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Culture & Implementation

Key Components of Successful Technology Adoption
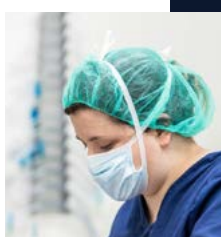
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In This Issue

Welcome

The rapid adoption of technology that has taken place during the course of the Covid-19 outbreak has highlighted many important factors when it comes to successfully adopting healthcare technology.

The culture around acceptance of digital solutions within health systems, by both practitioners and patients, has often been a major stumbling block that has thwarted many digital health initiatives. Complexities of care pathways, patient choices, and HCP preferences all must be aligned and built into any digital strategy in order for technology to be successfully deployed. In many cases this alignment is problematic.

Even when the culture of a health system, or organisation, is open to digital transformation, the second crucial hurdle is implementation. All technology applications need to be supported by a rigorous implementation strategy that helps ensure awareness of availability, guarantees access to all those who can benefit, and provides suitable resources like training and consultation processes in order to facilitate the transition. Without these elements even the most transformative technologies will not succeed in the healthcare environment.

Covid-19 has provided unique circumstances whereby for the first time all healthcare organisations and practitioners, alongside patients, are being forced to adopt a digital-first ethos. As a result of this unusual alignment, cultural acceptance has virtually been eliminated as an obstacle to technology adoption.

Implementation, however, remains the critical element! As is the case across many industries, digital-first healthcare looks like it is here to stay and organisations must ensure that their technical offerings become fully integrated within the healthcare culture if we are to prevent problems in the future. The providers of technologies that have been adopted so rapidly during Covid-19 will need to ensure that not only technical implementation but cultural implementation is addressed in order to meet the rising expectations of health providers and patients alike.

In this issue, we include a range of content that looks at the different issues around technology implementation and how transformation can be achieved while maintaining quality across the continuum of care.

Peter Corscadden of Hyland Healthcare discusses 'Digital Enablement, As a Route to a Better Patient Experience'; while Lucy Mackillop of Sensyne Health asks 'Can Digital Care Pathways Actually Reduce Demand on our Healthcare Systems?'. Also inside, Tim Morris of Elsevier discusses the Technology Enabling Nurses to Fight Covid-19; and we present original research from solution provider MediShout that discusses the capture of real-time data, on problems with logistics and infrastructure occurring in hospitals during the Covid-19 pandemic.

Matthew Driver
Editor

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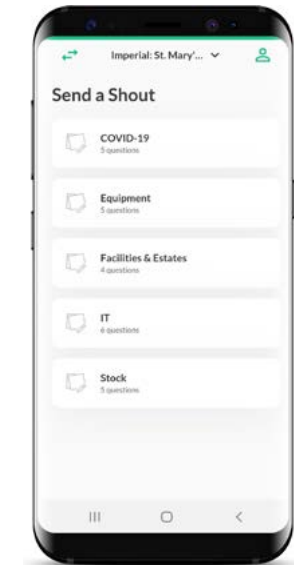# The Technology Enabling Nurses to Fight COVID-19

Globally, nurses are at the forefront of the response to the COVID-19 outbreak, working in extremely difficult circumstances and under continual pressure to maintain optimum standards of care. Here Tim Morris, Commercial Portfolio and Partnerships Director, Elsevier, discusses how technology can help support and enable nurses to fight COVID-19.

What are some of the main demands COVID-19 is currently placing on nursing staff, and how can technology best be used to alleviate some of that pressure to support care provision?

Globally, nurses are at the forefront of the arduous journey to combat and contain COVID-19, undertaking long, gruelling shifts in their armour and masks. Increased concerns about contracting the virus alongside a lack of sufficient PPE supplies have resulted in high levels of mental health issues within the nursing community. According to the British Medical Association 28% of health care professionals have said their mental health condition has got worse during the pandemic. The informational challenges that the nursing workforce are facing are also numerous, keeping up to date with policy changes, treatment developments and changes to clinical guidelines alongside maintaining quality care to improve patient outcomes, is hard to manage.

This highlights the need for dependable, accurate information as, in situations where guidelines and research are evolving rapidly, decisions need to be made fast. Being a senior nurse in emergency medicine 24 years ago, I was used to the unknown. Every day was a challenge – I was not sure what was going to come through the door or how patients may react – there was an element of thrill as well as trepidation. This, however, is different. The invisible virus is highly contagious, known to kill vast numbers of patients and its transmission is not easily traced. These factors add an additional level of anxiety impacting both healthcare professionals and their families at home.

Increasing the adoption of digital technologies has been vital to support nursing staff in order to alleviate some of the pressures they are facing. Technology interventions can help nurses streamline many administrative processes, enhance productivity and reduce care variability by providing up to date clinical information from reputable sources which is easily accessible. We have seen a staggering number of retired nurses return to the workforce, with more than 15,000 coming back to service within the NHS alone. As a result, technology has also been crucial in assisting with onboarding and training, freeing up time and resources elsewhere.

How is technology helping nurses to ensure continuity and consistency of care?

Technology is a vital way to standardise the level of care within healthcare systems by reducing care variability and ensuring consistency to improve patient outcomes. According to a report published by the Queens Nursing Institute 74% of community nurses find IT systems a more reliable way of working so it is important these systems are aligned throughout healthcare organisations to ensure they are being utilised effectively. Safe systems, that have been developed to assist nurses both during these challenging times and beyond, must contain evidence-based information to ensure that all nurses are practicing according to the latest information and organisational standards in in build competencies in these times. Systems must be interoperable to permit information to be shared securely to support the care of patients throughout, to further support to continuity and consistency of care.

Additionally, nurses who are remotely providing telehealth services also need readily available access to knowledge to make informed decisions on behalf of their patients, outside of the hospital environment.

They can turn to evidence-based knowledge platforms and open access resources to easily retrieve important information about COVID-19 and other diseases to provide in-depth answers and give the best care to patients in the safest way possible.

With staff levels under intense pressure, how can organisations ensure that nurses have access to necessary data, knowledge, policy information and training resources to allow them to carry out their duties, without adding unnecessary additional burden?

Numerous healthcare service providers have released free access to clinical guidance and support systems for COVID-19. These contain clinical information, care plans and protocols, order sets and decision support solutions, to support nurses with their understanding and help them with the management of COVID-19. Systems are aligned and are easily accessible both on mobile devices and computer systems allowing HCPs to continue to make best use of valuable time without adding an unnecessary burden. Quick access to nursing care plans, standardises the information available for nurses and reduces information variability, preventing potential problems and omissions of care. That way, when a nurse goes to assess someone for a respiratory compromise, they understand what they should be looking for and are supported with evidence-based goals and interventions. When care planning is integrated into the electronic medical record, they're prompted through the system on what factors they should be looking at, another way nurses can be guided easily and effectively.

These free-to-access, educational resources and toolkits, such as those available via Elsevier's Healthcare Hub, acknowledge the intense pressure they are currently under and subsequently support them with the necessary information to alleviate this. Rapid e-Learning training plans, such as those available on the NHS' E-learning for Healthcare site, have also been developed by healthcare organisations to support the redeployment of staff nurses making the transition into unfamiliar settings.

How can organisations best utilise technology as they start to resume provision of non-COVID-19 services?

As we are now beginning to see lockdown restrictions ease throughout Europe, routine surgeries, cancer treatments and postponed consultations will resume. The CovidSurg Collaborative has projected that, based on a 12-week period of peak disruption to hospital services due to COVID-19, 28.4 million elective surgeries worldwide will have been cancelled. As a result, beyond COVID-19, nurses' workloads will not ease and in, many cases, will increase significantly. As a result, it is vital that the healthcare systems and support tools that have been put in place are maintained to support nurses in the continuation of quality care and patient safety.

The uptake in digital technologies over the past few months has highlighted that we do have the technology to strengthen our health care systems for our patients, and it's time to maintain these to increase our preparedness for the future. ∎

The MediShout App: Communication, Control and Capturing Staff Voice During COVID-19

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Keywords: Covid-19; logistical issues; mobile application; healthcare workers; National Health Service;

ABSTRACT
Background
Covid-19 is exacerbating pre-existing pressures on healthcare systems. Frontline staff are relying more than usual on effective logistics and infrastructure to deliver patient care, for example provision of PPE, stock, facilities and equipment. Staff must adapt their ways of working in response to new challenges. Traditional communication channels within hospitals are often inefficient and not digitised, preventing healthcare organisations from adequately supporting ⇨

staff and providing efficient solutions to problems.

