective reports of decline

A parallel RCSI Short life working group evaluating the late career surgeon conducted a National survey in late 2023.[4] Of the 192 consultant respondents, a high proportion (93%) of the whole cohort wanted workload to be adjusted with advancing years, with 82% requesting enhanced training opportunities to adapt to newer technologies. When subgroup analysis was performed this wish for enhanced training in new technologies was well preserved, even in the younger quartile of newly appointed consultants. Clearly so for all these reasons there may be an enhanced role for postgraduate training bodies, as the subject matter experts, in licencing/ re-credentialing suitably trained practitioners for a selected basket of technologies. In addition, healthcare commissioners would have to consider systemic issues around ensuring safe and effective adoption of technologies a priori.

[2] Ziprin P, Ridgway PF, Peck DH, Darzi AW. The theories and realities of port-site metastases: a critical appraisal. J Am Coll Surg 2002 Sep;195(3):395-408.
[3] Linas A Bieliauskas 1, Scott Langenecker, Christopher Graver, H Jin Lee, Jillian O'Neill, Lazar J Greenfield. Cognitive changes and retirement among senior surgeons (CCRASS): results from the CCRASS Study. J Am Coll Surg 2008 Jul;207(1):69-78; discussion 78-9.
[4] Zulfiqar S, Lynch T, Ridgway PF; Professional attitudes towards Late Career Surgeons, Presented at Charter Day, RCSI 2024.

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New technologies in surgery in the context of "net zero" surgery- Prof Camilla Carroll.

For more than a century environmental scientists have been warning about the serious harmful effect human activity is having on the health of our planet evidenced by the accelerated decline in planetary health since the 1950s driven mainly by the consumption of energy derived from non-renewable sources (e.g. fossil fuels). Increasingly we are becoming aware of the "Global Climate Impact" associated with the delivery of 21st century healthcare. If the health sector were a country, it would be the fifth largest Green House Gas (GHG) emitter on the planet. The world's biggest climate polluters are associated with the biggest health sector climate footprint. The United States, China, and the European Union (EU) account for the top 3 contributors to healthcare's global climate footprint with the EU accounting for 12% of it alone.

The delivery of surgical care has a unique carbon footprint within healthcare. The surgical suite is a discrete functional unit within the hospital system and the operating theatre is utilised by multi-professional teams. Each surgical sub-speciality requires individual equipment and consumables. The surgical ecosystem has been identified as a "carbon hotspot" within the hospital setting, producing significant amounts of GHGs arising mainly from the use of volatile anaesthetic gases, high energy consumption and the use of consumables especially single-use plastics. Operating suites use 3-6% more energy when compared to the rest of the hospital setting and produce 21 -30% more waste. However, it's the use of consumables that is responsible for the most significant production of GHGs. Single-use surgical instruments are responsible for the top 20 contributors to high GHG intensity procured items. Data presented in the 2023 Green Surgery Report states that "Average reductions in carbon footprint of 38-56% are achieved through switching from single-use to reusable equipment".

It is a matter of significant importance that the surgical community takes immediate steps to mitigate the carbon footprint associated with the delivery of surgical care and moves towards the introduction of low carbon alternatives. Barriers to implementing sustainable principles and practice in the delivery of surgical care have been a lack of top-down and bottom-up leadership due to inadequate education and training in this evolving area. At RCSI we have taken a leadership role in highlighting the need to be 'Climate Smart' by informing our Surgical Community about the benefits to population health in following a "Green Agenda" when delivering surgical care and recently launched the RCSI document on "Sustainability Principles and Practice in Surgery" including an evidence based toolkit for the multidisciplinary surgical team outlining actions that can reduce the carbon footprint of the whole patient surgical journey.

So when it comes to consideration of new technologies, its essential that the surgical team considers how this fits with a needed move to "power-down" the operating room, without negatively impacting the delivery of safe and effective surgical care. Product selection by the surgical team is a very important part of addressing emissions associated with the operating suite along with the development of Green Theatre Champions to promote and sustain "Green Theatre Principles" in the perioperative workplace across the multidisciplinary team examining the carbon impact across the entirety of the patient's healthcare journey.

