



Royal College
of Surgeons
of England

ADVANCING SURGICAL CARE

The RCS England Innovation Hub

Our journey so far...

The introduction of a national flagship
surgical innovation hub

February 2026

INNOVATION



FROM RCS ENGLAND

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Foreword



It is with great pride that I introduce this report, looking back at the inaugural two years of the Royal College of Surgeons of England Innovation Hub. It is a testament to the remarkable journey that RCS England has embarked on, reflecting on the progress and achievements as well as the collaborative spirit of the I-Hub that have fuelled the group's endeavours.

The genesis of the I-Hub lies in the seminal report from RCS England's Commission on the *Future of Surgery*. Published in 2018, the *Future of Surgery* report highlighted the immense potential of technology in reshaping the landscape of surgical practice. It underscored the imperative to empower surgeons with the skills and knowledge necessary to navigate the dynamic intersection of innovation and patient care. By commissioning and publishing the *Future of Surgery* report, RCS England assumed the responsibility of driving a cultural shift, not only in the realm of surgery

but also as a vanguard for healthcare innovation across the UK. The mandate was clear: create, appraise and adopt the right technology for the right patient at the right time.

In response to this call to arms, the RCS England I-Hub emerged with a focus on proactive change. It is wholly committed to fostering a culture that embraces cutting-edge technology from frontline colleagues and industry partners.

I extend my deepest gratitude to the I-Hub team, who constitute the backbone of this activity. Hailing from multiple specialties and spanning different levels of seniority, the members of the I-Hub group exemplify the power of collaborative activity. Working with experts in RCS England complements the breadth of perspective that each team member brings to the table. This coalescence of thought and activity has been key in shaping the group's approach to innovation and ability to get things done.

I am particularly indebted to Professor Neil Mortensen and Mr Tim Goodacre for their unwavering early support, laying the foundation for the group's inception and initial activities. Their vision and commitment have been instrumental in propelling the I-Hub on its current trajectory. Additionally, I express my sincere appreciation to Mr Tim Mitchell, our current President, for his steadfast and ongoing support, reinforcing RCS England's dedication to championing the cause of surgical innovation.

As we unveil the achievements of the first two years, let it be known that this is merely the beginning of a journey. The I-Hub is poised to shape the future of surgical innovation. I invite you to join us in celebrating the accomplishments outlined in this report, and hope it inspires you to join the I-Hub network and support the activities that lie ahead.

Mr Ryan Kerstein
Director, RCS England I-Hub

Background

The ever-evolving innovation landscape in healthcare

Recent technological advancements and a programme for digital transformation in the NHS have fuelled new possibilities for the delivery of healthcare. The critical importance of innovation in improving patient outcomes is highlighted in the 10 Year Health Plan for England¹ and NHS England's wider innovation programmes². In commitment to innovation, NHS England launched its Accelerated Access Collaborative in 2016 to speed up the implementation and widespread adoption of groundbreaking innovations set to transform care.³ Ten years on, the health service and its patients are beginning to reap the rewards of proper resource and investment in healthcare technologies, as evidenced through the 2023 NHS Innovation Showcase event at the Royal Institution in London.

With the arrival of new technologies came the requirement to train the workforce in how best to safely and effectively apply them in practice. Published in 2019, the Topol review addressed this current skills gap with a strategic plan aiming to prepare the current and future NHS workforce for an influx of technological innovation across the next two decades.⁴ In order to create a digital-ready workforce, the NHS, royal colleges and other training bodies must take responsibility for providing up-to-date and relevant training to meet the needs of patients.

Various national initiatives to support workforce innovation training have been created, with the NHS Clinical Entrepreneur Programme leading by example through supporting frontline, problem-focused ideas from NHS professionals and refining them into commercial solutions fit for the NHS. Its success has facilitated the creation of 505 startups with a collective total of £971.4 million raised in funding.⁵ Other acclaimed formal training programmes include the NHS Digital Health Leadership Programme and the Topol digital fellowships.^{6,7}

Improving surgical outcomes through innovation

While an NHS-wide approach to innovation is necessary, surgery has distinct requirements to achieve a technology-enabled workforce. The demand for innovation is compounded by significant challenges faced in surgery. These include workforce recruitment and retention, the growing elective backlog, and increasing demands for surgical care due to an ageing population with a complex disease burden.

In recognition of the challenges and changing requirements of the surgical workforce, RCS England set up the Commission on the Future of Surgery in 2016. The commission released its landmark *Future of Surgery (FOS)* report in 2018, when the NHS was celebrating its 70th birthday, providing a vision for the next 30 years until the centennial year.⁸ The four technology domains identified in the report as most likely to make the greatest impact in surgery were: minimally invasive surgery; imaging, virtual reality and augmented reality; big data, genomics and artificial intelligence (AI); and specialised interventions. It recommended that in order to realise the potential of these new technologies, surgeons should be trained not only in the skills and knowledge to apply them but also in how to evaluate and implement these technologies locally.

Supplementing the original report, a second report, titled *Future of Surgery: Technology Enhanced Surgical Training (FOS:TEST)*, was released in 2022.⁹ This utilised the vision of the Future of Surgery Commission to provide a blueprint for evidence-based technological solutions to aid the redevelopment of the surgical curriculum and train the future generation of surgeons in how to make optimal use of these technologies.

The surgical innovation dilemma

Despite these pivotal reports, an innovation skills gap still exists in the surgical workforce, with a lack of formal teaching available to surgeons in training. This creates the danger of surgical innovations being inadequately or inappropriately applied to patient care and a surgical workforce that is unable to deliver on the Future of Surgery vision. Another recognised challenge is the disconnect between frontline surgical innovators, academia and industry, leading to ineffective, non-user-centred innovation development. Conversely, surgical innovators find it difficult to partner with industry to develop solutions to validated problems they face. Perhaps most importantly, there is a lack of coordinated national activity to understand the greatest needs in surgery that targeted innovation could address and where this innovation would have the greatest impact. Without critical oversight of the national surgical landscape, we run the risk of repetition, creating ineffective solutions and human resource inefficiency.

