

Imperial College
London



Patient Safety Translational Research Centre

Our progress

NIHR | Imperial Patient
Safety Translational
Research Centre

Institute of
Global Health Innovation



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Foreword

Improving the safety of healthcare is not just a priority of our Centre, but one of global importance. Indeed, the recent recognition by the World Health Assembly that patient safety is a global priority was welcome news. Figures such as the 2.6 million patients dying every year due to unsafe care, and the \$42 billion spent annually on medication errors alone, demonstrate the urgent necessity of such a shift and compel us to do better for patients and professionals alike. While there is much to be done, with this report I am glad to share with you the strides we are taking towards our ambitions of ensuring safer care.

With the rise of digital technologies we are discovering more opportunities to exploit these innovations in healthcare, but we must also ensure that their development is based on evidence. Streams, a medical information and alerting mobile app that our Institute helped develop, has shown promise to improve workflow and enhance clinical delivery in hospitals. Now we are evaluating this tool across the Imperial College NHS Trust to examine whether it can improve task management and therefore patient safety. It is through research such as this that we continue on our mission to diffuse innovation both locally and nationally.

We are also exploring novel ways to involve patients and the public in our work in this sphere. For example we have been training young people with past mental health issues to conduct research with individuals with current mental ill-health, to better understand the acceptability and feasibility of digital tools such as wearables and social media to detect mental health deterioration.

While ultimately our work seeks to benefit patients, we must not forget that in order to care for patients we must care for our professionals. One of the many ways we are working to better support healthcare staff is through a national trial of an evidence-based text-messaging intervention to reduce clinician burnout, and therefore facilitate the safer delivery of care. We would not be able to carry out vital research such as this at scale without our partners and collaborators.

I would like to offer our ongoing gratitude to the NHS and NIHR for enabling us to bring our research to fruition, and our partner Centres in Manchester and Yorkshire, with whom we strive to collectively transform the safety and quality of healthcare.



Professor the Lord Ara Darzi
Director, Imperial NIHR Patient Safety
Translational Research Centre
Co-Director, Institute of Global Health
Innovation



Foreword

Patient safety is both a goal and a movement with considerable momentum behind it. The WHO's establishment of a World Patient Safety Day to take place on September 17th every year enshrines the importance of patient safety in the global health agenda and compels international action. Here in the UK, the investment in patient safety – both within the NHS and across the research landscape – is testament to the national commitment to provide the safest standards of healthcare. Our Centre is one of three in England that are focused on developing the evidence base for safer care, a consortium dedicated to research that can yield meaningful change for patients and the frontline.

Progress in the research world is too often reserved for academic journals and absent from policy discourse and local action planning. The three Patient Safety Translational Research Centres are combatting this problem and bringing a new brand of translational research to the health service. We work to understand, design and develop interventions with practical utility and real world relevance to measure safety, pre-empt error and support positive behaviours. We learn from our staff, our patients, our policy-makers and a host of stakeholders to develop viable solutions.