Medtech industry perspective- Mr Enda Mulvany.

In Ireland, as is clearly articulated by the respondents and contributors in this report, fostering innovative partnerships, collaboration and deepening trust between healthcare and industry is increasingly crucial. However, the adoption of new digital technologies face significant challenges, including cybersecurity, managing unstructured data, securing funding, and navigating the time required for implementation and adoption. Consequently, there is a pressing need for investment in information technology and information security personnel within the healthcare sector. Without these skilled stakeholders, decision-making processes and the pace of technology adoption may suffer delays.

To address these challenges, it is imperative to establish best practices for introducing new technology, such as implementing a Value Analysis Committee, defining a customer success charter, and ensuring consent and ethical considerations regarding data usage. Early adoption pathways following Value Analysis Committee review are particularly necessary in the current landscape. Feedback from research and industry stakeholders highlights trust issues in the healthcare sector. In response, HealthTech Ireland, in collaboration with Ibec's Irish MedTech Association, has developed the Irish Medical Technology Industry Code of Ethical Business Practice. This code aims to uphold a culture of integrity and ethical business practices within Ireland's medical technology industry. Compliance with this code is mandatory for HealthTech Ireland members in their interactions with healthcare professionals and organizations. Conducting research to identify technology providers' adherence to ethical standards is essential when exploring new solutions.

By working together, we can foster collaboration, build trust, and address the evolving needs of surgery in Ireland's healthcare landscape.

NEW TECHNOLOGIES FOR FUTURE OF SURGERY IN IRELAND
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APPENDIX ONE

Contributors to New Technologies for Future of Surgery in Ireland RCSI Working Group Report 2024			
Ms	Mary	**Barry**	Consultant Vascular Surgeon, St. Vincent's University Hospital.
Prof	Donal	**Brennan**	Professor of Gynaecological Oncology, UCD; Consultant Gynaecological Oncologist, Mater Misericordiae University Hospital.
Prof	Ronan	**Cahill**	Professor of Surgery, UCD; Consultant General and Colorectal Surgeon, Mater Misericordiae University Hospital.
Mr	John	**Caird**	Consultant Paediatric Neurosurgeon, CHI Temple Street.
Prof	Calvin	**Coffey**	Foundation Chair/Professor of Surgery, University of Limerick; Consultant General and Colorectal Surgeon, University Hospital Limerick.
Prof	Kevin	**Conlon**	Professor of Surgery, Trinity College Dublin; Consultant HepatoPancreatoBiliary Surgeon, St. Vincent's University Hospital.
Mr	Kevin	**Cronin**	Consultant Plastic Surgeon, Mater Misericordiae University Hospital.
Ms	Orla	**Cullivan**	Irish Surgical Training Group (Urology).
Prof	Aiden	**Devitt**	Consultant Orthopaedic Surgeon, University Hospital Galway.
Ms	Claire	**Donohoe**	Consultant Oesophagogastric Surgeon, St James's Hospital; Clinical Senior Lecturer in Surgery, Trinity College Dublin.
Mr	John	**Doris**	Consultant Ophthalmic Surgeon, University Hospital Waterford.
Prof	Tom	**Gallagher**	Consultant General, HPB and Liver Transplant Surgeon, St. Vincent's University Hospital.
Mr	Michael	**Gilbride**	Consultant Oral and Maxillofacial Surgeon, University Hospital Limerick.
Dr	Niall	**Hardy**	Specialist Registrar in General and HPB Surgery.
Prof	David	**Healy**	Consultant Cardiothoracic Surgeon, Mater Misericordiae University Hospital and St. Vincent's University Hospital.
Prof	Helen	**Heneghan**	Professor of Surgery, UCD; Consultant Bariatric and General Surgeon, St. Vincent's University Hospital.
Prof	Arnie	**Hill**	Professor of Surgery, RCSI; General Breast and Endocrine Surgeon, Beaumont Hospital.
Prof	John	**Hinchion**	Consultant Cardiothoracic Surgeon, Cork University Hospital.
Ms	Niamh	**Keane**	Project Manager, Surgical Affairs, RCSI.
Prof	Michael	**Kerin**	Professor of Surgery, University of Galway; Director of the Cancer Managed Clinical Academic Network (MCAN), Saolta University Health Care Group.
Ms	Debbie	**Killeen**	Project Manager, UCD, Centre of Precision Surgery.