Furthermore, a significant cultural barrier exacerbates the surgical innovation dilemma: a pervasive sense that innovative surgeons lack the endorsement to follow through on their ideas. This cultural issue is deeply rooted in the surgical field, where tradition often holds a strong grip and deviation from established practices is met with resistance. This environment can stifle creativity and leave many potentially transformative innovations undeveloped. The result is not only a series of lost opportunities to advance surgical care but also a palpable sense of demoralisation among staff who feel their innovative potential is not valued. Addressing this cultural barrier is essential to cultivating an ecosystem where innovation is not just welcomed but actively encouraged, ensuring that the surgical workforce feels empowered to explore and implement new ideas that could redefine patient care.

The creation and aims of a surgical innovation hub

Exacerbated by the demand to develop capacity and capability in the workforce in innovation, these pain points felt by current surgical innovators demonstrated a need for a national organisation to lead the development of surgical innovation activities. In autumn 2022, RCS England was proud to launch the I-Hub, a flagship national bespoke surgical hub for innovation.

The I-Hub aims to create a collaborative network of surgical innovators from the NHS, academia and industry, connecting the whole ecosystem to work in partnership to deliver evidence-based innovations for surgery and our patients. It will empower surgeons and encourage them to start their innovation journey. This includes both the intrapreneurial tech enthusiasts who want to implement innovations locally and the clinical entrepreneurs aiming to bring novel devices and concepts to healthcare but who require support at the very early conceptual stage. The I-Hub will foster a culture of creativity and collaboration, encourage entrepreneurship, inspire surgeons in training, upskill the workforce to deliver on the future vision of surgery and likely support growth in the surgical innovation ecosystem.

The RCS England I-Hub

Our vision

To be an innovation hub that puts RCS England members first, and that supports, develops and connects frontline surgical innovators with academia and industry to create and adopt world-class innovations in surgery.

Our objectives

RCS England's I-Hub has been established with four goals:

1. To guide and support members through the complex innovation pathway, from local technology adoption to pioneering ideas that enhance surgical practice
2. To supply resources and skills development for both intrapreneurship and entrepreneurship, empowering surgical innovators in the field
3. To recognise and foster the role of the surgical innovator, providing the support needed for their development
4. To create a comprehensive network of surgical innovators, spanning RCS England's membership, the UK's medtech sector and beyond

The story

The I-Hub has been created from the personal experiences of a team of frontline surgical innovators. The team members have each identified problems in their workplace and successfully developed innovative solutions to address these. Each has been successful in their own right and all share a common experience in the process: that it was a lonely journey, filled with challenges and stifled by a lack of know-how in moving their idea from conception to fruition. This lack of guidance and support led to a circuitous route for each that may have been avoided with the right guidance. Streamlining and guiding surgical innovators is something the whole team is passionate about, and this resulted in the creation of the I-Hub.

What is our unique selling point (USP)?

Our USP lies in being the UK's first innovation hub embedded in a royal college, designed specifically to cater for the needs of RCS England's fellows and members. Being a part of RCS England gives the I-Hub a distinct, strong and esteemed platform in a globally recognised body. The prestige of the College also positions it as a catalyst for cultural transformation, setting the stage for the I-Hub to lead in surgical innovation.

This leadership role of RCS England is not new; it has been evidenced previously through the *FOS* reports,^{8,9} policy documents, and pioneering robotics and digital programmes. Building on this groundwork, the I-Hub will sit as the surgical innovation ecosystem's nexus, bridging gaps between surgeons, academic institutions, regulatory bodies, policymakers and industry.

How does the I-Hub deliver on its objectives?

The RCS England I-Hub serves its members through the development of skills and experience in innovation, and the creation of a connected network of surgical innovators and their wider healthcare partners. This aligns with the core values of the College. It provides leadership in surgical innovation, engaging the profession to achieve cultural change, influencing policymakers and identifying high-impact areas in surgical innovation. The I-Hub identifies NHS leaders in surgical innovation and has created a network of frontline surgical innovators both from the intra- and entrepreneur cadre. This network of surgeons collaborate with each other on innovation projects, support the adoption of evidence-based surgical innovations and contribute expertise to ongoing surgical developments.

Whether at the conceptual stage or when bringing a product to market, members can access expert advice from the I-Hub team and its network to advance their ideas. The I-Hub also connects its membership network with academic and industry partners to accelerate the delivery of technical advances in surgery.

How can innovation hubs support the workforce to deliver world-class innovations?

Innovation hubs have gained traction as a collaborative space for innovators, academia, industry and policymakers to develop new ideas and implement new technologies in healthcare. There are many local and regional examples including Alder Hey Innovation in Liverpool, TheHill in Oxford, and the Buckinghamshire Research and Innovation Lab while national examples include the Ministry of Defence's jHubMed, the NHS Accelerated Access Collaborative and Innovate UK's Innovation Hub.^{3,10-14}

Broadly speaking, these entities support and develop entrepreneurs, connect stakeholders, accelerate innovation development, and (if successful) facilitate economic growth and improve patient care. They do this through the generation of new innovative technologies and the acceleration of existing innovations to a broad market. Surgery has its own challenges that innovation will help to address. Prior to the creation of the RCS England I-Hub, there was no national dedicated surgical innovation hub in the UK to support surgeons. This limited the potential of the workforce to deliver user-centred, clinically valuable, transformative evidenced-based innovations.

RCS England and innovation

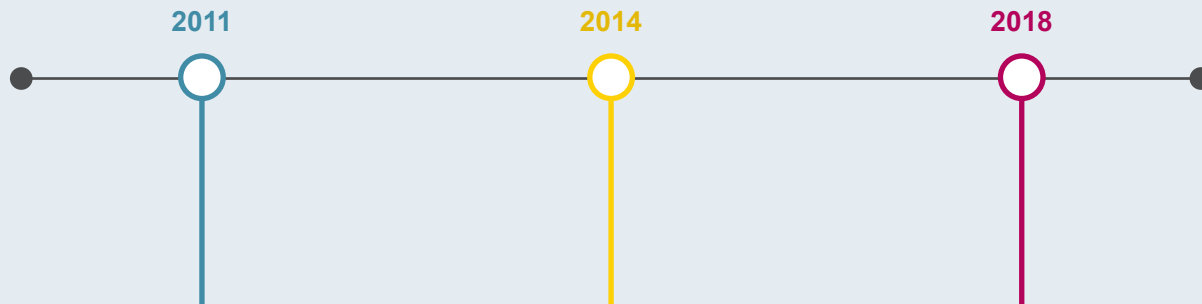
RCS England has a history of championing innovation in surgery, from funding the evaluation of new techniques through to providing expertise to government and regulatory bodies about new technologies. The Cutlers' Surgical Prize, for example, was instituted in 1981 and has become established as one of the most prestigious annual prizes for original innovation in the design or application of surgical instruments, equipment or practice to improve the health and recovery of surgical patients.¹⁵