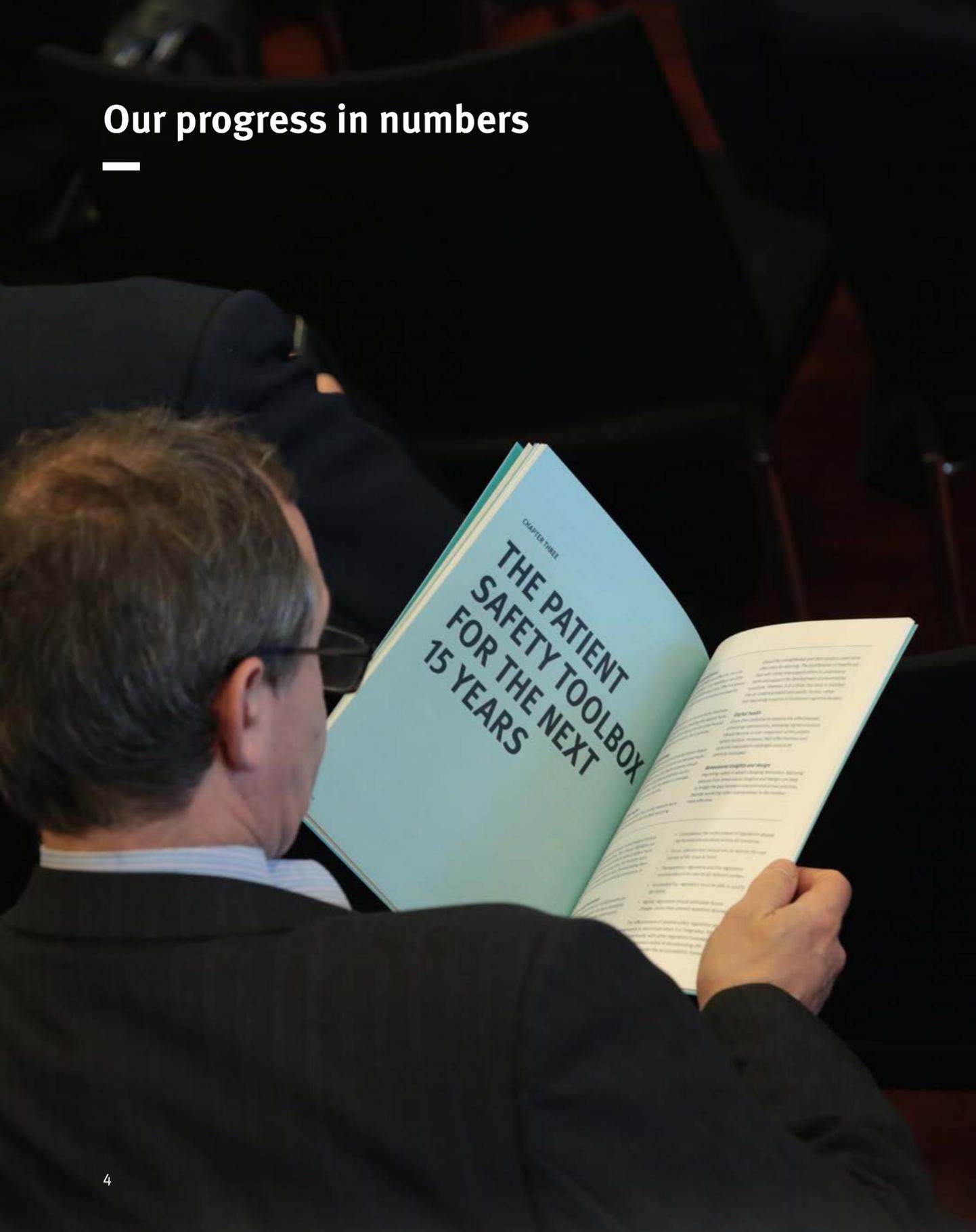
This report chronicles our progress in this endeavour, focusing on the most recent years of work since our Centre's renewal in 2017. It presents a promising vision of the new innovations on the horizon, but it also compels a concerted effort to implement and advance such tools. In line with the goals of our UK National Patient Safety Strategy and those of the World Patient Safety Day, this report shares our progress and invites scrutiny of our work to ensure scientific research continues to generate the tools and evidence needed to make care safer.



Dr Kelsey Flott
Policy Fellow and Patient Safety Lead,
NIHR Imperial Patient Safety Translational
Research Centre



Our progress in numbers



<p>126</p>  <p>articles we've published in high-impact journals</p>	<p>In 2018 we held our</p> <p>6th  symposium,</p> <p>an event that has become a staple event among the patient safety community</p>
<p>14 PhD students recruited to work with us to improve patient safety</p> 	<p>500 patients in our trial to spot sepsis and people who are unwell, using wearable sensors</p> 
<p>20% </p> <p>stroke survivors' boost in daily activity observed in an early study of our mobile app for rehabilitation</p>	<p>250,000</p>  <p>patients' records we analysed to discover an indicator of clinical deterioration</p>
<p>444  </p> <p>survey respondents who are helping shape research priorities for people with multiple health conditions</p>	<p>1.5 billion </p> <p>people's safety in healthcare could be transformed by the Global Patient Safety Collaborative</p>

Our impact

Our mission is to develop the scientific evidence base from which to drive safer care.

We have over 50 projects underway that are investigating the burden of harm and discovering and developing interventions to improve care.

Listen, Learn and Improve:

Using language analysis to interpret and act on written patient experience feedback for near real-time patient benefit.

Stories from patients' lived experience of care are a rich source of information from which to improve care quality. However, too often patient feedback is not responded to in a timely manner. Digital technology could streamline this process, but the unstructured format of patient feedback – free text narratives – has meant this potentially valuable resource has failed to be exploited to its full potential. We've devised an innovative solution to this widespread issue, which is enabling patients' comments to be efficiently translated into quality improvement measures, and for the impact of these to be prospectively evaluated.