NEW TECHNOLOGIES FOR FUTURE OF SURGERY IN IRELAND
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Prof	Aoife	**Lowery**	Professor of Surgery, Trinity College Dublin; HepatoPancreatoBiliary (HPB) Consultant Surgeon, St. Vincent's University Hospital.
Prof	Carmel	**Malone**	Consultant Breast and General Surgeon, Galway University Hospital; Head of School of Medicine, University of Galway.
Mr	Kevin	**McElvanna**	Consultant General and Colorectal Surgeon, Craigavon Area Hospital.
Dr	Jennifer	**McGarry**	SHO, Mater Misericordiae University Hospital.
Prof	Barry	**McGuire**	Consultant Urological Surgeon, St Vincent's University Hospital, Dublin and Professor of Postgraduate Surgical Education and Academic Development, RCSI.
Ms	Alison	**McHugh**	Irish Surgical Training Group President (ENT).
Mr	Nathaniel	**McHugh**	Irish Surgical Training Group (ENT).
Mr	Ozanan	**Meirieles**	Vice Chair of Innovation, Department of Surgery; Associate Professor of Surgery, Duke University School of Medicine; Surgical Director of Duke AI Health.
Ms	Alice	**Moynihan**	Clinical Research Fellow, UCD; Specialist Registrar in General Surgery.
Mr	Enda	**Mulvany**	Senior Business Development Director, Medtronic.
Prof	Peter	**Neary**	Professor of Surgical Oncology/Colorectal Surgeon; University Hospital Waterford/University College Cork.
Prof	Fergal	**O'Brien**	Professor of Bioengineering and Regenerative Medicine, Deputy Vice Chancellor for Research & Innovation, RCSI.
Mr	Sharjeel	**Paul**	Locum Consultant General and Endocrine Surgeon, Senior Clinical Lecturer, Cork University Hospital.
Ms	Megan	**Power Foley**	Irish Surgical Training Group (Vascular).
Ms	Nicola	**Raftery**	Irish Surgical Training Group (Gen Surg).
Mr	Darragh	**Rice**	Irish Surgical Training Group (Cardiothoracic).
Prof	Paul	**Ridgway**	Consultant General, HPB and Liver Transplant Surgeon.
Mr	Fiachra	**Rowan**	Consultant Orthopaedic Surgeon, University Hospital Waterford
Mr	Kieran	**Ryan**	Managing Director of Surgical Affairs, RCSI.
Prof	Patrick	**Sheahan**	Consultant Otolaryngologist Head, Neck & Thyroid Surgeon, South Infirmary Victoria University Hospital; Professor of Otolaryngology, University College Cork.
Mr	Ashokkumar	**Singaravelu**	Intercalated Research Masters Student, UCD.
Dr	Liadán	**Tobin-Schnittger**	Intern, Mater Misericordiae University Hospital.
Prof	Laura	**Viani**	President of RCSI.
Mr	Danilo	**Vukanic**	Irish Surgical Training Group (Orthopaedics).
Mr	Mark	**Wilson**	Consultant Oral and Maxillofacial Surgeon,Galway University Hospital.

APPENDIX TWO

ABOUT THE RCSI WORKING GROUP ON NEW TECHNOLOGIES FOR THE FUTURE OF SURGERY IN IRELAND.

The RCSI Future of Technology for Surgery Steering Committee was established in early 2023, at the request of President Professor Laura Viani and with approval by RCSI Council, to understand and set out the first steps of a path on how best Irish surgery could prepare for the future of surgical practice and care with regard to new technology in the broadest sense. The agreed outcome of the first committee meeting on 31st March 2023 was that a project team would, under the steering group and reporting to the Postgraduate Surgical Committee of the RCSI, engage with specialty, academic and training leads in Ireland to garner views and perspectives on how now and near future technologies impact their particular area with a focus especially on the next 5-10 years and both identify common ground and share back ambitions and concerns. This information is here collated as a framework document for presentation to the RCSI President and Council and, through them, the Irish Surgical Community to contribute to an informed position for wider stakeholder engagement on the direction and needs of Irish surgery including training relative to new technology.