Leaders in RCS England have acknowledged the potential of technological advancements for the improvement of surgical care. In its response to the NHS chief executive's innovation review in 2011, RCS England noted the importance of innovation in developing new surgical treatments and reiterated that innovation should be a top priority for the NHS.¹⁶ The College followed this statement with its report *From Theory to Theatre*, which advocated for the highest-quality surgical research that translates into effective frontline clinical advances.¹⁷

Innovation in surgery is not just about digital transformation, medical devices and new processes but also about new techniques. This is an aspect of innovation that distinguishes surgery from other clinical specialties. A follow-up report titled *From Innovation to Adoption* was produced by RCS England in 2014 to highlight factors that have enabled and hindered the adoption of prominent surgical innovations and techniques in the past.¹⁸ This provided a pathway for the evaluation and adoption of promising evidence-based surgical innovations to improve surgical care.

More recent reports include *FOS* and *FOS:TEST*,^{8,9} and a new good practice guide produced in 2019 to inform surgeons of the best practice in surgical innovation.¹⁹ Titled *Surgical Innovation, New Techniques and Technologies*, this is an excellent resource for surgeons who are exploring the development of new techniques or technologies with patient safety at the forefront. Given the increased uptake of robotic-assisted surgery across the NHS, further good practice guidance aimed at robotic surgeons was released in 2023.²⁰

Timeline: RCS England reports on innovation

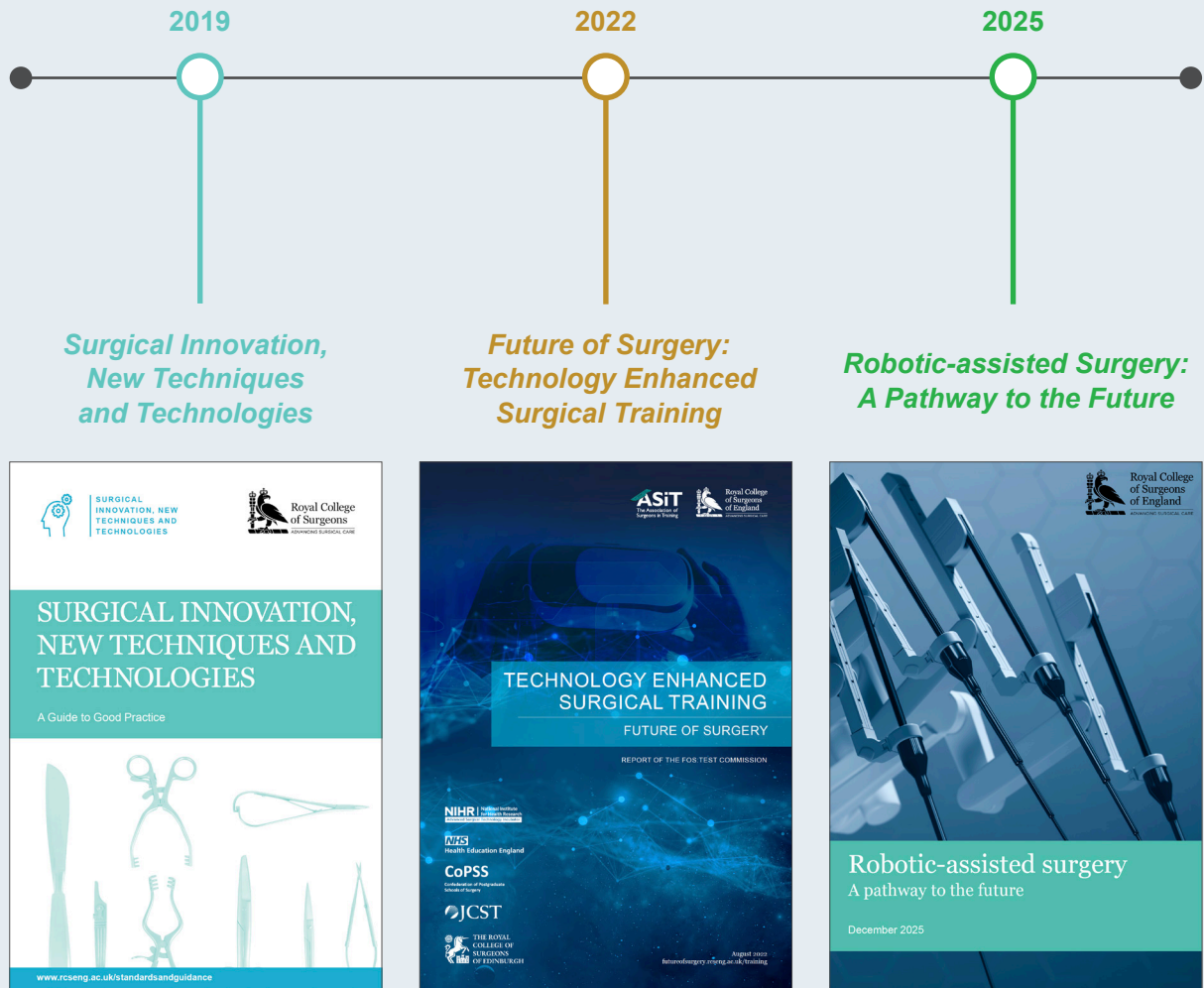


From Theory to Theatre

From Innovation to Adoption

Future of Surgery





RCS England to deliver the Future of Surgery vision

RCS England is well positioned to become the leading organisation to drive surgical innovation and deliver on the vision outlined in the *FOS* report.⁸ The College is a charitable organisation that exists to serve its surgical members and the surgical workforce. It is an institution that is highly experienced in informing policy and the direction of surgery. The close relationship that RCS England has with its membership enables it to identify and address the recognised challenges in surgical innovation. The College has an important role in this new phase of innovative technological advancement and believes it must support the surgeon innovator.