Our researchers have developed a Natural Language Processing (NLP) algorithm that processes and analyses patient experience narratives in near real-time, through daily

feeds. Some large NHS Trusts receive over 20,000 free-text patient experience reports each month. Our algorithm can analyse these in four minutes, deriving useful themes and alleviating the analytic burden to staff. We also co-designed a dashboard to visualise the data and recruited patient experience champions to ensure its uptake in trial areas. This continuous and rapid analysis allows feedback to be promptly acted upon and resulting changes to be implemented into regular staff workflow. Patients are also reassured that the information they provide about their lived experience of care is being used to ensure better experiences for themselves and others.

This work has revitalised the benefits of hearing from patients in their own words, by holding narrative data to the same rigorous scientific standards applied to quantitative data. Our tool is now being trialled in new care settings, and represents the first of its kind in the English NHS.

Dissecting digital technologies for mental health:

Co-producing research with young people with mental health difficulties.

The number of people with mental health problems is rising, and many develop these disorders under the age of 25. We're committed to finding innovative ways to meet this growing demand for mental healthcare, focussing on digital technologies. These tools, such as apps and online services, could transform how people seek and receive care. That's why we're building the evidence we need to ensure such innovations are effective and acceptable to those they are designed to benefit. We know that what we do is most impactful when we work with these individuals, so we've been involving young adults with mental health difficulties in this pioneering research.

This project has been dissecting young people's perspectives on a range of technologies to detect mental health deterioration, including wearables and social media. Young adults with lived experience of mental health problems have been involved in every stage of the work, from design to data collection and dissemination. Our results are demonstrating how digital interventions may be a viable alternative solution to more traditional mental health services, opening up more support to the younger demographic, which we urgently need.

This research is offering unique insight into young people's mental health and the evidence base we need to tailor new digital solutions to patients' needs. Our method has already been adopted by other research groups and we have been recognised by West London Health Trust for our "excellent model" of co-production.

Developing leaders in safety and quality

We're building the next generation of leaders in patient safety, to ensure a future of safer care that's delivered in a sustainable way. Now in its fourth year, our Masters in Patient Safety gives professionals the tools they need to drive real improvements in the quality of health systems and reduce preventable harm. Through our world-class faculty and internationally-renowned teaching staff, students develop expert knowledge of the proven methodologies to implement and evaluate solutions arising from healthcare's ever-changing landscape.

"Patient safety is a top priority of any healthcare system. Healthcare providers are looking for professionals that have the skills to design, implement, measure and deliver safer care. Students in our programme graduate equipped with the knowledge required to drive quality and safety initiatives."

Professor the Lord Ara Darzi, Course Leader and Co-Director of the Institute of Global Health Innovation

"The blending of health policy into the Patient Safety MSc provided a perfect platform for understanding how to protect patients at a system, organisation and individual clinician level. The programme also taught us how to use data at all levels to reinforce safety through learning health systems which are crucial to the future of healthcare delivery in the NHS."

Joshua Symons, Patient Safety MSc graduate and Associate Director of Data Optimisation, NHS Digital

Involving and engaging patients and the public

We know the value of carrying out research with patients and the public. That's why we embed patient and public involvement and engagement in all of our research, so that what we do is relevant for, and tailored to, the people who will benefit from it.



Can of Worms

Experts have voiced that talking about health data sharing with the public is like opening a can of worms. We're collaborating with the Helix Centre for Design in Healthcare to change this, by pushing boundaries in public involvement and engagement. We worked with Helix to transform this metaphor into an innovative and immersive exhibition to engage with the public about complex topics centring on health data.

Our event attracted more than 400 attendees over four days, stimulating rich dialogue on the important subject of medical information.

By capturing these conversations and feedback from the exhibit, we highlighted that engagement with the public, and between healthcare organisations, is key to effective and ethical data sharing.

This was the first in a series of events we're hosting to build trust with the public and engage with them about complex subjects.



Hearing Birdsong installation at the Helix Centre, 2019



Can of Worms exhibition at the Helix Centre, 2018

Hearing Birdsong

We were one of the first pilot projects to win funding from the UCL Centre for Co-production in Health Research, to co-produce a sandpit innovation workshop for people with hearing loss. Our event brought together people with hearing loss, researchers, clinicians and the voluntary sector to co-produce ideas to improve communication between adults with hearing loss and health/social care professionals.