WORKING GROUP COMMITTEE COMPOSITION:

Prof Ronan Cahill (chair), Consultant General and Colorectal Surgeon, Mater Misericordiae University Hospital and Full Professor, University College Dublin.

Prof David Healy, Consultant Transplant Surgeon, Mater Misericordiae University Hospital and St Vincents University Hospital.

Prof Carmel Malone, Consultant General and Breast Surgeon, University Hospital Galway.

Mr Enda Mulvany, Digital Surgery Lead, Medtronic Ireland.

Prof Fergal O'Brien, Deputy Vice Chancellor for R&I Office of Research and Innovation

Prof Paul Ridgway, Consultant Surgeon, Tallaght University Hospital.

Mr Kieran Ryan, Director, Surgical Affairs, Royal College of Surgeons In Ireland.

The chair of Surgical Affairs at RCSI for the duration of this working group was **Ms Bridget Egan**, Consultant Vascular Surgeon, Tallaght University Hospital.

Their work is acknowledged here with great thanks.

NEW TECHNOLOGIES FOR FUTURE OF SURGERY IN IRELAND
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METHODOLOGY:

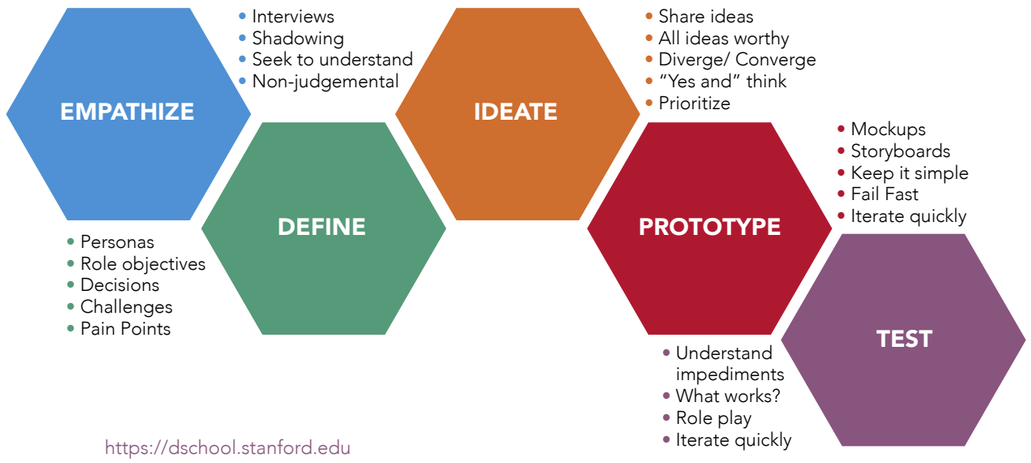
With committee consultation, these primary themes for development were agreed:

1. What technological advances are emerging in surgery now and in the next 5-10 years?.
2. What opportunities/challenges face specialties in this regard?
3. How will the delivery of training within specialties be affected?
4. What effect will future technology advances have on patients?
5. How should RCSI best position themselves to support surgeons and prepare for future technological advances?

To perform the consultative work along with data aggregation and analysis, a project team within the UCD Centre for Precision Surgery was commissioned for the work of generating data due to their reputation, interest and activity in the field of new technologies to better surgery. In considering new technologies, a definition that including disruptive technologies as innovations that significantly alter the way that consumers, industries or businesses operate was considered apposite to categorise technologies being considered and the scope was broadened outside of available now in theatre devices to include emerging trends that are changing the way many industries and even society functions. Examining analyst literature including from KPMG and McKinsey reports in this area identified the following technology categories as key emerging 'new' ways of working: 3d printing of physical models/implants; Artificial intelligence/cognitive computing (smart software systems); Data and Analytics (analysis of data to create real time change); Digital platforms for collaboration; Internet of things (smart and connected devices and systems); Large language models/generative AI; Marketing platforms (social media); Robotics; Virtual/augmented reality (smart head-mounted displays/glasses); and Wearable devices/remote monitoring to which was added the following 'surgery specific' technologies by brainstorming among the working group: 3d digital reconstruction of cross-sectional imaging; Biomaterials; Genomics; Surgical Video Aggregation at Scale and Fluorescence Guided Surgery.