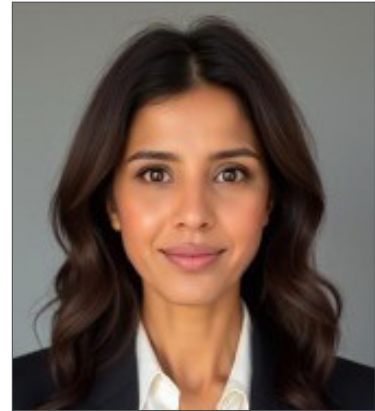
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Highlights of the first two years

1. Industry workshop (September 2022)

Convenors: *Ryan Kerstein, Edward St John and Marcus Stow*

Engaging industry and leading national stakeholders to discuss how a flagship innovation hub can augment and facilitate world-class surgical innovation

The RCS England I-Hub aims to develop and foster strong partnerships between frontline surgical innovators, academia and industry. With this in mind, the I-Hub launch event on 7 September 2022 was a pan-stakeholder event to get the broadest possible views on innovation in surgery.

The I-Hub launch event opened with words of commendation and support from the RCS England President, Professor Neil Mortensen, the RCS England Future of Surgery Commission chair, Mr Richard Kerr, and the national clinical lead for innovation at NHS England, Professor Tony Young. The primary aim of the event was to facilitate roundtable discussion with national stakeholders about the current surgical innovation landscape, and the role that the I-Hub could occupy to augment the process for both surgeons and industry.

The objectives were to:

- introduce the concept of the I-Hub to industry
- initiate a network of industry partners committed to supporting the goals of RCS England and the I-Hub
- create a synergistic and connected relationship between industry and the community of frontline surgical innovators

Workshop outcomes

- The I-Hub should act as a focal point for a national network of surgical innovators.
- Industry welcomes the establishment of the I-Hub as a uniquely positioned entity, which is currently missing in the surgical ecosystem.
- The implementation of a flagship surgical innovation hub may bridge the current gap observed between industry, regulators, partners and frontline surgical innovators.
- The I-Hub should act to streamline the innovation process for industry and innovators to encourage inward investment into the UK healthcare system.
- Despite the creation of effective and safe surgical innovations, industry is still challenged by the process of widespread adoption in the NHS. The I-Hub should consider how it could streamline this process so that clinically valid innovations benefit patients consistently and coherently across the whole NHS.
- The I-Hub should serve the needs of the UK's surgical community and patients, and generate calls to action aimed at solving the most pertinent and difficult surgical challenges.
- The I-Hub should exist to serve its membership, providing skills development and support to frontline innovators with early-stage developments.

Stakeholders in attendance at our launch event

- Surgeons
- Global technology companies (Google, Microsoft)
- Surgical device manufacturers (Intuitive Surgical, Medtronic, Johnson & Johnson)
- Startups (Eagle Eye Surgical, Concentric Health, BIOS Health, Proximie, eConsult, Fundamental Surgery, Pando, Eva Health Technologies)
- Charities and universities (RCS England, University of Bristol)
- Service providers (NHS England, NHS Digital, Health Innovation Network)
- Governance/regulatory bodies (Medicines and Healthcare products Regulatory Agency)
- Consultancy firms and funders (PUBLIC, SBRI Healthcare, KHP Ventures)

Key numbers

- Blue-chip companies: **5**
- Healthcare startups: **8**
- Surgeons: **11**

2. Survey (October 2022 – November 2024)

Surveying members, surgical innovators and industry leaders regarding the creation of an RCS England innovation hub

Since October 2022, RCS England has been surveying a range of stakeholders who are fundamental to the future operations of the I-Hub. A QR code for the survey was shared at our opening stakeholder events and at the Future Surgery Show in 2022, 2023 and 2024 as well as via an editorial in the RCS England *Bulletin* in 2023.²¹

The survey aims were to:

- gain insight about potential users of the I-Hub, including their characteristics and experience in innovation
- understand stakeholders' and members' wants and needs from the flagship RCS England I-Hub
- build a founding network of subscribers to the latest updates and activities of the I-Hub

The survey was completed by stakeholders outside the known, close community of surgical innovators and provided actionable insights. The inclusion of diverse surgical stakeholders aligned with the core aim of the I-Hub to include fellows and members who are new to surgical innovation but who are interested in learning and becoming part of this new network.

Survey results

A total of 156 respondents had completed the survey by November 2024, including RCS England fellows and members, surgeons from other colleges, allied healthcare professionals in the operating theatre and students. There was representation from across the whole of the UK.

Key characteristics of respondents

- 36% had at some point held a formal role in innovation, or had founded or worked in a medtech company.
- 20% had developed their own innovations as an entrepreneur.

Areas of innovation most likely to have an impact on surgery

- AI
- Robotics
- Augmented and virtual reality

Highest-priority deliverables requested by respondents

- Coordinating a network of surgeons with an interest in innovation
- Workshops for developing digital skills
- Meeting spaces for surgical innovators and industry to collaborate
- Innovation resource templates (including non-disclosure agreements, project plan tools etc)

Key numbers

- Survey respondents: **156** (from October 2022 to November 2024)

3. Future Surgery Show 2022 (November 2022)

Setting out the I-Hub's vision to the surgical community

The I-Hub was present at the annual Future Surgery Show in November 2022. On day 1, the team showcased the I-Hub's vision to an audience of surgeons, industry and other stakeholders. The team engaged in debate around the current surgical innovation ecosystem and answered questions from attendees. The audience was invited to participate in a survey designed to develop insight into how the flagship RCS England I-Hub could support surgeons.

4. RCS England/ASiT innovation skills course (December 2022)

Convenor: Joshua Burke

Innovation skills development is core to the I-Hub, building on and implementing the recommendations in the *FOS:TEST* report.⁹ On 16 December 2022, the I-Hub supported the Association of Surgeons in Training (ASiT) and the RCS England Expert Advisory Network (EAN) to deliver skills development in innovation.

The two-day innovation skills course (funded by B. Braun through the RCS England 'proof of concept' programme) brought together surgeons in training, medical students and wider interdisciplinary professionals from industry and academia to equip delegates with the core tools and knowledge required to innovate in surgery. The blend of talks and interactive workshops helped delegates in developing their early-stage ideas.

Topics in this course included:

- core surgical innovation themes including AI and robotics
- development of innovation surgical skills
- identifying unmet needs
- developing a business case
- evidence generation
- intellectual property and law
- pitching and presentation skills

Key numbers

- Attendees: **17**
- Surgical innovation experts: **8**
- Days of workshops: **2**

5. Fellows and members workshop (January 2023)

Creating the I-Hub's vision from a room of surgical innovators and members using the Google Ventures design sprint process

On 30 January 2023, the I-Hub welcomed surgical innovators from the RCS England membership to an interactive workshop. The purpose was to engage the members in conversation about the development of an innovation hub, gaining insight into how this could help surgeons deliver the best and safest surgical care, supported by world-class innovation.