Objectives

This study deployed the MediShout mobile phone application (app) to capture real-time data, on problems with logistics and infrastructure occurring in hospitals during the Covid-19 pandemic. The main objectives were to determine whether; healthcare staff would use the app, reporting led to immediate improvements, and data-collection could drive long-term transformational change and improve responses to future pandemics.

Methods

The app was used by staff to report issues with logistics and infrastructure across two hospital emergency departments (EDs) at Imperial College Healthcare Trust, UK. These reports were acted upon by senior physicians and nurses, operational managers and service helpdesks. Data was collected from the start of the first peak of Covid-19 in the UK, between March and April 2020. Data from each report were retrospectively analysed across multiple categories, including problem description and time of submission. To gauge the impact of each issue on clinical care, reports were scored against an impact scoring tool using a modified version of the World Health Organisation's 'quality of care' definition.

Results

During this study, 94 reports were submitted. Reporting peaks were observed at times corresponding to clinical handovers. Peaks were also observed when changes had occurred to existing processes within the EDs. Impact analysis highlighted that every report sent had 'impact' or 'significant impact' on various aspects of care, including efficiency, patient safety and timely treatment.

Conclusions

The MediShout app captured valuable real-time data from frontline staff during the peak of Covid-19. Staff readily adopted the digital technology as it provided a more efficient way to resolve issues. This enabled hospitals to better allocate scarce resources, such as PPE, to those who needed it most. This study suggests listening to the voice of frontline staff during times of crisis allows more effective responses.

Capturing data during pandemics is critical for healthcare organisations to learn lessons and maintain control. During this study, it was established that most problems occurred due to changes in practice, such as dividing EDs into Covid-19 and non-Covid-19 zones, rather than increased caseload. Logistical and infrastructure issues were categorised as being 'material' (stock, equipment, medicines, or estates and facilities) or 'workflow' (task-management, new ways of working, infection control and communication) in nature. This provides healthcare organisations with a methodical tool for risk-assessing and coordinating future pandemic responses.

BACKGROUND

Healthcare prior to Covid-19

The healthcare industry is perpetually under pressure to provide high quality, cost-effective, patient-centred care. The demand has gradually been rising over the years due to factors such as an ageing population,[1] the increasing prevalence of noncommunicable diseases[2,3] and the growing burden of largely preventable

chronic conditions.[4] Even prior to Covid-19, logistical issues had a significant impact on clinical work with one report highlighting that approximately a third of NHS nurses waste more than one hour per shift finding missing equipment.[5]

Impact of Covid-19

The Covid-19 pandemic has exacerbated pressures already faced by healthcare systems. Globally, Covid-19 has forced healthcare organisations to enter crisis-mode making coordination of responses challenging. In the face of a disaster like Covid-19, frontline staff are even more reliant on well-functioning logistics and infra-structure to deliver care.[6] For example, staff require appropriate infection control measures such as clean working environments and personal protective equipment (PPE) to prevent spread of infection and save the lives of both patients and staff.[7]

The pandemic has forced healthcare organisations to rethink how healthcare is delivered with staff having to radically change their ways of working, often on an hourly basis. For example, elective work has been halted,[8] staff shift-patterns have changed and many clinicians have moved into sub-specialities they've not trained in.[9] Factors such as shortage of vital medical equipment, for example ventilators and PPE, are contributing to the psychological burden on healthcare workers.[10] Yet, job satisfaction of healthcare workers is critical for ensuring patients receive the best quality of care and ultimately feel satisfied.[11,12]

Digital Health

As healthcare systems adapt to new working conditions, Covid-19 has rapidly accelerated the need for digital health solutions and innovative technologies.[13] For example, GPs have radically changed their ways of working to adapt to the current crisis, resulting in demand for telemedicine soaring.[14] The importance of data, and not just patient data,[15] in the health and social care industry is becoming more apparent with global technology companies working with NHSx, the National Health Service's digital branch, to help manage the coronavirus pandemic.[16]

However, many areas of healthcare still lack digital infrastructure and solutions to support frontline staff, who witness problems first-hand and in real-time. For example, most healthcare organisations lack efficient communication channels for staff to rapidly escalate logistical or infrastructure problems to the people or teams who create change. With healthcare staff relying on instant messaging mobile applications such as Whatsapp to communicate at work, the organisations that they work for are not able to respond rapidly or effectively to resolve issues.[17]

This lack of digital presence hugely impacts patient care. In the short-term, issues accumulate and delay staff, whilst in the long-term not collecting valuable data could prevent transformational change and better responses to future pandemics. Thus, whilst healthcare staff should be focused on treating patients, their time is often wasted by logistical and infrastructure issues such as insufficient PPE, estates and facilities problems, faulty IT or missing equipment, which they have difficulties reporting.[5]

MediShout is a mobile phone app that allows healthcare staff to instantly report any logistical or infrastructure problem they encounter to those who create change, such as senior physicians, senior nurses, operational managers and service helpdesk teams. By
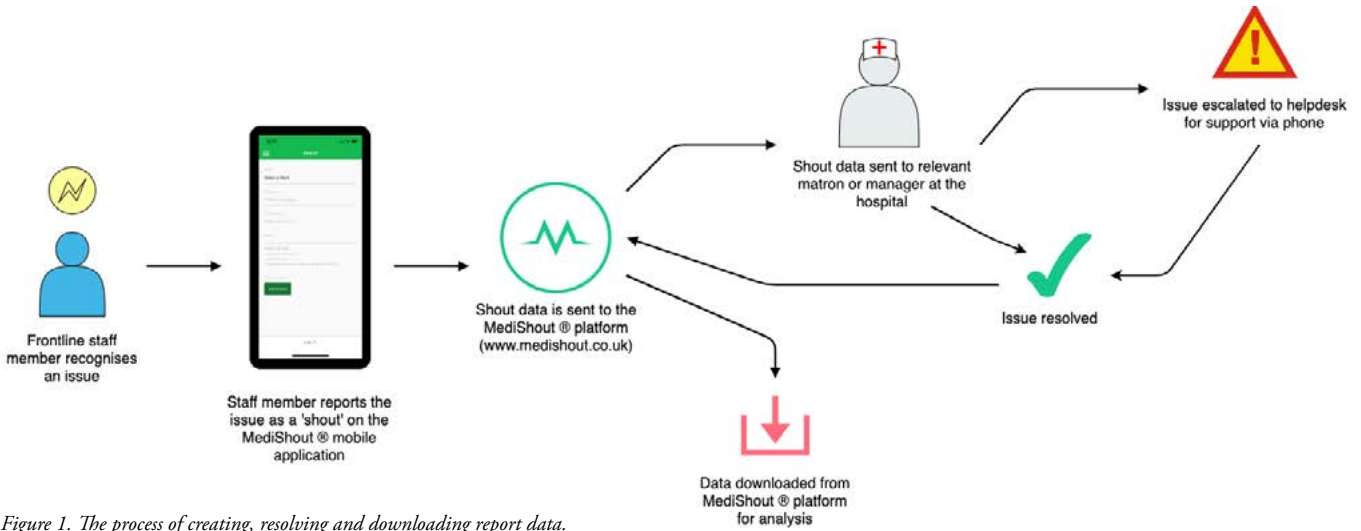

Figure 1. The process of creating, resolving and downloading report data.

harnessing the insights of frontline staff, MediShout also hopes to better understand the challenges staff faced during the pandemic.

Objectives

This study aims to implement a mobile phone application (app) to capture real-time data on logistical and infrastructure problems occurring during Covid-19. The main objectives are:
1. To determine if frontline healthcare staff would engage with digital technology during a pandemic, and use a mobile phone app to report logistical and infrastructure problems in real-time.
2. To analyse the impact of problems reported and determine whether reporting led to immediate improvements in healthcare provision.
3. To establish whether reported data can drive long-term transformational change and enable healthcare organisations to respond better to future crises, for example future surges of Covid-19 or new pandemics.

METHODS

Data collection

This study collected data using the MediShout mobile app,[18] which was made available to all staff working at the emergency departments (EDs) of Imperial College Healthcare NHS Trust's two main hospitals in London, United Kingdom. These hospitals were granted free unlimited use of MediShout, with their staff downloading the app and registering with a hospital email account. Staff could report any logistical or infrastructure issue relating to several broad categories; Covid-19, equipment, estates, facilities, stock or IT. The reports were accessed via the MediShout platform by senior members of the ED team; such as senior physicians, senior nurses and operational managers who would resolve issues themself or escalate issues to the relevant service helpdesk team (Figure 1).

Data-Analysis

This study analysed data reported from the start of the first peak of Covid-19 in the UK in late March to early April 2020, and this time-period was chosen as it is when hospitals underwent major changes to their normal function. The data was cleaned with duplicate reports removed. A retrospective analysis was performed by comparing data collected within each report (Figure 2); including problem description, date and time stamp, issue-category, location, staff self-reported time wasted by issue and solution where available.