Working Group Project Team Members	Role	Project Responsibilities
Ronan Cahill Professor of Surgery/Consultant General Surgeon UCD/Mater Misericordiae University Hospital	Project Team Lead	Liaison with RCSI, Development of project documents, Interviewer, Data Analysis and Report Writing
Debbie Killeen Project Manager, UCD	Project Manager	Project support & administration. Record keeping, Data Management
Ms Alice Moynihan SpR & Clinical Research Fellow UCD/Mater Misericordiae University Hospital	Researcher	Project setup including ethics application, data management & analysis, IHSTG Liaison, Interviewer and report writing.
Mr Ashokkumar Singaravelu	Researcher	Data and Graphical presentation

Stanford d.school Design Thinking Process



https://dschool.stanford.edu

Initial project team actions focused on identifying the framework of best fit for the research to ensure deep engagement with real-world experience and issues relating to the research questions. After considering several models, the Stanford d.school Design Thinking Process was agreed as suitable methodology for approaching the task for the following reasons: Design thinking encourages openness and relationship building as opinions are sought in a non-judgmental way; Use of a well-known and understood methodology is conducive to transparency and the robust generation of findings; The process aligns easily with the objectives of the project and in particular the qualitative nature of the data to be collected; Clearly defined steps are a natural fit for the structure of this project; Adherence to the step-wise nature of the process demands that adequate time is spent on deep and empathic understanding of user needs in order to allow for genuine insight, identification of problems with the highest level of specificity and eventual generation of the best solutions mitigating against the natural urge to "solutionize" right away.

It was agreed between the project team, the working group committee and RCSI Surgical Affairs and President that the scope of work fitted the Design Thinking stratagem best under the 'Empathize' and 'Define' stages, with findings then to be reported back to RCSI for consideration as to next steps. Specifically, in scope was engagement with all national stakeholders regarding now and near-term new technologies relevant to surgery including training considerations and how best to prepare for associated opportunities and challenges. Solutions and implementation were out of scope at this stage with 'Ideation' being envisaged to follow as part of any subsequent work. While brainstorming identified many relevant stakeholders that can help understand the wider significance of the issues in question to Irish society, the first constituent groups to be addressed were agreed to be:

- Specialty leads of established named representative speciality surgical groups in Ireland.
- Surgeons with statutory academic responsibilities (i.e. University Chairs of Surgery)
- Higher Surgical Trainee Leads (committee members of the Irish Surgical Training Group representing each specialty **https://istg.ie/home/about-us/committee-members/**)

It was felt that these together would constitute a representative sample of key stakeholders in the Irish surgical community to cover both current and future users of and key clinical decision makers for new technologies and their adoption. It was anticipated that these would also generate a data set that was acceptably diverse in terms of career stage, institutional affiliations and geographical spread. More broadly, other groups identified as relevant to Irish Surgery included International Surgical Professional Societies and Groups, Hospitals (including those in the Private and Independent sector), Industry, the Irish Medical Council, the Health Service Executive, Department of Health, Government, Patients and the broader Public, and it is envisaged that initial findings can be presented to these subsequently.