This workshop was designed so that attendees were unaware of any previous development work. This was to prevent bias and enable the most creative-minded surgical innovators to generate original ideas about the I-Hub vision. Following an approach that used an abridged version of the Google Ventures design sprint model (see below),²² the attendees were asked to address one of the following two questions:

1. How can we make the NHS surgical innovator a recognised, supported and effective role in the surgical team?
2. How can we generate innovative health interventions across the surgical pathway to improve patient outcomes and experience?

Combining their experience, the two groups engaged in an iterative process to deconstruct the questions and design a roadmap that the I-Hub could use to refine its mission. Tasks included defining problems in the surgical innovation ecosystem, identifying barriers that are preventing the community from achieving its innovation goals and proposing ways to overcome these. The afternoon involved idea generation followed by group discussion, which also involved analysis of interesting and pertinent thoughts.

Outcomes

- A universal definition for the term ‘surgical innovator’ should be agreed for clarity and understanding.
- The I-Hub should facilitate and normalise the work of the innovator surgeon in a similar way to how RCS England supported the academic surgeon, including the creation of an integrated surgical innovation pathway.
- The I-Hub is in a unique position to lead positive change in the culture and attitude towards innovation in surgery.
- Developing skills and experience in innovation should be at the core of the I-Hub.
- The I-Hub should act to bridge the gap between frontline surgical innovators and industry, removing barriers and potentially providing funding to support early-stage surgeon-led ideas.

What is a design sprint?

The Google Ventures design sprint is a tried and tested five-day process utilising design thinking principles to shortcut answers to important questions.²² Usually, it would take a team a few months to produce, test and iterate an idea through a series of defined tasks but with the design sprint approach, it is possible to accomplish all this within five days. The fellows and members workshop further compressed days 1, 2 and 3 of the Google Ventures design sprint process into a few hours.

Key numbers

- Important questions deconstructed: **2**
- Attendees: **33** surgeons (including surgical innovators with broad experience from startups, industry and governance)
- Ideas generated in the low-effort, high-impact section: **21**

6. Surgical innovator portfolio careers workshop (June 2023)

Convenor: Deena Harji

A one-day event to support surgical intra- and entrepreneurs who wish to build a surgical innovator portfolio career

In June 2023, the I-Hub was delighted to launch its first workshop open to the full RCS England membership focusing on informing surgeons on how to build a portfolio career in innovation. The I-Hub team understands how complex and intricate the field of surgical innovation is to navigate, especially when new to it. This session was created to support those enthusiastic early-stage intra- and entrepreneurs build careers in surgical innovation with advice on where to seek opportunities. The event hosted guest speakers from across the innovation spectrum including startup founders, NHS innovation leaders, and surgeons working in innovation consultancy and venture capital.

Talks at this workshop included:

- Professor Jag Dhanda (Consultant Surgeon and Chief Executive Officer, Virtual Reality in Medicine and Surgery) – *Bridging the Gap Between Innovation and Academia*
- Professor Tan Arulampalam (Consultant Surgeon and Johnson & Johnson MedEd Lead) – *MedEd in Surgical Innovation*
- Mr Piyush Mahapatra (Consultant Surgeon and Chief Innovation Officer, Open Medical) – *Innovative Leadership in the NHS*
- Miss Kari Shah (Surgeon in Training and Consultant, Deloitte) – *How to Get Into Surgical Consultancy*
- Miss Louise Glanvill (Surgeon in Training and Venture Capitalist) – *Building a Parallel Career as a Venture Capitalist*
- Ms Sieuming Ng (Surgeon in Training and Founder, SafeAP) – *Optimising the Digital Marketplace*
- Miss Nadine Hachach-Haram (Consultant Surgeon, and Founder and Chief Executive Officer, Proximie) – *The Ultimate Surgical Entrepreneur*

The event wrapped up with an open but frank discussion of ‘juggling hats’. This was an engaging interactive Q&A session about balancing life as a surgeon while developing and maintaining a surgical innovator portfolio career.

Key numbers

- Attendees: **40**
- Talks: **7**
- ‘Juggling hats’ discussion: **1 hour**

7. From QI to Startup' workshop (September 2023)

Convenor: Joshua Burke

Engaging the membership by drawing parallels between quality improvement and healthcare startups

This workshop was designed to encourage the wider RCS England membership into surgical innovation by demonstrating how quality improvement (QI) methodology can be applied to develop healthcare products or services that have an impact. The event debunked the stereotypical entrepreneur image by showcasing surgeon-entrepreneurs who had developed validated solutions to problems that they personally encountered while working in the NHS. Other subjects covered in the workshop were intellectual property, developing prototypes and securing funding. Importantly, the clinical validation of innovative technologies prior to adoption (through Getting It Right First Time and National Institute for Health and Clinical Excellence initiatives) dominated the discussion among the surgical audience.

Talks at this workshop included:

- Miss Angela Lam (Surgeon in Training and Founder, Flux HealthTech) – *Identifying an Unmet Need Through Quality Improvement*
- Mr Jacob Koris (Surgeon in Training and GIRFT Fellow) – *The Need for Evidence-based Innovation and Transformation*
- Will Doherty (Patents Director, Albright IP) – *Intellectual Property for Healthcare*
- Oliver Sowerby (Head of Surgical Technologies, Team Consulting) and Ms Emily Mills (Surgeon in Training) – *Turning Your Medical Device Idea Into a Prototype*
- Sam Stephens (Director, TBAT) – *Funding Your Startup Idea*
- Professor Jane Blazeby (NIHR Senior Investigator and Professor of Surgery, University of Bristol) – *The Risks of Surgical Innovation*
- Dr Mark Slack (Chief Medical Officer, CMR Surgical) – *What Makes a Good CMO?*
- Mr Edward St John (Consultant Surgeon and Chief Medical Officer, Concentric Health) – *Improving Informed Consent with Concentric Health*
- Mr Grant Nolan (Surgeon in Training and Founder, MyOpNotes) – *Streamlining Op Notes With MyOpNotes*
- Mr Alex Almoudaris (Post-CCT Surgeon and Chief Executive Officer, TouchPoints.health) – *Recommendations for Creating Your Healthtech Startup*

Key numbers

- Attendees: **30**
- Talks: **10**
- Surgical innovators: **3**

8. Future Surgery Show 2023: Festival of Innovation (November 2023)

Hosting two days on the main stage of the Future Surgery Show, showcasing innovators from healthcare, academia and high-performing industries

Exemplifying the progress made across the preceding 12 months, the I-Hub team returned to the Future Surgery Show in 2023, hosting two days on the main stage. Titled the Festival of Innovation, the I-Hub invited guest speakers from high-performance industries outside healthcare to share insights on applying new technologies and innovation methods. By drawing parallels to industries outside healthcare, the I-Hub inspired attendee surgeons to think in a more dynamic manner, fostering a creative and lateral thinking approach to the challenges that face them.