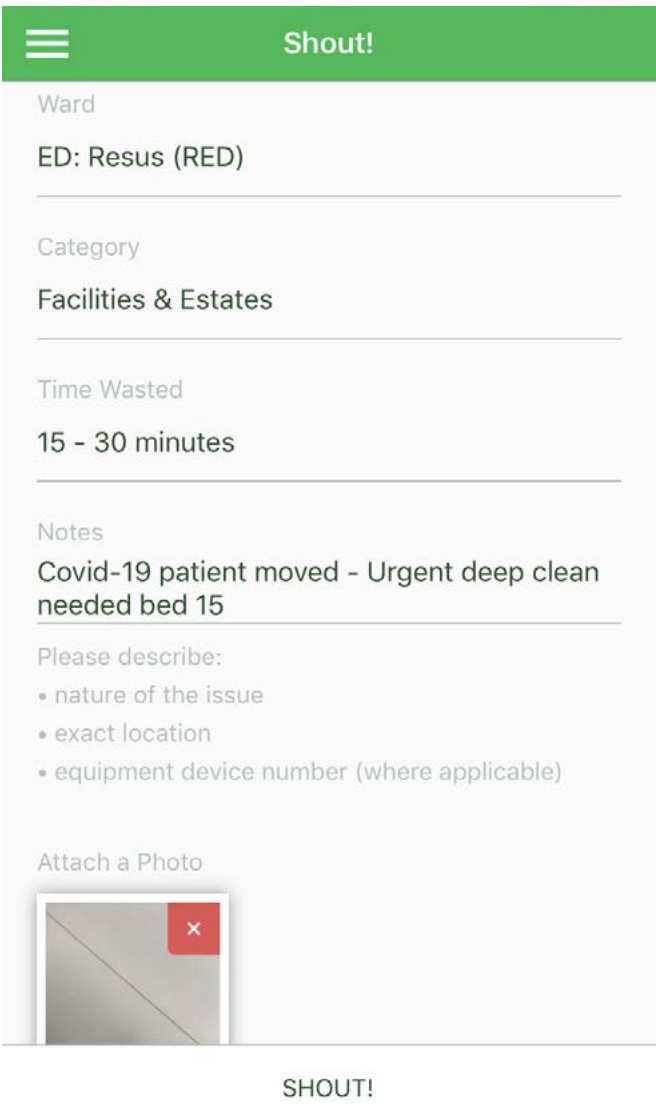Figure 2. A mock-up view of the reporting interface for users.

Impact-Analysis

To gauge the impact of each issue reported, on clinical care, the authors created an impact scoring tool using a modified version of a World Health Organisation's 'quality of care' definition[19]. This definition lists six criteria to determine 'quality of care', but for this study 'safe' was sub-categorised as 'safe for patients' ⇨

and 'safe for staff' (Table 1).

Category	Definition
Safe for patients	Delivering health care that minimizes risks and harm to patients, including avoiding preventable injuries and reducing medical errors.
Safe for staff	Delivering health care that minimizes risks and harm to staff members.
Effective	Providing services based on scientific knowledge and evidence-based guidelines.
Timely	Reducing delays in providing and receiving health care.
Efficient	Delivering health care in a manner that maximizes resource use and avoids waste.
Equitable	Delivering health care that does not differ in quality according to personal characteristics such as gender, race, ethnicity, geographical location or socioeconomic status.
People-centred	Providing care that takes into account the preferences and aspirations of individual service users and the culture of their community.

Table 1. Categories of care quality, modified from the World Health Organisation.[19]

All reports sent via the MediShout app were assessed against each of these categories and scored as 0 (no impact on this category of care quality), 1 (impact on this category) or 2 (significant impact on this category). Therefore, each report had a maximum 'impact score' of 14. Four individuals scored the reports independently, and a mean score was calculated for each report.

RESULTS

Data Collection
96 reports were sent from 23 unique users over the period of this study. The maximum number of reports submitted by a single user was 14.

Data-Analysis
Location:
44.1% of issues were reported from green (non Covid-19) areas, 41.9% from the red (Covid-19) areas and the remaining 14% from non-clinical areas such as offices or corridors.
Category:
48.4% of issues were categorised as Covid-19, 27.5% as facilities and estates, 16.5% as equipment and 7.7% as stock.
Staff self-reported time wasted:
35.1% of issues didn't waste staff time, 29.8% of issues wasted 0-15 minutes, 9.6% of issues wasted 15-30 minutes, 6.4% wasted 30-60 minutes and 19.1% wasted 60+ minutes.
Time of shout:
Figure 3 shows a large peak of reporting between 07:01 and 08:00, and another smaller peak between 19:01 and 20:00. Reporting activity at these times were higher than the daily average.
Date of shout:
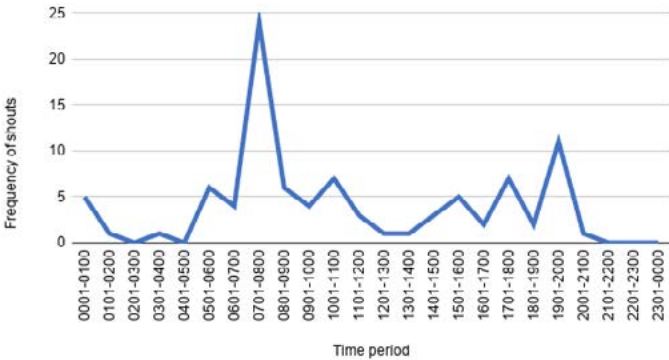The distribution of shouts by date shows three noticeable peaks; March 21, 25 and 31.

Figure 3. Distribution of all shouts per hour, over 24 hours.

Impact analysis
'Efficient care' was the aspect of care quality most impacted by the reported issues, with the highest average score of 1.298 out of a maximum of 2 (Table 2). The highest impact score for a report was 13.25, and the lowest was 2.25. The mean score was 7.111 and the median was 7.25. A full frequency distribution of the report impact scores can be seen in Figure 4, and a score for each report is available in Supplementary Figure 1.

Category	Score
efficient	1.298
timely	1.215
staff safety	1.154
patient safety	1.149
effective	1.059
people-centred	0.758
equitable	0.479

Table 2. Average impact scores for each quality of care category. The categories are ranked by their scores.
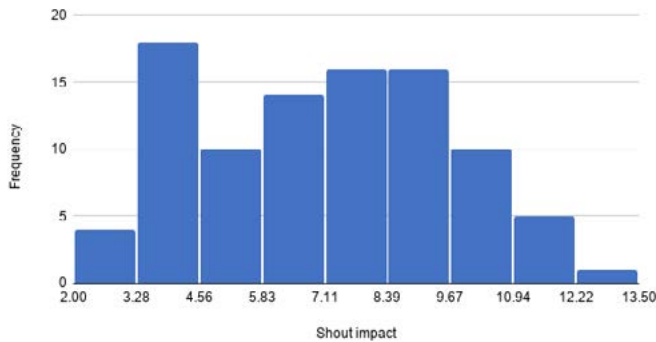

Figure 4. A frequency distribution (histogram) of the report impact scores.

Analysis showed that reports with the highest impact score would often describe multiple issues within a single message. For example, the report that obtained the highest impact score of 13.25, described several issues such as 'running low on Covid-19 swabs', running 'out/running low on blood cultures/Venturi mask/Venturi adapters' whilst also highlighting issues about 'capacity'.

Themes also emerged during free-text analysis which enabled the authors to categorise all reports as being 'material' or 'workflow' in nature, as seen in Table 3. Material problems are issues with physical aspects of service provision and can be further sub-categorised as stock, equipment, medicines, or estates and facilities. Workflow problems relate to processes and can be further categorised as task-management, new ways of working, infection control and communication.