The winning idea, Hearing Birdsong, seeks to raise awareness of hearing loss and increase earlier diagnosis. The project is using birdsong played in a safe space as a way for people to check their hearing, and to prompt them to seek further help and advice if needed.

Hearing Birdsong has been co-produced by designers, clinicians, engineers, PSTRC researchers and people with hearing loss. We held a pop-up installation to launch the ongoing project and 79% of visitors said that it raised their awareness of hearing loss, and 9 of these individuals signed up for a hearing test.

Hearing Birdsong embodies the principles of co-design in research: it was made possible by leveraged funds from a co-production award, the idea was born out of a diverse group of patients, professionals and members of the public, and it is being taken forward with scientific rigour to more effectively raise awareness about hearing loss and combat an emerging patient safety issue.



Our research

In 2017, the National Institute for Health Research (NIHR) renewed our Centre for the third time, establishing us as one of three centres for excellence in patient safety in England. This marked the beginning of a refreshed research journey for us, offering the opportunity to build on our expertise in involving patients in their care, optimising big data to identify trends in patient safety and building new tools and interventions to prevent error.

Our work focuses on six major themes of research, spanning the breadth of patient care – from improving diagnostics to making medication safer. These address safety at both the patient level, for example finding ways to prevent health deterioration, and the systems level to make advances across the care continuum. Our research themes were developed based on the evidence around the burden of unsafe care, both clinically and economically. They are intended to address current challenges and pre-empt future threats.

 **THEME 1: Safer systems across the continuum of care**
Developing and evaluating interventions to make it safer for patients as they transition from one care system to the next.

 **THEME 2: Partnering with patients for safer care**
Empowering and engaging patients in the safety of healthcare.

 **THEME 3: Avoiding deterioration in patients with complex needs**
Developing and implementing solutions to identify and manage patient deterioration.

 **THEME 4: Enhancing the safety of medication technology**
Building evidence to make medicines and healthcare technologies safer.

 **THEME 5: Improving diagnostic accuracy and decision-making**
Working towards more accurate diagnoses and reduced delays in clinical decision-making.

 **THEME 6: Ensuring value for money in patient safety**
Understanding the economic burden of avoidable harm and cost-effectiveness of safety initiatives.

Together these workstreams provide the infrastructure of our work, but they do not operate in isolation: creating safer systems involves ensuring value, and enhancing diagnostic accuracy involves building safer technologies. These themes are deliberately interwoven and their cumulative impact is greater than the sum of their individual outputs.

THEME 1:

Safer systems across the continuum of care

THEME LEAD: PROFESSOR ARA DARZI



OUR GOAL:

To create safer systems for patients as they move along the care pathway.

OUR WORK:

Care transitions can risk patient safety through miscommunication during the transfer of responsibility from one care system to the next. We're working across every level of healthcare to make this process safer, and ensure our research has the greatest potential for impact. From digital apps and training programmes to national guidelines, we're influencing the individual, the team, and the system as a whole.

OUR PROGRESS:

Driving improvements across the care continuum requires two things: first, behavioural interventions to promote safer transitions across care settings, and second, the application of human factors to design better pathways and processes. Our work in both of these areas is making a difference to patients and professionals alike.

We've built evidence demonstrating how behavioural interventions influence the likelihood that innovations will be adopted in healthcare. And our research showed that cognitive biases can make professionals less willing to adopt new innovations, and that low-cost behaviour modification strategies can reduce the effects of these biases. We've also

partnered with the Royal College of Anaesthetists and the Behavioural Insights Team to design and launch a national clinical trial to reduce the extrinsic causes of clinician burnout.

Using our expertise in human-centred design, we helped develop a digital app for a healthcare professionals, Streams, which we've now implemented for evaluation across the Imperial College Healthcare NHS Trust. Involving more than 10,000 staff, we're investigating the safety and feasibility of Streams, and its impact on patients and professionals. In an effort to continually expand our work, this venture successfully leveraged £145,000 in funding from UK Research and Innovation, one of ten funded 'Sprint Exemplar Innovation Projects' that aim to show the potential of data to improve healthcare. We're also developing a user-centred interface which enables patients to better understand and communicate their medical history with professionals during care transitions. We're doing this in a co-produced way, working with users to ensure the design is tailored to their needs.

Our two-pronged approach in this sphere will not only encourage better practice, but also help pre-empt error and reduce the likelihood for mistakes.



THEME 2:

Partnering with patients for safer care

THEME LEAD: MR ERIK MAYER



OUR GOAL:

To support more active and safe involvement of patients in their own care.