Day 1

The Festival of Innovation opened with a talk by Dr Bettina von Stamm on the pressing topic of sustainability and why we must be more environmentally conscious as innovators. Daniel Wain then presented his Six 'I's[®] innovation framework, which enables a level playing field for everyone in the workplace to be innovative. Following this, two innovators in Formula 1 motorsport presented their lessons learnt from innovating. The first was a former chief executive of McLaren Applied, Ian Rhodes, who discussed F1's approach to innovation, particularly around processes, and how he applies this unique insight to medical device development to gain an advantage. A former engineer at Williams Advanced Engineering, Oscar Morgan, explained how he used feedback loops to apply and accelerate the use of hybrid powertrain technology to an e-scooter company he founded called Bo.

The first day of the Festival of Innovation concluded with Professor Mustafa Erden highlighting the importance of universities in developing the future of healthcare. Examples ranged from low-cost robotic surgical trainers and Mustafa's Allap system (Autonomous and Intelligent Laparoscopy Trainer with Real-time Feedback) to his 'big picture' vision of an exoskeleton that can assist nurses when they bend their body for tasks such as lifting and transferring patients.

Talks on day 1 included:

- Dr Bettina von Stamm (Founder and Director, Innovation Leadership Forum) – *Why Innovating for Sustainability Is No Longer Enough*
- Daniel Wain (Management Consultant, Daniel Wain Consulting) – *Innovation: The Big Picture and the Six 'I's[®]*
- Ian Rhodes (Investor Director and Former Chief Executive Officer, McLaren Applied Technologies) – *Lessons From F1: Using Data to Focus Scarce Clinical Resources*
- Oscar Morgan (Founder and Chief Executive Officer, Bo) – *Lessons From F1: Applying Racing Technology Off the Track*
- Professor Mustafa Erden (Associate Professor, School of Engineering and Physical Sciences, Heriot-Watt University) – *Robotics and AI Research in Healthcare: From Surgeon Training to Exoskeletons*

Day 2

The Festival of Innovation welcomed four guests giving talks on day 2. The former chief digital officer for NHS England opened by outlining a vision for the future hospital with revolutionised care pathways supported by the world's best technologies. Professor Stupples guided the audience through the advancements in space, discussing how breakthroughs have been applied in healthcare. Sarah Furness taught the audience through the lens of her career as a Royal Air Force helicopter pilot about how she battled and overcame impostor syndrome. The prolific US healthcare innovator Dr Daniel Kraft then delivered an inspiring virtual talk on how technology will propel health and medicine into the future. Finally, the talk given by the RCS England I-Hub team provided interested current and new members a chance to understand the I-Hub vision, including a highlight of the activities to date.

Talks on day 2 included:

- Tara Donnelly (Founder, Digital Care) – *Can Innovation Save Healthcare?*
- Professor David Stupples (Professor of Electronic and Radio Engineering, City, University of London) – *Lessons From Space: Innovating Into Deep Space*
- Sarah Furness (Former Helicopter Pilot and Squadron Leader, Royal Air Force) – *Leaning Into Discomfort to Learn New Things and Bust Impostor Syndrome*
- Dr Daniel Kraft (Physician-scientist, Inventor, Entrepreneur and Investor) – *See the Future Bright*
- RCS England I-Hub Team – *I-Hub Overview and Q&A*

Key numbers

- Attendees across the 2023 Future Surgery Show: **1,000+**
- Days of innovation: **2**
- Main stage talks: **10**

9. RCS England webinar on AI in surgery (February 2024)

Convenor: Ryan Kerstein

RCS England webinar series to educate members on the clinical application of AI in surgery

The I-Hub has supported a series of webinars publicising RCS England's Future of Surgery programme, in particular its robotics and digital work with Mr Ryan Kerstein, a key contributor. Following this, the I-Hub presented a webinar on AI in surgery with guest speaker Chaitanya Korisapati, a technology strategist for public sector healthcare and life sciences at Microsoft in the UK. Surgeons were given a live demonstration of a use case involving how ambient voice technology works for clinical practice. Chaitanya explained how generative AI can be used in the NHS, including how trusts and clinicians can safely apply ChatGPT models to NHS datasets. The webinar concluded with a Q&A session in which various topics such as AI, data and patient safety were debated.

Key numbers

- Attendees: **81**
- Generative AI live demo: **1**
- Feedback quotes:

“I am really grateful for the opportunity to join this event. It also enlightened us about the numerous possible AI applications in healthcare. The presentation was not just informative but also eye-pleasing. Thank you all for your work!”

“Speakers provided useful and interesting answers to common questions about AI, especially distinguishing between AI, machine learning, deep learning and generative AI. Great insights about pivotal responsible AI principles and myth-busting discussions.”

“It was a well-planned and concise talk on AI implementation in healthcare.”

“The interactive demo part was really interesting. I enjoyed the event very much. I couldn’t find a single point that I think could be improved.”

10. Surgical innovation clinic (March 2024 – present)

Convenor: Ryan Kerstein

Providing innovation expertise to surgeons through a regular, bespoke surgical innovation clinic

In order to extend the support that the I-Hub offers to the RCS England membership, it piloted its first ever surgical innovation clinic in March 2024. This regular meeting offers surgical innovators a safe space to access the I-Hub team, allowing surgeons to request specific support for their innovation. The I-Hub team has a diverse range of expertise in innovation and a rich network that may be utilised to support surgeons in their innovation journeys. This aligns with the core aim of supporting members through the complex innovation pathway, something our I-Hub team founders experienced as a lonely and cumbersome journey, and one they hope future surgical innovators will feel empowered in. The I-Hub commenced regular fortnightly surgical innovation clinic sessions in October 2024.