Material	Workflow
STOCK 'No fascia iliaca block equipment, need suture kits, slings, collar and cuff' '[struggled to find] stock in red area. Struggled to find ECG dots, gloves'	TASK MANAGEMENT 'We currently do not have porters based in each area (green or red zone). They are currently positioned in green area only therefore we are constantly ringing green trying to chase a porter wasting significant time on this, last night we had to get nurses/HCAs leaving designated areas in order to do transfers. We need a porter designated to each area'
EQUIPMENT 'Running low on Covid-19 swabs. Ran out/running low on blood cultures/Venturi mask/Venturi adapters' 'We also need more thermometers, the tempadots are proving unreliable.'	NEW WAYS OF WORKING 'If a patient was going to have a cardiac arrest and we were in full PPE from the beginning then no time will be wasted in getting ready and therefore the patient might have a better outcome, instead of using up time donning before attending. We should just be wearing full PPE from the start of the shift in the red zone especially red resus.'
MEDICINES 'Please can we have a controlled drug cupboard in the green zone. We also need penthrox, metoprolol, adenosine, labetalol, heparin, GTN, pantoprazole, 100 ml N/Saline'	INFECTION CONTROL 'Patients with Covid-19 are accidentally being screened by green zone staff. Therefore, there is a risk to staff associated with a lack of PPE and surgical masks for green zone triage staff. I feel that green zone triage is an area that is unknown, therefore staff should also wear masks and PPE in this area'
ESTATES AND FACILITIES 'Automatic doors not working, have to be opened manually'	COMMUNICATION 'No Tannoy is currently available in green resus to provide quick communication with red zone's senior decision making team' 'Red RNA needs a phone as we are unable to communicate with anyone'

Table 3. Examples of problems reported, categorised into 'material' or 'workflow'. Quotations have been taken directly from the data and only amended for the purpose of making grammatical sense.

Discussion
The first objective for this study was to assess the ability of the MediShout mobile phone app to be used by staff to capture real-time data on logistical and infrastructure problems. Around the peak of Covid-19 in the UK, 94 reports were sent using the MediShout app on a wide variety of issues. Staff voluntarily using this digital solution, without any form of direct incentivisation, highlights that they believe this form of communication could benefit their clinical practice.

A large peak of reporting was observed between 07:01 and 08:00, and another smaller peak at 19:01 to 20:00. Reporting activity at these times was higher than the daily average and coincided with the morning and evening handover meetings, where staff discuss both clinical and non-clinical issues. Without the app, staff would have to make time-consuming telephone calls or send emails, which could result in them missing vital parts of the hand-over, going home late or not reporting the issue.

Unreported and unresolved issues would have a huge knock-on effect for other staff, particularly when 65% of all reported problems wasted staff time. 20% of reported problems wasted an hour or more of staff time. The app provided staff with a quicker way of escalating any logistical or infra-structure problems encountered during their shift. This form of communication improved efficiency and saved time, highlighting why healthcare staff happily adopted the digital technology.

The second objective was to analyse the impact of reported problems and determine whether reporting led to immediate improvements in healthcare provision. The retrospective impact analysis demonstrated that the app enabled staff to highlight issues that were significantly impacting their ability to provide quality care. MediShout supported hospital teams and enabled them to resolve issues in a more efficient and effective way thus facilitating care improvements.

The majority of reported issues occurred in the two-week period after the healthcare system underwent major changes to its service provision, such as implementing red (Covid-19) areas, stopping elective care activities and requiring staff to wear PPE. The data collected from the app allowed hospital managers to respond rapidly to problems occurring on the frontline as a result of these changes.

By the third week of the study period, coinciding with the peak of the Covid-19 pandemic in London, far fewer reports were sent, indicating that the core issues had been resolved and the EDs were better prepared. By the time the peak caseload arrived, it seems staff were accustomed to the new ways of working and could focus on providing best care. The problems reported seem to be due to the changes in practice, and not related to the actual Covid-19 caseload itself. This implies that, if we can adequately accompany any changes to practice with staff feedback, healthcare environments will be able to respond to and manage crises more effectively.

The final objective was to establish whether reported data can drive long-term transformational change and enable healthcare organisations to respond better to future crises, for example another surge in Covid-19 cases. The data indicates that co-adaptation of frontline staff with their working environment, improves the capabilities of the healthcare system during a time of crisis. The valuable lessons from this study can be extrapolated and applied to other healthcare environments.

When times of crisis or pandemic occur, causing situations to evolve rapidly and change normal service provision, this study recommends that healthcare organisations adopt a methodical approach to managing logistical and infrastructure problems. Organisations should categorise all potential problems, risk-assess them and allocate managers to oversee problems deemed 'high-impact'. A simple categorization system, based on the data analysed in the study, can be seen in Table 4. ⇨

Material	Workflow
STOCK	TASK MANAGEMENT
EQUIPMENT	NEW WAYS OF WORKING
MEDICINES	INFECTION CONTROL
ESTATES AND FACILITIES	COMMUNICATION

Table 4. A way for healthcare organisations to categorise logistical and infra-structure problems occurring during a pandemic

This study also recommends that during pandemics, healthcare organisations should adopt digital technologies to engage their staff, act upon the problems they see in real-time and use the data to be better prepared next time. During this study, staff in non Covid-19 zones were not initially given PPE however those working in triage used MediShout to highlight the fact they were seeing Covid-19 patients (see Table 3). This consequently led to the hospitals updating their PPE policies, and the staff were appropriately given PPE for protection. Thus, listening to frontline staff enabled rapid responses and better allocation of scarce resources.

Limitations

The quantity and quality of reporting data is dependent on the information sent by staff using the mobile app. Thus, assumptions were made about the accuracy of the reported information. The app highlighted the unique experiences of staff and the problems that they encountered. However, the reported data also suggests that for optimal impact, the data should be considered alongside broader factors that contribute to best patient care. This will enable the full impact of each issue to be explored in more detail. The validity of the impact analysis tool was dependent on the strength of the WHO's definitions, and the scoring system used to rate impact. Whilst the authors believe that the impact scale provided detailed metrics, this was performed retrospectively.

Future work

There are immediate opportunities for further research by collecting and analysing data from a larger pool of hospitals, and over a longer time frame. In addition, it would be insightful to prospectively understand the true impact of problems reported on wider healthcare systems. A larger quantity of follow-up data could be collected regarding reports and their resolutions, to identify more specific lessons for improving healthcare environments.

CONCLUSIONS

The use of the MediShout app in EDs captured valuable real-time data from frontline staff as they responded to the peak of Covid-19. This study indicates that listening to the voice of frontline staff during times of crisis enables healthcare organisations to respond to these challenges more effectively. Data collection is essential in ensuring better control, management and coordination of responses during pandemics and also normal times. The use of MediShout, and the categorisation of problems into material or workflow issues, provides healthcare organisations with a methodical tool for risk-assessing and coordinating future pandemic responses.

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MULTIMEDIA APPENDIX

Supplementary Figure 1. Average impact scores for each category of each shout, and their totals.

Abbreviations

PPE: Personal Protective Equipment
App: Mobile phone application
EDs: Emergency Departments ∎

5 Effective Ways ePrescribing Improves Patient Safety & Streamlines Physician Workflow

Electronic prescribing is transforming the way healthcare facilities are delivered today. It is also playing a significant role in the nation's attempts to amplify the quality and safety of the prescribing process.

A study conducted by the Everett Clinic in partnership with the University of Washington's School of Pharmacy found that e-prescriptions improved patient safety by reducing potential medication errors and avoiding adverse drug reactions. Researchers evaluated more than 5,000 prescriptions written before an electronic order entry system was implemented at the Clinic and 5,000 more after e-prescribing was put into place.

In this piece, we will be looking at a few ways e-prescriptions can improve patient safety and streamline physician workflows in a healthcare setting for better outcomes.

1 Increasing Clinician Productivity

Writing down prescriptions manually can be both tedious and exhausting, as these prescriptions usually need to be drawn up and authorized individually. With e-prescription systems, clinicians can automatically refill tens and hundreds of RXs at the same time, allowing more time to review them. This can both minimize the prescription error rate and increase efficiency.

With e-prescription systems, clinicians also can swiftly permit an emergency refill in case a patient loses access to their medication. Ee-prescription systems furnish frequent alerts about duplicate therapies, which can aid doctors avoid prescribing numerous treatments for the same medical indication.

An e-prescription system can also be integrated with a medical transcription service that will take care of HIPAA compliance and documentation at the same time. This will further rid clinicians of all paperwork and data entry related tasks, thereby increasing their productivity.

2 Lowering Medication Costs

According to recent research conducted by Surescripts, ePrescribing is linked to an increase in healthcare savings of around $140 to $240 billion and improved health outcomes over a span of the next ten years.

Physicians in the study who embraced ePrescribing wrote out close to 40% of their prescriptions electronically. This led to a 10% increase in patient first-fill medication adherence, which translates to reduced risk of hospitalization and fewer doctor visits. When taking into consideration this 60/40 ratio of paper-to-electronic prescriptions, the said study exhibited that prescription delivery rates rise to 81.8%, and 76.5% get picked up.

This is extremely uplifting, given the fact that many prescriptions never even make it to a pharmacy counter. Surescripts lead researcher Seth Joseph said this number could be as high as 22% to 28%, based on a Journal of General Internal Medicine study.