DATA COLLECTION AND MANAGEMENT:

The data collection tools for this framework approach to the core stakeholders were chosen by the project team and agreed by the committee to be:

- a preliminary questionnaire
- a semi-structured interview to be recorded for subsequent thematic analysis

The initial timeline was to complete data collection in Q3 2023 with the proviso that this would be subject to scheduling and availability of busy clinicians. A number of platforms were identified as suitable for use on the project namely:

- Google docs for storage and shared access to project documentation
- Google forms for circulation of questionnaire and initial collation of responses
- Doodle to offer a 'self-service' facility for booking interview slots
- Zoom to conduct face to face interviews. Interviews were recorded, auto-transcribed and individually re-checked for accuracy.
- NVivo (Lumivero) for qualitative data analysis.

on the basis of meeting the criteria for consideration:

- familiarity to the project team/ general sentiments around usability.
- availability as the project did not have dedicated resource for purchase of software or licences so platforms had to be free to use or available to staff through UCD IT.

QUESTIONNAIRE DEVELOPMENT AND PROCESS:

The questionnaire was finalised and circulated by email with a link to the Google form in September 2023. Using Likert-types scales, respondents were asked to indicate their attitude and opinions in relation to a series of questions in the following categories:

1. Sentiments re New Technology in Surgery.
2. Factors that drive your interest in new technologies (esp. investment decisions)
3. Knock on Effects of New Technology.
4. What technologies are important now?
5. What technologies are important in the next ten years?
6. To what extent is your specialty investing in new technologies?
7. How prepared are we to address each of the following opportunities/issues as they relate to new, disruptive technologies?
8. Exposure to new technologies during practice/training.
9. Technology access influence on decision to apply for a consultant post.

Submitted questionnaire data was downloaded from Google docs as a .csv file then exported to Excel for analysis. Names were removed as an identifier and responses were coded according to category (academic/non-academic/trainee). Responses at each point of the scale were totalled for every question. As a first pass at understanding the general attitude of respondents to each question a "Summary of positive answers" was created to capture the positive/negative feeling on each point. These early findings were presented back to RCSI in November 2023.

INTERVIEW PROCESS:

It was decided that peer-to-peer interviewing on a volunteer basis was likely to encourage the most candid responses and allow differing perspectives be elucidated so a semi-structured interview method via Zoom was developed. Once each respondent had submitted a response to the survey they were emailed an invitation to interview with a link to a Doodle poll offering a number of slots for booking. If none of the slots were suitable then other arrangements could be made to facilitate their scheduling. On confirmation of an interview slot, the interviewee was emailed two documents - a New Tech Meeting Outline which set out the structure of the interview and a Future of Surgery Information Leaflet for informed consent. All participants were also reminded at the start of the zoom interview that it would be recorded for later analysis. Each interview was attended by two members of the project team but, to avoid hierarchical imbalance, the project team interviewer was at the same career level as interviewees while the other team member took a listening and note-taking role.

THEMATIC ANALYSIS:

Interviews were recorded and transcripts generated within the Zoom app (each zoom interview auto-generated three types of files - video, audio and a transcript) before being checked and cross referenced manually by verification of the transcript against the audio file to ensure accuracy including correction of syntax & medical terminology, removal of timestamps and general sense-checking. Thematic analysis of the corrected transcripts was performed using NVivo software with manually coding to identify theme, subthemes and sentiment. Where appropriate interviewees were grouped according to gender, role (academic, clinical lead, trainee) or seniority (trainee, consultant) to assess for differences between groups. Statistical analysis was performed using SPSS with Fischer's Exact test used for comparative statistics due to small sample size. Interviews were all completed between September 2024 and February 2025. Corrected transcripts were imported and preliminary coding started in mid-December 2023 being completed in March 2024.

ETHICS:

Due to the nature of the work programme including data collection and management, ethics committee input was formally sought in advance of commencement and assured via low risk ethics exemption from University College Dublin (see Appendix Three), as the project team all work within this institution.

NEW TECHNOLOGIES FOR FUTURE OF SURGERY IN IRELAND
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SEMI-STRUCTURED INTERVIEW FORMAT (SUPPLIED IN ADVANCE OF INTERVIEW).

Structured interview- Recorded via zoom. Expected duration 30-45 minutes.

The goal is to articulate a vision for Irish Surgery with a focus on new technologies. This workshop will feed into a positioning statement for Ireland to be advanced via RCSI Surgical Affairs. The focus in on imagining the future, enabled by new and near future technologies and the creation of a common goal between RCSI and stakeholders.