OUR WORK:

We know the value of empowering patients in healthcare. That's why we're using a range of cutting-edge approaches to promote greater patient and carer involvement in healthcare and shape future patient safety practice. Our research is generating high-quality evidence to facilitate the implementation and diffusion of practical and sustainable safety initiatives.

OUR PROGRESS:

From digital technologies to behavioural insights, we're using innovative solutions to build patient-centric approaches to care. We focus on two main areas: co-production with patients and professionals, and new approaches to consumer health analytics.

We're interrogating data so that we can learn from patients and their experience. This has included generating a bespoke platform that uses natural language processing to provide meaningful insights from the analysis of free-text patient feedback. This work won the 2019 BMJ Award for Digital Innovation and is now being scaled-up for larger roll-out through partnership with national NHS bodies. Our researchers have also collated evidence on the frequency that patients identify errors in their medical records, and which types they pick up. This data is helping us to examine patients' ability to spot discrepancies in their medical history.

We've been working with users to build a number of safety-related interventions, such as our Foundations of Safe Care framework that integrates both patient/carer and healthcare professional perspectives. This sets out the values and actions needed to create an environment that patients consider safe. Another is our digital tool for recording side effects of chemotherapy, now in its second-generation, and we're testing this prototype with nurses to ensure its usability and acceptability. We've also created a prototype software system for stroke survivors to improve the quality and safety of rehabilitation outside of the hospital. This low-cost, high-engagement digital app was developed with users and has now been piloted with 20 stroke survivors. We observed an average activity increase of 20% each day with this novel application.

Ensuring the sustainability – as well as feasibility and viability – of interventions such as these is crucial for their long-term success. That's why we're developing big data infrastructure that will enable us to collect the information we need to evaluate the impact of new solutions at scale.



THEME 3:

Avoiding deterioration in patients with complex needs

THEME LEAD: PROFESSOR PAUL AYLIN



OUR GOAL:

To better identify deteriorating patients and ensure timely and appropriate clinical response.

OUR WORK:

Patient needs and care are becoming more complex. Against a backdrop of increasingly squeezed resources, this means the potential for failures in healthcare delivery is rising. In response to this concerning situation, we're working to identify and manage patient deterioration, in acute and community settings, so that we can better address their needs.

OUR PROGRESS:

Deterioration is a risk in all settings of care. That's why we want to understand how to apprehend deterioration, not only in healthcare but also in the community, by learning from available data and deploying experimental interventions.

Our projects seek to realise the potential of promising digital technologies for healthcare, such as the clinical trial we're running so that we can identify unwell patients and cases of sepsis using wearable sensors and digital alerting systems. Our work with young people has also demonstrated that monitoring mental health using a mobile app, wearable device or social media is acceptable to this demographic and would enable early detection of mental health deterioration.

We're now partnering with the Centre for Psychiatry at Imperial College London to develop and examine the effectiveness of mobile apps to reduce self-harm in young people. Such partnerships enable us to extend the scope of our work, which is why we've also been successfully exploring opportunities beyond the health sector. We're working with health tech start up companies to tackle deterioration risks like improving hydration for elderly people with dementia.

Alongside our work with people, we've been working with numbers to find new ways to identify and ultimately prevent deterioration. We discovered an indicator of deterioration linked to A&E attendance and hospital admission, through the analysis of 250,000 patients' primary care records. Our research also found that immediately prescribing elderly patients antibiotics for urinary tract infections is linked with a lower risk of sepsis and death, potentially saving lives in the future.



THEME 4:

Enhancing the safety of medication technology

THEME LEAD: PROFESSOR BRYONY DEAN FRANKLIN



OUR GOAL:

To enhance the safe use of medicines and healthcare technology.

OUR WORK:

Medication errors are among the leading causes of avoidable harm in healthcare systems globally. We're building on existing knowledge about medication errors and generating new evidence about the risks and benefits of technologies in healthcare, to make these interventions safer and more effective.

OUR PROGRESS:

Our work within this theme aligns with the third World Health Organization Global Safety Challenge: Medication Without Harm. We're working to support this challenge by tackling enduring problems, particularly those relating to prescribing patterns and behaviours, and developing human-centred technologies.

We're using eye-tracking technology to study the on-screen design of electronic prescribing systems, in parallel with a qualitative study that's examining prescribers' experiences of these systems. These efforts will help enable us to optimise on-screen decision support tools. We've also explored patients' and carers' use of patient-held information about medication – digital or paper tools for people to carry medication records – and involved patients in every stage of analysis. Our researchers are now developing proposals to test an approach to encourage greater uptake of these interventions.