3 Increasing Patient Medication Adherence

When compared to manual prescriptions, e-prescriptions are exceptionally comprehensible in terms of dosage and treatment. They also require less interpretation on the part of the pharmacist. This can considerably reduce medication errors. ePrescribing can also help ensure patients have the exact information about how a particular drug should be taken.

Increased adherence to medication therapies can deliver better health outcomes and reduce costs too. As demonstrated by the Surescripts' study mentioned earlier, a 10% increase was noticed in prescriptions picked up when e-prescribed compared to written scripts.

In addition to greater medication adherence, ePrescribing can reduce the peril of an incorrect dosage, which can easily waste time or even cause harm to a patient in a worst-case scenario.

4 Augmenting the Outcomes of Electronic Health Records

In the United States, more than 4.5 million visits to physicians' offices and emergency rooms (ERs) are caused by avoidable adverse drug events (ADEs) each year. These ADEs happen because of allergies, interactions with other drugs or treatments, and other factors — like chronic use of specific medications and high drug dosages. ➥

The majority e-prescription systems are planned in a way that they integrate with electronic health records (EHRs) that collect information about patients' past and current medical history, including allergies. These EHR systems can alert clinicians if a prescription may interact with another treatment or prevent them from prescribing a medication that a patient would be allergic to.

Therefore, it can be safely assumed that when used alongside an ePrescribing system, EHR outcomes get augmented further.

5 Enhancing the easy Exchange of Patient Prescription Information

The Centers for Medicare and Medicaid Services estimates that prescription drug expenditure in the United States came to some $358.7 billion in 2020, up from $345.7 billion in 2019.

With this growth in expenditure on prescribing of pharmaceutical drugs, e-prescribing is expected to magnify the exchange of patient prescription information among many organizations including pharmacies in retail settings, physician offices, prescription benefit management companies, and insurance providers.

E-prescribing has also helped to involve patients in the prescription process by automatically sending text messages, emails, or voicemails to the patients confirming their order and pharmacy of choice; pharmacies can then notify patients by the same pathways when a prescription is ready.

Due to all these reasons, it can be rightly said that ePrescribing has greatly enhanced the easy exchange of patient prescription information.

About the Author:

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Can Digital Care Pathways Actually Reduce Demand on our Healthcare Systems?

By Lucy Mackillop, CMO, Sensyne Health

Much has been written about the role of remote monitoring in healthcare. Early promise has not always been born out in real-life clinical practice, often due to the complexities of the care pathway involving multiple individuals and fragmented agencies; as well as societal and patient choice factors. This means the results of well conducted trials of digital remote monitoring interventions often cannot be replicated in real-life.

In addition, digital technologies are often adopted without the necessary careful thought to understand what its adoption is hoping to solve, improve, or make more efficient. Adopting a remote monitoring system to complement usual care, may improve user satisfaction and potentially have some benefits on outcome; but it doesn't necessarily reduce demand on the healthcare system – in fact, often, quite the reverse. The pandemic has caused huge spikes in digital technology adoption as doctors and patients embrace social distancing guidelines. More than 75% of all NHS practices reported that they have used video to see patients in the third week of April 2020 alone, compared to just 10% before the pandemic. This is a tremendous shift.

Covid-19 has sharpened the mind. As lockdown came into effect on March 23rd 2020, we all understood the need for social distancing and minimising footfall to our GP surgeries and hospitals in order to manage infection rates effectively, and ensure healthcare systems were not overwhelmed.

Despite the challenges of implementation, there is now a real imperative for remote patient monitoring (RPM) and management to support patients and help healthcare systems become more efficient. RPM has allowed us to take more control of our own health whilst reducing footfall to our healthcare facilities, allowing resources to be focused on where it is needed most. As demand for healthcare continues to grow, RPM can play a key role in assisting healthcare staff manage increasing demand without over-stretching already strained clinic and staff resources.

Identifying challenges in the adoption of remote monitoring

This shift needs to be permanent: we will need to make better use of remote monitoring and virtual clinics to help meet the growing demands on healthcare in a post-COVID world. RPM has the potential to help clinicians make earlier diagnostic or treatment decisions which is afforded to them by virtue of better data, well presented for fast interpretation; and of course, the introduction of machine learning algorithms can provide decision support functionality. So, where do we start?

Firstly, a thorough understanding of how a remote patient monitoring system is anticipated to support, for example, earlier interventions or improve operational efficiency, are essential to any implementation. And indeed, the anticipated benefits need to be clearly identified and measured before and after implementation.

Secondly, prior to the pandemic, it was clear that many digital health innovations failed as clinicians were reluctant to engage with them, according to Deloitte's Shaping the future of UK healthcare: Closing the digital gap report, due to the amount of change required to familiar processes, the time taken to implement, and a lack of education and training. Therefore, it is imperative that a proper change management process is followed. This is preferable, and likely to be much more impactful, than the lazy alternative of adding the technology to existing care-pathways.

Third, but of equal importance, is ease-of-use. New technologies must be simple and intuitive for both clinicians and patients if they are to bridge, rather than reinforce, the digital divide.

Finally, digital health technology providers need to understand the regulatory and technical environment the technology will inhabit. It is very likely that the technology may be deployed in hardware that is not high spec; therefore what is developed in a high tech company might not work seamlessly in an NHS hospital with older, less powerful infrastructure.

So, the successful adoption of RPM will require a shift of mindset across both the public and the healthcare sector to embrace new technologies; and indeed Covid-19 may have provided a motivation for them to do exactly that.

Remote monitoring: Key in managing Covid-19 and easing lockdown

The pandemic has prompted hospitals and healthcare organisations to rethink their operations, catalysing the deployment and use of new digital technologies in days and weeks instead of months and years.

The Government, Public Health England and the NHS, have already made a strong push for those with milder Covid symptoms to take advantage of applications that can help individuals self-manage their health and help alleviate the strain on local healthcare systems. This allows clinicians to focus more time on the patients that need emergency care. RPM could potentially have a significant impact in helping healthcare professionals triage patients submitting symptom and vital sign health data from home.

RPM also has the power to improve access to healthcare services for vulnerable groups advised to shield during the Covid pandemic. For example, Sensyne's GDm-Health digital therapeutic app helps pregnant women and their care teams significantly improve the way they monitor and manage diabetes. The risks to mother and child associated with this condition are significant, and include an increased rate of caesarean section, pre-eclampsia and premature birth. Clinicians use the system to remotely monitor blood glucose levels, and prioritise care to women needing it most. Mums-to-be upload their blood glucose readings from home, and communicate with their care teams through the app. The need for face-to-face appointments is reduced, administrative time is saved, and quality of care is improved. GDm-Health is an exemplar of how RPM can enhance the existing care pathway, improve operational efficiency and help deliver better outcomes for patients.

Equipping scientists with data for drug discovery

The fundamental role of RPM is to improve the quality of data and information flow to deliver timely, effective and safe care. Data from RPM applications can be uploaded to Electronic Patient Records (EPR), which can be used to provide a complete medical history and real-time information source to support early diagnoses. Furthermore, this data can be anonymised, aggregated and used to analyse patterns within a disease and inform clinical research aimed at drug discovery and disease prevention. Gaining insights from anonymised patient data may allow for faster vaccine development and new treatments, not just for Covid-19, but also for other diseases.

As we continue to fight coronavirus, we must recognise the great potential of technology to help us. It is important that RPM solutions are implemented swiftly but with a clear pathway to deliver operational efficiency and improved clinical care in a tightly controlled ethical, information governance and regulatory framework. The hope is that by doing so, healthcare providers can manage future peaks, continue to improve health outcomes, free up time for clinicians to treat more patients and drive scientific research into disease prevention and treatment.

Demand on our healthcare systems will continue to rise, yet it can be better managed with technology that is aimed at earlier detection and intervention, preventing more costly treatments and providing the catalyst for transformative change in medical practice, helping to move from reactive to preventative models of care. ■

INDUSTRY NEWS

## News and Information for Digital Health Professionals

My Personal Therapeutics Wins Research Funding for AI-driven Personalised Cancer Treatment Plans

My Personal Therapeutics, a London-based medtech/digital therapeutics company and Pentavere Research Group, a Canadian-based Artificial Intelligence and data insight company have been awarded EUREKA Collaborative R&D: AI and Quantum Technologies Competition funding for a project titled "Utilisation of AI to develop Personalised Treatment Plans for cancer".

EUREKA is a publicly-funded, intergovernmental network, involving over 40 countries. EUREKA's aim is to enhance European competitiveness by fostering innovation-driven entrepreneurship in Europe, between small and large industry, research institutes and universities.

The companies will receive funding totalling £792,000 from the UK's innovation agency, Innovate UK, and Canada's National Research Council's Industrial Research Assistant Program, as part of their Collaborate R&D programme.