11. RCS England I-Hub x Team Consulting: Innovation roundtable event (June 2024)

Convenors: Ryan Kerstein and Oliver Sowerby

Guiding surgeons through the pathway of physical and digital innovation in healthcare

In 2024, the I-Hub partnered with the healthcare innovation consulting firm Team Consulting to deliver a series of events for the RCS England membership. The first event was aimed at the wider membership, welcoming surgeons to learn about the pathway and many components required to successfully bring a healthcare product to market. Seven stations were set up, each with a different focus, including identifying unmet needs, concept development, prototyping, regulatory navigation, funding and resource management, coding and technical skills, and

collaborative skills. This event supports the I-Hub's vision of building a surgical workforce that is skilled and knowledgeable about the innovation process, whether that be creating a new surgical product or supporting the adoption of innovation in their hospital. The message was clear that surgeons are integral to innovation in surgery.

Key numbers

- Attendees: **30**
- Stations: **7**

12. RCS England I-Hub x Team Consulting: Clinical innovation challenge event (September 2024)

Convenors: *Ryan Kerstein and Oliver Sowerby*

Addressing an unmet clinical need in neurosurgery through collaboration between industry and neurosurgeons

Our second event hosted in partnership with Team Consulting was to invite proposals from surgeons with an unmet clinical need in order to then collaborate with industry to explore whether an innovative solution could be found. The aim was to showcase the power of industry collaboration with surgeons in co-designing potential solutions to clinical challenges.

Neurosurgeon Mr Shahzad Muhammad submitted the chosen proposal involving the clinical challenge of switching between surgical scissors and bipolar forceps for cauterisation, with each change causing a small (but nevertheless frequent) delay. This can ultimately result in substantially prolonged overall operative time. Perhaps most frustrating for the surgeon is stepping away from the microscope to safely visualise the change of surgical instrument in their hand. This requires the surgeon to recalibrate their focus to resume the operation, delaying the surgery further.

During the event, delegates from a spectrum of surgical specialties worked through a series of brainstorming sessions to address this unmet clinical need. The sessions started with deeply understanding the problem before moving to proposing potential solutions, from frugal to moonshot.

This workshop highlighted not only the importance of surgeons to the development process, ensuring a streamlined journey and user-centred design, but also the importance of collaborating across surgical specialties. This was illustrated perfectly by the general surgeon delegate who presented a potential solution for this neurosurgical unmet clinical need based on a surgical instrument used to overcome a similar problem in colorectal surgery. Since the event, Shahzad, his colleagues, Team Consulting and the RCS England I-Hub team have scheduled meetings to explore feasible concepts and to develop the preferred concept into a prototype.

Key numbers

- Attendees: **30**
- Concepts taken forwards by Team Consulting: **4**

13. Future Surgery Show 2024: Festival of Innovation 2 (October 2024)

Convenors: *Marcus Stow and Alexander Coombs*

Back to the Future of Surgery: Taking innovation and game-changing lessons from surgery's past and applying them to the future

Returning to the Future Surgery Show in 2024, the RCS England I-Hub team hosted another Festival of Innovation across both days of this event. The theme for 2024 reflected innovation in surgery throughout history, from disruptive moments in the past right up to the game-changing innovations of today and the mind-bending technologies of the future.

Day 1

The I-Hub opened the 2024 Festival of Innovation with Professor Olof Akre from Karolinska University Hospital in Sweden. Working at a globally renowned centre for research and robotics, Olof chose to focus his talk on the challenges faced in advancing surgical techniques in robotic surgery, concluding with lessons of how to be a world-leading hospital. On the theme of robotics, Professor Sanja Dogramadzi opened the audience's imagination to 'the art of the possible' in surgical robotics while also keeping everyone's feet firmly on the ground (for now). The I-Hub proudly welcomed Colonel Nigel Tai for his first public talk as the new defence professor of military surgery, highlighting the military's role in advancing surgery and how modern warfare has changed the requirements of surgery in the military.

Talks on day 1 included:

- Professor Olof Akre (Professor of Oncological Surgery, Karolinska Institute) – *Advancing Surgical Techniques and Lessons of Innovation From a World-leading Hospital*
- Professor Sanja Dogramadzi (Professor of Medical Robotics and Intelligent Healthcare Technologies, University of Sheffield) – *The Machine and the Scalpel: Envisioning the Future of Robotics in Surgery*
- Colonel Nigel Tai (Defence Professor of Military Surgery, UK Ministry of Defence) – *Innovation Through Adversity: Military Advances in Surgery*

Day 2

Emil Hewage of BIOS Health opened with a talk with the tongue-in-cheek title 'Who needs a surgeon anyway?', the message being that surgeons are critical to the future of neuro-implantables in treating a diverse range of diseases. Our next speaker, Mr Pankaj Chandak, took us to surgery's past to learn from the father of modern surgery, Joseph Lister. Pankaj highlighted some of Lister's personality traits that enabled him to overcome cultural battles and establish the pioneering use of antiseptics in surgery, focusing on how we can apply these learnings of the past to the future. The 2024 Festival of Innovation concluded with I-Hub director Ryan Kerstein using the FOS report⁸ as a vision for the future of surgery, now entering new frontier: healthcare 3.0.

Talks on day 2 included:

- Emil Hewage (Chief Executive Officer, BIOS Health) – *Who Needs a Surgeon Anyway? The Frontiers of AI and Bioelectronics*
- Mr Pankaj Chandak (Hunterian Professor, RCS England) – *Lessons From the Past: Lister – Surgeon, Scientist, Innovator*
- Mr Ryan Kerstein (Director, RCS England I-Hub) – *To Infinity and Beyond: Surgery Beyond 2040*

Key numbers

- Attendees across the 2024 Future Surgery Show: **1,500+**
- Days of innovation: **2**
- Main stage talks: **6**

Publications

The RCS England I-Hub acknowledges that culture change is fundamental to normalising the surgeon innovator. The paradigm is shifting but the surgical community must champion and support the innovative and groundbreaking work surgeons have undertaken to improve care for patients and the workforce. The I-Hub team will make it their mission to do exactly that. Over the past two years, innovation in surgery was featured regularly in the RCS England *Bulletin*, with one of our I-Hub founders, Ryan Kerstein, as editor.