The meeting is about answering these strategic questions

(1) "How do you identify, access and utilize surgical technology today?"

(2) "What is the difference you want to make for patients?"

(3) "What is your/our ambition for surgery in 2035?"

To do this, we would like your insights regarding the current state and ambition for your speciality. Alongside the questions above, we will complete with you canvases for both the value proposition for new surgical technology and the cover story for each specialty/stakeholder.

Following the interview phase, we will look for foundational themes between specialities and other stakeholders around common goals that will feed into to an overall charter for future of surgery in Ireland.

Meeting agenda:

(1) Welcome

(2) Confirm consent, agenda and expectations (5 mins)

(3) Strategic Qs1-3 above (5 mins each)

(4) Value proposition canvas (5 mins)

(5) Cover story canvas- inspirational example, bold and ambitious vision (5 mins)

(6) General comments: How is this ambition realized with new technology? Disruptive Technologies Value Map/Role of RCSI/Any other perspectives.

(7) Wrap up

Cover story canvas

Challenges the client to project themselves into the future and envision what success looks like.

In the long-term- think beyond the realm of the known and safe- why else would there be a story about the client in one of the world's best selling magazines.

The canvas provides solid input for formulating a more formal vision, vision statement and high level business case

Cover- should jump out

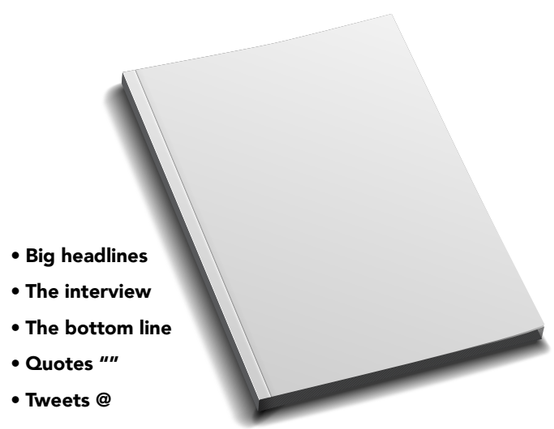
The interview- what are patients saying about the specialty/hospital when they are interviewed?

Social media- what would get retweeted (inc photos)?

Big headlines- eye popping, what would make people stop in their tracks and read the article?

The Bottom line- what would it all boil down too, what has been achieved according to the article?

Quotes- Not just positive quotes, how will others including critics respond?



NEW TECHNOLOGIES FOR FUTURE OF SURGERY IN IRELAND
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Disruptive technologies value map (KPMG) categories:

Table stakes: high investment for strong impact today.

Strategic: significant investment today for strong impact tomorrow.

Maturing: strong impact without high investment (system hum along at producing value).

Sunrise/sunset: medium investment with medium impact.

Nascent/future stars.

APPENDIX THREE

ETHICS APPROVAL LETTER
PARTICIPANT INFORMATION AND CONSENT FORM

UCD School of Medicine
Catherine McAuley
Education and Research Centre,
University College Dublin
Mater Misericordiae University Hospital
Nelson Street, Dublin 7, Ireland
T +353 1 716 4597
www.ucd.ie/medicine

1. Introductory statement

This study entitled "The Future of Technology for Surgery" is being conducted by Prof. Ronan Cahill at the UCD Centre for Precision Surgery.

2. What is this research about?

This research aims to discern the views of clinical and academic leaders within Irish Surgery on the potential benefits technology may hold for Irish surgery over the next decade, with regard to improving patient care and advancing surgical services and research.

3. Why am I doing this research?

You have been asked to participate in this research due to your role as a clinical, academic or trainee lead within an Irish surgical society or association.

4. How will your data be used?

If you agree to participate in this study, you will take part in a semi-structured interview with a nominated researcher on the study, exploring the research topic. This interview will be recorded to allow for later transcription and thematic analysis. Your level of experience (Consultant vs Trainee) will be recorded alongside basic demographics such as age and gender to allow for subgroup analyses.