These funds will be used by Pentavere Research Group and My Personal Therapeutics to access Genomics England's whole genome sequencing lung cancer data set and selectively generate drosophila avatars for high-throughput drug screening. The resulting tumour genomic profile and corresponding drug treatment recommendation data will feed into our
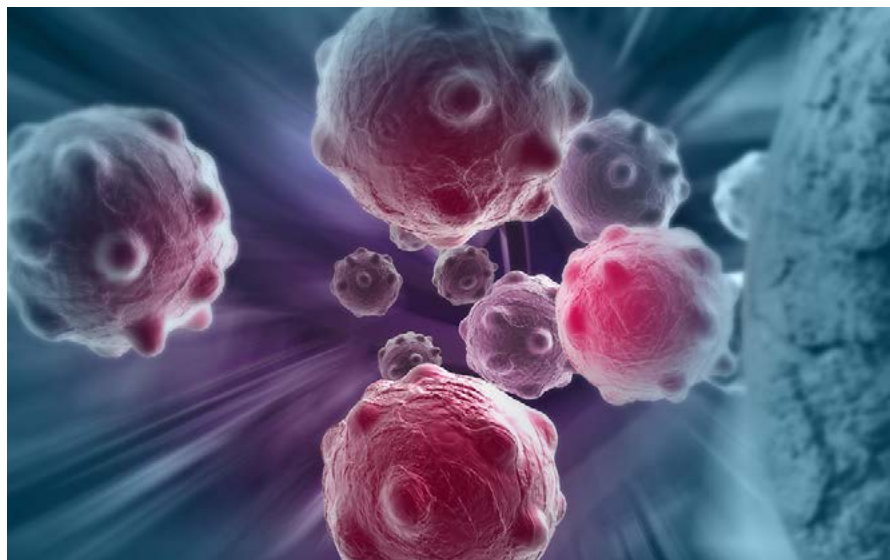
AI Personal Discovery Process predictive model. Potentially, some of the funding can support personalised treatment recommendations for lung cancer patients in the UK.

"This Eureka award will partly fund this ground-breaking collaboration between My Personal Therapeutics, Pentavere and Genomics England towards the development of our rapid personalised cancer therapeutics offering – AI PDP" shared My Personal Therapeutics' CEO Laura Towart.

My Personal Therapeutics is a London based medtech/digital therapeutics company offering personalised cancer thera-

peutics utilising technology developed at Mt Sinai Medical Center. The Personal Discovery Process technology leverages Big Data curated from electronic health records, and genomics to build personalised fruit fly 'avatars' that model individual patients at an unprecedented level of complexity. Using robotics, thousands of drugs are screened in combinations to identify drug cocktails designed to target the tumour while preserving the patient's quality of life. Nearly all combinations incorporate non-cancer drugs, making them less toxic and more affordable. We are integrating AI/predictive modelling to enable rapid personalised treatment recommendations. ■

Largest Independent Randomized Controlled Trial of a Digital Therapy against Chronic Pain

In the largest independent randomized controlled trial (RCT) of its type, a multimodal app-based therapy program for patients with non-specific low back pain has outperformed standard-of-care treatment across all medical outcomes.

Results of the study, published in the Journal of Pain Research, show that patients using Kaia, the back pain management app developed by leading digital therapeutics company Kaia Health, reduced pain levels, anxiety, depression, stress, and improved wellbeing and body functionality significantly more compared to standard-of-care treatments, e.g. pain killers, surgeries, physical therapy.

"This large-scale study demonstrates the significant benefits for
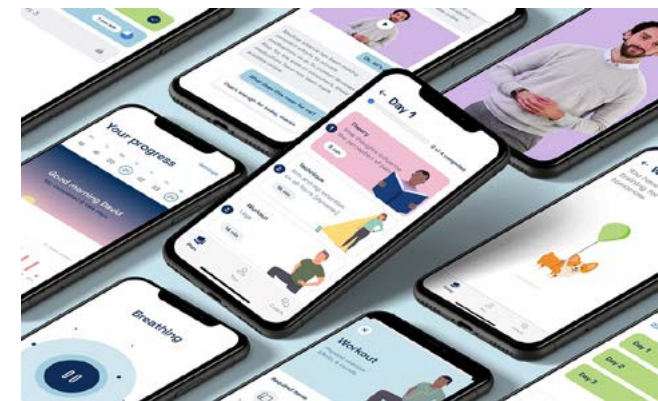
people managing low back pain when using Kaia to deliver a multimodal treatment through a digital device, such as a smartphone," says Thomas R. Toelle, M.D., Ph.D., Head of the Pain Center of the Technical University Munich, Germany. "These results add to the growing body of medical evidence that supports the use of digital multimodal treatments for chronic conditions, such as back pain."

Low back pain is one of the leading causes of global disability, with an enormous cost for healthcare systems worldwide. According to a 2018 report on the impact of musculoskeletal pain on employers, chronic pain, including back pain, accounts for 188.7 million lost work days, and $62,4 billion in lost productivity cost.

Kaia is an app-based, multimodal digital therapy program for back pain, which focuses on Physical therapy, Relaxation exercises, and Medical education.

"COVID is changing the way that health care is delivered and driving a meaningful increase in demand for multimodal virtual therapy solutions. We're focused on the highest level of clinical rigor to protect the health of patients, and significantly improve their chronic pain; remotely, effectively and at scale," says Kaia Founder and President, Konstantin Mehl. "Companies looking to integrate digital back pain therapy into their health plan for employees can trust that the Kaia treatment is medically sound." ■

Research Suggests Digital Mental Health Interventions have Significant Long-term Impact on Anxiety and Depression

Treating anxiety and depression with digital mental health therapy has a significant and long-term benefit for recovery, according to recently published research which involved the World's largest "real-world" study into the long-term benefits and cost-effectiveness of iCBT in improving access to psychological therapy.

The research was undertaken by Silver-Cloud Health, the world's leading digital mental health company, with the School of Psychology at Trinity College, the Uni-

versity of Dublin, and health economics analysis from the University of Sheffield.

Published at a time of increased anxiety and impact on mental health from the COVID-19 pandemic, the research emphasises how digital cognitive behavioural therapy (iCBT) as part of wider psychological care can deliver strong clinical improvements and recovery. More than half of those with a diagnosis of anxiety and/or depression recovered after three months, according to the

study published in npj Digital Medicine.

The findings, revealed in the largest ever study of its kind and involving more than 360 service users in England on the Improving Access to Psychological Therapies (IAPT) programme, strongly endorse the role that digital mental health can play in treating depression and anxiety disorders.

The study comes as mental health providers anticipate a significant increase in a range of disorders linked to anxiety and ⇨
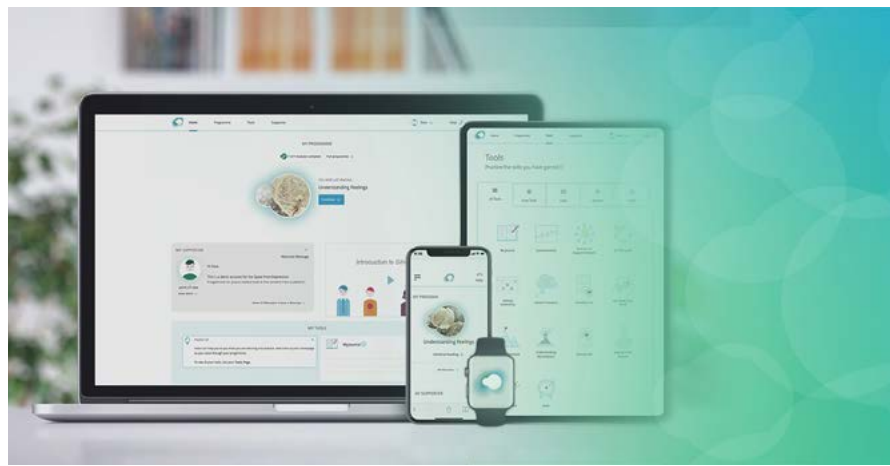
depression stemming from the pandemic and emerging as the lockdown continues to ease. The potential triggers include grief, job loss and insecurity, loneliness and isolation.

The findings underline the benefits from long-term outcomes and cost-effectiveness of including digital mental health interventions such as SilverCloud as part of clinical care, including stepped care models such as IAPT. Supporting economic analysis based on criteria suggested by the National Institute for Health and Care Excellence (NICE) indicated that over a 12 month period such health support could be cost-effective. Currently, iCBT accounts for just seven per cent of treatments completed within an IAPT programme.

The study participants were service users at Berkshire Healthcare NHS Foundation Trust, which is acknowledged as being at the forefront of developing new approaches to mental healthcare. It is one of NHS England's Global Digital Exemplars for transforming patient care and engagement through new technology.