May 2022: Innovation techover

The first example was an entire issue themed the 'innovation techover': a deep dive on various stages in the innovation process from reputable surgical companies such as Concentric Health, Proximie and CMR Surgical. Topics covered in the May 2022 *Bulletin* included defining the problem, building a solution, prototyping, marketing and information governance.²³ Although complex, each topic was designed to be easily read and digestible for all surgeons. The aim was to inspire those surgeons who may not be self-proclaimed innovators but who may nevertheless have an unmet clinical need and might benefit from understanding how they can innovate around it.



January 2023: The future is bright

I-Hub team member Joshua Burke led a *Bulletin* article in January 2023 proposing the creation of a new integrated innovation training pathway for surgery.²⁴ Despite the existence of academic, education, and management and leadership training pathways, innovation is yet to be formally recognised in equal manner, with no pathway available to surgeons in training who want to develop skills in innovation to support the NHS. This article goes some way to addressing that by providing an outline of what an integrated innovation training pathway may look like and what points should be considered in its development.

In the same issue, other topics of innovation included learning to code during undergraduate medical school training (in a paper by Shamim *et al*)²⁵ and frugal innovation

(with a feature article from the vet 'wizard' Romain Pizzi).²⁶ The I-Hub was also featured in the editorial section of the *Bulletin*, with I-Hub director Ryan Kerstein setting out the I-Hub's vision to the RCS England membership.²¹ It ended with an invitation for surgical innovators to join the I-Hub network and to be notified of upcoming activities.



November 2023: Five years into the Future of Surgery

In partnership with the I-Hub team, Max Butler published an update in the November 2023 *Bulletin* to summarise the progress made towards the vision of the 2018 *FOS* report.²⁷ The article revisited the four technology domains, giving short summaries of the report's predictions and comparing these with the reality of the present day.



January 2024: Advancing healthcare through innovation and transformation

A *Bulletin* article from January 2024 by Koris *et al* discussed the risks and barriers that may hamper the successful development and adoption of surgical products.²⁸ The article refers to the Getting It Right First Time initiative, aimed at avoiding unwarranted variation in health outcomes by supporting early-stage startups in obtaining evidence for their innovation.

Key recommendations

In its first two years, the RCS England I-Hub has harmonised a network of surgeons who have joined forces to improve surgery for patients through innovation and technology. The I-Hub has demonstrated proof of concept through its well-attended workshops, gathering together industry, academics and surgeons.

Key recommendations arising are that the I-Hub:

- becomes the lead for surgical innovation activity across the UK, leading cultural change and skills development through the normalisation of surgical innovators as an equal phenotype to the surgical academic, leader and educator. This should include increasing awareness of the role of the surgical innovator, providing awards for success in surgical innovation, and creating a bespoke surgical innovator training and fellowship pathway.
- becomes a national platform for NHS surgical innovators to collaborate and advance innovation in surgery
- advocates for the allocation of national specialty innovation leads and regional innovation leads across the UK
- campaigns for better recognition of surgical innovation activity on ST3 surgical applications
- becomes a convening and connecting point as well as a collaborative working space at RCS England's London headquarters in Lincoln's Inn Fields where frontline surgical innovators across the UK, industry and organisations can meet, create and develop world-class surgical innovations together
- becomes the 'go to' resource for surgical innovators across the UK to learn, network and develop skills in innovation
- recognises, identifies and assists in addressing the most important technological needs in surgery
- aims to engage the wider RCS England membership (including those who would not usually participate in surgical innovation activity) to develop these key innovation

Next steps for the I-Hub

Growing a presence and delivering new content for RCS England members

The I-Hub team is committed to amplifying the I-Hub's impact and reach among the RCS England membership and beyond. This next phase will see core focus on four areas:

1. Innovation resource and content development
2. The creation of a new ecosystem of surgical innovator support
3. Wider support for the development of innovation skills and experience across the RCS England membership
4. Maximising the impact of our connecting and convening role

Crucially, the I-Hub aims to champion a transformative culture shift in the surgical community to put the surgical innovator at the core of the future delivery of high-quality surgical care in the UK and worldwide.

The I-Hub as a key stakeholder in the surgical innovation ecosystem

In order to foster a vibrant and productive surgical innovation ecosystem where frontline innovators are empowered to forge and refine world-class innovations, the I-Hub aims to:

- conduct surveys among its members to identify and address the most pressing surgical needs through a national surgical needs call
- pursue strategic partnerships with a leading figure/organisations in surgical technology to bolster the I-Hub's mission both in structure and in financial backing
- encourage NHS frontline surgical innovators to present their novel solutions for acknowledged challenges, offering support right from the conceptual phase
- assist NHS frontline surgical innovators with mature innovations by linking them with a cadre of experts to aid in development, prototyping or scaling, regardless of the innovation stage
- establish and nurture a network of NHS surgical innovation leads
- develop guidelines around intellectual property and information governance, among other frameworks, to streamline the innovation process

A call to action

Since 2022, the RCS England I-Hub has laid a solid foundation for transformative growth and innovation in the surgical community. As we reflect on the strides made and the lessons learnt, it is clear that the journey ahead is filled with significant potential and opportunity. The I-Hub has not only begun to redefine the landscape of surgical innovation but it has also ignited a cultural shift towards embracing and integrating innovation at every level of surgical practice.

Looking forwards, the call to action is clear and compelling. We invite all fellows and members of RCS England, from seasoned innovators to those at the beginning of their innovation journey, to join forces with the I-Hub. Together, we have the power to drive forwards a future where surgical innovation is not just an aspiration but a core pillar of our everyday practice. It is time to leverage our collective expertise, creativity and passion to continue breaking new ground, enhancing patient care and shaping the future of surgery.

The success of the I-Hub and the impact of surgical innovation depend on our shared commitment and collaboration. Let us unite in this endeavour, forging new partnerships, exploring groundbreaking ideas and championing the role of the surgical innovator. The future of surgery is in our hands, and together, we can achieve extraordinary advancements for our patients and for the surgical profession at large.

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If you are interested in finding out more or if you want to be part of the I-Hub network, please complete our short survey by visiting <https://forms.cloud.microsoft/e/zxv029LykU> or scanning the QR code.



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The RCS England Innovation Hub is an initiative that connects industry partners to support surgical innovators in developing, evaluating, and delivering new products and tools. To find out more about our work, please visit: www.rcseng.ac.uk/innovation

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