We're also working to improve medication safety for children, through the development of TouchDose, a clinical decision support system designed to reduce errors in the administration of paediatric medication. Having completed a controlled evaluation of TouchDose in a simulation setting, we're now finalising the design of a trial in clinical practice.

Our work in primary care is also developing and testing targeted approaches to improve antimicrobial decision-making. This is alongside running a clinical trial to test whether behaviour modifications can increase the uptake of delayed or back-up antimicrobial prescriptions in GP surgeries.



THEME 5:

Improving diagnostic accuracy and decision-making

THEME LEADS: DR OLGA KOSTOPOULOU & PROFESSOR BRENDAN DELANEY



OUR GOAL:

To tackle the challenges related to diagnosis and decision-making in primary and surgical care.

OUR WORK:

Delays in decision-making can, in certain circumstances, be a matter of life or death. But improvements in speed should not come at a cost to diagnostic accuracy. That's why we're seeking to improve both the timeliness and accuracy of clinical decision-making, where delay and misdiagnosis threaten patient safety.

OUR PROGRESS:

To improve and streamline the diagnostic pathway we must not only innovate to develop more precise diagnostic aids, but also devise approaches to better support those making clinical decisions.

We're developing and testing a point of care diagnostic tool to prevent errors during treatment and diagnosis of certain conditions. Designed to detect urinary tract pathogens, we've now tested this tool in a pilot study of hundreds of clinical samples. This is alongside a separate validation study we've completed to underpin the development and implementation of a novel wearable monitor to identify urinary tract infections associated with catheters. This could enable real-time tissue diagnostics during this invasive procedure.

In primary care, the team is making headway in evaluating a number of interventions designed to assist GPs in the decision-making process. Using video analysis, we've shown that decision support systems (DSSs) used in GP surgeries result in a small increase in consultation time, alongside improvements in diagnostic accuracy. This work will help optimise the effectiveness of DSSs while ensuring their use does not negatively impact patient experience. In tandem with theme 4, we've also identified certain clinical characteristics that may predict unnecessary prescribing in children with acute respiratory tract infections, findings we're now looking to apply in primary care to assist antibiotic decision-making. And through funding from Cancer Research UK, we're investigating how cancer risk scores, such as QCancer, influence clinical judgment. This research will be examining how best to present these scores to GPs to support their decisions about urgent referral for suspected cancer.



THEME 6:

Ensuring value for money in patient safety

THEME LEAD: PROFESSOR ELIAS MOSSIALOS



OUR GOAL:

To better understand the economic burden of avoidable harm and generate evidence on the cost-effectiveness of safety-related initiatives.

OUR WORK:

Avoidable failures in healthcare are costly, yet there has been a lack of economic evidence related to patient safety. We therefore want to better understand the wider economic burden of avoidable harm, and generate evidence on the cost-effectiveness of interventions that aim to enhance patient safety. Our work will inform policy, improve efficiency and incentivise high-value care.

OUR PROGRESS:

We're working towards a greater understanding of the value of new interventions, as well as strengthening the economic case for safer care. To do this we're exploring the existing evidence on the value of patient safety, while also evaluating safety initiatives.

So far we've reviewed 8,500 titles and over 1,000 manuscripts to assess the evidence relating to cost-effectiveness in patient safety. This fed into a protocol we published to measure developments in the scope and quality of evidence. Our efforts in this sphere have identified a series of peer-reviewed publications that build the economic case for increased investment in primary care, incentivising healthcare integration and payment for performance in developing

countries. We're also measuring our own resource here in the UK by examining NHS incident reporting systems, a project involving 300 staff recruited from 8 NHS organisations across England. This helped us map and validate the processes of incident reporting systems, creating a tool that can be used in economic analysis and quality improvement in the NHS. The team is now developing a simulation of how information flows through this map in order to better predict safety incidents and inform policy-making.

To bridge the gap between health economics and patients, our researchers used patient reported outcome measures linked with hospital episodes statistics to estimate the impact of patient safety incidents on patients' quality of life. We also orchestrated a workshop at the Global Symposium on Health Systems Research 2018, to inform the design of value-based payment approaches that reward safe and high-quality care.

This work promises to provide the evidence needed to make prudent investments in safety and substantiate the case for patient safety in the UK and beyond.



For more information

Visit our website:

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