Dr Derek Richards, Chief Science Officer at SilverCloud Health and Co-Director of the E-Mental Health Research Group, Trinity College, the University of Dublin, said: "This is important, large-scale research that demonstrates how digitally-provided cognitive behavioural therapy can enhance a wider mental health therapy programme calibrated to an individual's needs.

"Due to its results on long-term improvement, recovery and cost-effectiveness, at a time of increasing demand for psychological and behavioural healthcare, digital mental health care should be viewed as a standard part of psychological support and no longer simply as an innovative approach.

"As a result of the global pandemic, many individuals within communities are facing mental health challenges and iCBT can play an important part complementing current mental healthcare services, increasing their reach and capacity, and helping support and treat more people."

As part of the study an IAPT treatment group was given eight weeks of supported digital mental health intervention to treat depression and anxiety, compared with a waiting list control group that did not receive the treatment initially.

Psychiatric interviews of participants at three months after treatment found that, overall, 56.4% no longer had a diagnosis of anxiety, depression or a joint diagnosis. A further significant decrease in symptom scores was seen after 12 months, on average a 50% decrease.

The study report in npj Digital Medicine states: "In a society where the prevalence for depression and anxiety is rising and demand is outpacing what mental health services are able to offer, embedding digital interventions as treatment alternatives increases accessibility and service efficiency, which has the potential to be cost-effective for the health care system."

Judith Chapman, Development Director at Berkshire Healthcare, said: "By our joint working at Berkshire Healthcare Talking Therapies with SilverCloud Health in a long-term randomised controlled trial, we have been able to measure the effectiveness of iCBT within an IAPT setting. The findings have proven the effectiveness of treating anxiety and depression using iCBT with excellent patient outcomes.

"The trial has demonstrated that digital treatment has a strong place alongside conventional face-to-face mental health therapy, which is not a second class treatment offer but a robust evidence-based and accessible treatment for the population, especially during the unprecedented and challenging times we are experiencing due to COVID-19." ∎

NanoVation EU Funding to Develop a Novel Respiratory Monitoring Device

Israeli medical startup NanoVation has been awarded a €2.5 million grant as part of the European Union's prestigious Horizon 2020 EIC Accelerator program. The Haifa based company is developing a new respiratory monitoring device, based on its proprietary nano-sensor technology. The device targets monitoring and management of patients with various respiratory conditions such as Chronic Obstructive Pulmonary Disease (COPD), which was cited as the third leading cause of death in the world by the World Health Organization. The grant will be utilized within the "SenseGuard" project and will allow NanoVation to further develop and commercialize their SenseGuard™ device for monitoring patients at hospitals and at home.

SenseGuard™ is a wireless wearable medical device for continuous monitoring of patients' breathing, based on the startup's unique technology – a first of a kind nano-based respiratory sensor. The device has already gone through clinical trials and received CE marking, proving that the technology is both safe and highly accurate in monitoring the respiration of patients. It is currently being deployed in hospitals in Israel and the EU for further clinical research of its state-of-the-art capabilities.

Unlike existing solutions, SenseGuard™ is capable of measuring lung-function from patients' regular breathing without any need for cooperation or unpleasant test execution by the patient. Approximately 328 million people worldwide are classified as suffering from COPD. The economic cost is huge and estimated at an annual spending of $49 billion in the U.S. and a similar amount in the EU. Approximately half of all direct COPD costs are associated with hospitalization due to deterioration in the respiratory function of only 6.4% of the patients. These costs could be significantly reduced through a high-quality and simple-to-use home monitoring device that identifies any deterioration early and leads to a dramatic reduction in the need for hospitalization through treatment intervention at the patient's home.

Dr. Gregory Shuster, CEO and co-founder of NanoVation, commented: "Lung function changes indicating a worsening condition can appear up to three weeks before reaching an acute state that often leads to hospitalization and a lengthy rehabilitation. The residual lung damage will impair quality of life, or in the worst-case lead to death."

"Our pioneering device aims to enable identification of the early signs of deterioration in lung function, and enables early treatment," noted Shuster. "The cost of preventive intervention and treatment ranges from tens to hundreds of dollars, while they minimize unnecessary hospitalizations, which would cost between $10,000 and $40,000 for an individual in the US and between €3,000 and €10,000 in Europe, and translate into billions of dollars annually for the entire health system."

Dr. Shuster added: "The Horizon 2020 Program grant is a strong vote of confidence in NanoVation and will help us dramatically reduce the clinical and economic burden of COPD and other respiratory diseases."

Horizon 2020 is the biggest EU Research and Innovation program ever, and one of the most competitive. It supports Small and Medium-sized Enterprises (SME) with breakthrough innovation projects and aims to promote and fund discoveries and world-firsts by taking unique ideas from the lab to the market. The round of applications in October 2019 was highly competitive with a success rate of 4% from 1852 submitted proposals.

NanoVation was founded in 2014 as a spinoff from the Technion - Israel Institute of Technology, and led by Dr. Gregory Shuster, CEO, Nadav Bachar, CTO, and Professor Hossam Haick, the company's CSO. By now, the company raised $6 million in two rounds of financing and grant support from the EU Horizon 2020 program, as well as the Israel Innovation Authority. ∎

Hyland Healthcare and TietoEVRY Extend Partnership for Revolutionary Digital Pathology Solutions

A consortium of five companies, including TietoEVRY and Hyland Healthcare, have partnered to deliver PATOS, a digital pathology solution that enables improved cancer diagnostics and patient treatment, to Region Västra Götaland in Sweden.

Region Västra Götaland, serving 1.6 million citizens, was the first region in Sweden to establish a coordinated effort for digital processes across its pathology units. This transformation has driven a need for solutions that can deliver speed, quality, and accuracy of diagnoses for pathologists, patients and healthcare organisations.

By understanding the value that digital pathology brings to the table, Tieto-EVRY and Hyland can combine and leverage their unique offerings into one Laboratory Information Management System (LIMS) to deliver services covering the fully digital diagnostic process.

PATOS is a solution delivered by Tieto-EVRY, integrating technology infrastructure, instrumentation and diagnostic analysis from a consortium of five partnering companies of which Hyland is one.

Hyland's Acuo vendor neutral archive (VNA) and NilRead enterprise viewer are central components of the solution providing both storage and management of digital pathology images. Hyland's solution will also contribute with functionality for the industry standard, DICOM, formatting the images that are produced by scanning the slides, ensuring the interoperability and full flex- ⇨

is an ever-increasing need for improved image resolution and that is creating demands on storage capacity. Effectively storing a growing number of these images is a key challenge where TietoEVRY as a Nordic leader of infrastructure offerings can provide a cost-efficient storage solution for the digital images", says Patric Nilson, Head of Healthcare Solutions and Specialist Products, TietoEVRY.

TietoEVRYs Lifecare Pathology LIMS supports a fully digital pathology process, both the laboratory process and the diagnostics, including possible integrations with viewers and image analysis.

"Digital pathology is an emerging area in medical imaging and TietoEVRY and Hyland Healthcare are at the forefront of delivering working solutions that address the modern healthcare landscape." By helping pathologists accelerate analysis via digitisation, we're helping them make quicker diagnoses and potentially save lives. It's rewarding when technology has a very real human impact", says Mark Groesch, Director of EMEA Sales at Hyland Healthcare. ∎

ibility for the digital pathology solution in the future.

Hyland´s Acuo VNA can manage larger data sets at higher speeds than traditional archive systems, a must for pathology images that are several times larger than typical radiology studies. The vendor-neutrality of Acuo also allows pathology images to be stored and accessed alongside other types of imaging studies, providing added convenience and enhancing diagnosis.

"Hyland has been a good partner in this solution, and we are very happy to continue looking for ways to deepen our collaboration. With digital pathology, there

Cegedim to Collaborate with IBM to Provide Access to Real-world Clinical Data

Cegedim Health Data is working with IBM Watson Health to integrate clinical rich real-world data from Cegedim's Health Improvement Network, THIN® into IBM Watson Health's real-world evidence solution portfolio. The integration of THIN® will support IBM Watson Health research services and IBM MarketScan® Treatment Pathways with offering life sciences and pharmaceutical clients access to rich and diverse European real-world data (RWD).

The THIN® database, which includes clinical data beyond biometrics such as diagnoses, treatments, clinical outcomes and interventions, will complement IBM's proprietary databases for use in executing high-quality research studies and a self-service analytic tool to support life sciences clients.