5. What will happen if you decide to take part in this research study?

If you agree to take part in this research study, you will be invited to participate in a 30-45 minute semi-structured online interview with one of the researchers at a time chosen at your convenience. You will be asked a series of questions exploring the topic of technology in surgery in Ireland. While these questions have been pre-prepared, the interview will be conducted in such a manner as to allow a broad discussion of the topic. You may decline to answer any question without giving cause.

6. How will I protect your privacy?

All data related to the study will be stored in a secure manner at UCD Centre for Precision Surgery in keeping with GDPR best practice. Your data will be pseudonymised at the point of collection. Continuous efforts will be made throughout the study to ensure your privacy. Transcripts will be coded and amalgamated during the process of thematic analysis to maintain privacy and direct quotations that may result in identification will not be used in any subsequent report or publication.

NEW TECHNOLOGIES FOR FUTURE OF SURGERY IN IRELAND
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7. What are the benefits of taking part in this research study?

While there is no direct benefit to the individual in taking part in this study, it is our intention that the results of this study will be included in a framework documented to be presented to the RCSI President and Council, which has the potential to benefit all surgical practitioners.

8. What are the risks of taking part in this research study?

As with any study there is the risk of a data leak in relation to this study. However, all appropriate measures will be taken to avoid this and sensitive personal data will not be collected as part of this study.

9. Can I change my mind at any stage and withdraw from the study?

Participants may withdraw from the study without needing to provide a reason up until the point at which their data has been integrated with that of the other participants during the analysis phase of the study.

10. How will I find out what happens with this project?

The results of this study will be submitted for publication in peer reviewed academic journals. Participants will have the opportunity to review these submissions if they so wish.

On the basis of what is stated about, I AGREE to participate in this research project:

Adult Participant Consent Form	Tick Yes
I have been given a copy of the Information Leaflet and this completed consent form for my records	
Do you feel you have been given sufficient information about the research to enable you to decide whether or not to participate in the research?	
Have you had an opportunity to ask questions about the research?	
Do you understand that your participation is voluntary, and that you are free to withdraw at any time, without giving a reason, and without penalty?	
Are you willing to take part in the research?	
Are you aware that the interview will be audio recorded?	
Will you allow the research team to use anonymised quotes in presentations and publications?	
Will you allow the anonymised data to be archived, to enable future use and sharing to third parties?	

Participant

NAME and SURNAME of the participant …….....

Email …….....

Signature ……..... Date…….....

LS-LR-23-207-MOYNIHAN-CAHILL LOW RISK STUDY APPROVAL

Thursday 7 September 2023

Dear Alice

Thank you for your low-risk study submission to the Human Research Ethics Committee – Sciences (HREC-LS) which meets the criteria for a low-risk study with human participants only. Should the nature of your research change and thereby alter your low-risk status you should inform the Committee.

Please note for future correspondence regarding this low-risk study that your Research Ethics Reference Number is: **LS-LR-23-207-Moynihan-Cahill**.

This Low-Risk Study is approved by the HREC on the condition that you have provided accurate details of the study and that you will observe the following:

- **External rec approval and/or permission to access/recruit human participants/ or their data:** *(if applicable)* Please be aware that recruitment of participants or data collection should not begin until written permissions to access them are secured from the appropriate authority such as external organisations/individuals/internal schools, colleges and units.
- **Researcher duty of care to participants:** please ensure that ethical best practice is considered and applied to your research projects. You should ensure that participants are aware of what is happening to them and to their data whether a study is de-identified or not. All researchers have a duty of care to their participants who have the right to be informed, the right to consent to participate and the right to withdraw from the study.
- **Please note** that HREC no longer process **insurance cover** on behalf of the researcher. Researchers are required to complete a self-assessment form from the UCD SIRC office – please see https://www.ucd.ie/sirc/insurance/humanresearchinsurance/

Any additional documentation should be emailed to research.ethics@ucd.ie quoting your assigned reference number (provided above) in the subject line of your email.

All low-risk studies are subject to a research ethics compliance review.

Regards

Jan

Janette Stokes
Research Ethics Officer
Office of Research Ethics (ORE)
W. www.ucd.ie/researchethics

RCSI

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