"Many life sciences companies are pursuing market access in Europe and require a fully integrated solution to access real-world data. We can help address this emerging need by integrating the THIN® database directly into IBM Watson Health research services and IBM MarketScan Treatment Pathways. This collaboration further enables IBM Watson Health and Cegedim Health

Data to support clients with a unified approach to evidence generation, thereby helping to streamline clients' commercialization and market access strategies," said Mary Presti, Vice President of Life Sciences at IBM Watson Health.

This collaboration supports IBM Watson Health in developing

meaningful use cases and insights for their clients using high-quality European real-world data. Not only does IBM have access to this European real-world dataset through its research services and self-service analytic solution, its researchers are trained to leverage the strengths of THIN®, which includes rich, longitudinal, anonymised and representative real-world data with a history dating back to 1994.

The collaboration comes at a time when the value of real-world data is arguably greater than ever before, as organisations and institutions globally seek answers to some of the industry's biggest challenges. The European Medicines Agency has recognised that RWD

analyses can support important investigations, and has called for a learning healthcare system at the international level based on data gathered in everyday practice to generate new knowledge.

Gilles Paubert, Global Head, Cegedim Health Data, concludes: "Cegedim is committed to enabling advancements in patient outcomes. Combining THIN® data and experts with IBM's high-quality research experience and analytics platform presents a very real opportunity to help improve the potential of real-world data and provide that with every new patient treated, we know more overall about the practice of medicine." ∎

Nanox Secures Funding for Disruptive Medical Imaging Technology

Nano-x Imaging has secured a $110 million equity investment from global investors to finance the global rollout of its innovative medical imaging technology.

Nanox, founded by the serial entrepreneur Ran Poliakine, is an Israeli corporation that is developing a commercial-grade digital X-ray source designed to be used in real-world medical imaging applications. Nanox believes that its novel technology could significantly reduce the costs of medical imaging systems and plans to seek collaborations with world-leading healthcare organizations and companies to provide affordable, early detection imaging service for all.

Nanox has signed agreements for the deployment of its innovative medical imaging system and diagnostics services in 13 countries across 5 continents. The Company plans to revolutionize early-detection healthcare via deployment of a global medical imaging infrastructure at an affordable price-per-scan service model while maximizing availability and accessibility of the service to all socio-economic communities.

"It is easy to say that we are aiming to change the world," says Ran Poliakine, Founder and Chief Executive Officer of Nanox. "the main challenge with such statements is always the execution. We have a bold vision of helping to eradicate cancer and other disease by means of early detection. We are actively working for the deployment of a global medical imaging service infrastructure that may turn this dream into reality. We cannot do it without partners and investors who share our vision and support our plan. I thank our friends at SK Telecom, Foxconn, Industrial Alliance and Yozma Korea for their faith and trust in the Nanox team and vision." ∎

# Will Immunity Passports be Blockchain's Breakthrough Application?

COVID-19 immunity passports have been touted as a possible way to help take the strain off increasingly stretched healthcare systems and shrinking economies. As the UK's effort to implement its track and trace programme proved, however, there is mounting anxiety that technologically enabled responses to COVID-19 could be detrimental for data privacy. Despite this, according to TrueProfile.io, blockchain offers some hope for alleviating these privacy fears, setting the stage for the technology to finally break through into the mainstream.

Immunity passports aim to link an individual's identity with their COVID-19 test status, opening up a way out of lockdown restrictions for those that are proven to be immune to the disease. This means that any immunity passport would rely on antibody tests – which are intended to show whether someone has recovered from the infection – to then provide certification that a person is immune and cannot catch the virus again.

By the very nature of COVID-related immunity passports, they are likely to contain sensitive and personal health data. This has made them a hot topic when it comes to data privacy, with many concerned about how the data will be stored and who will have access to the data. This is where blockchain – a decentralising technology typically associated with Bitcoin and cryptocurrency – can be used to ensure data governance and that user privacy will not be compromised.

René Seifert, Co-Head at TrueProfile.io, explained: "A blockchain-enabled digital immunity passport could be viable if end-users provide proof of ID before testing and a permanent 'digital fingerprint' of the certificate is placed on the blockchain, which is used by a verifier, such as an employer, to check authenticity. Crucially, as test results are stored as a 'fingerprint', this offers a form of encryption and makes sure that the digital certificate provided to the end-user is secure and tamper-proof by design, which means it is unalterably linked to their identity. For those more concerned about the data security, as each 'fingerprint' is individual and does not reveal any information about whom the document belongs to, it also safeguards the information it contains.

"The fundamental assumption in blockchain is that a centralised data monitoring or validation is not required among a network of distributed databases, because some pre-agreement about data validation has been conducted. This makes it ideal for the immunity passport use-case, as no central party has control over its content, giving the end-user complete control of how their health data is being used. Utilising this technology could also alleviate concerns over a wider surveillance infrastructure (including a contact tracing app) that will collect data beyond the purposes of determining people who are potentially immune to COVID-19. Ultimately, implementing this technology into such an important and urgent issue would likely bring it into the mainstream consciousness and out of the shadow of Bitcoin and
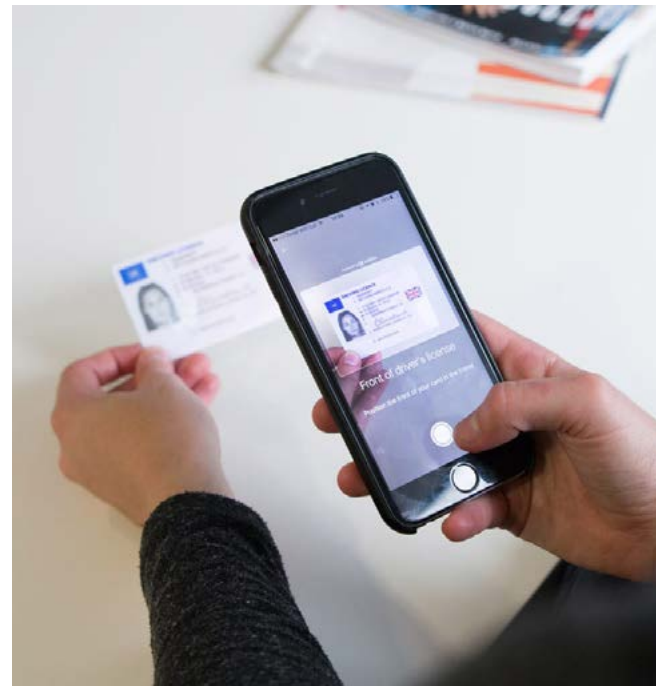
the world of cryptocurrency."

Despite the privacy guarantees that a blockchain-enabled immunity passport can afford, René also believes that a strong dose of caution needs to be kept in mind before developers get ahead of themselves. The World Health Organisation (WHO) has consistently warned about a lack of scientific evidence for COVID-19 immunity, saying those who wrongly believe themselves to be immune could get reinfected or transmit the disease further. For René, this has the potential to derail the concept of digital immunity passports entirely.

He concluded: "At present, the biggest barrier to immunity passports is the testing itself. Firstly, immunity tests need to possess higher levels of sensitivity and specificity, which are essential measures to express the rate of false negatives and false positives of a result. More worryingly, due to the novelty of the disease, scientists don't have enough data on the body's immune responses. This means that we simply don't know how long someone remains immune to COVID-19 – or even if they can become immune at all in the case of asymptomatic patients.

"As such, a more sensible line of action would be to follow the science. For a blockchain-enabled immunity passport to truly work effectively and be taken seriously, it is crucial that COVID-19 tests not only have high levels of sensitivity and specificity, but any antibody test is proven to show that end-users cannot get infected again. However, this should not mean that governments and healthcare bodies abandon the development of blockchain-enabled immunity passports altogether, as the time may come when this sort of technology could be highly effective and help keep citizen health data secure and decentralised." ∎

Elucid's Dashboard Gives Pharma Real Time Patient Adherence Data during Clinical Trials

Understanding and monitoring meditation adherence during clinical trials is a problematic process. Researchers need to know that trial participants have administered the correct dosage at the appropriate times in order to fully document the impact of a particular medication. Elucid's Pill Connect dispensing system, is one solution that is looking to provides CROs and pharma with the ability to show adherence across the whole trial, by country, by site even down to the individual patient number in real time.

Elucid's system provides trial researchers with a dashboard that is automatically created by the dispensing of the pill/tablet through the intelligent Pill Connect cap which fits on any standard pill bottle. The patient receives a reminder on their phone when the pill or pills should be taken. The patient then touches the dispense button on the screen and the pill is ejected from the bottle and a signal is sent, via the phone, that the pill has been dispensed. If the patient does not respond to the alert a reminder text or even a call can be made to prompt them or find out why. The patient does have the opportunity to respond to the alert by tapping on the screen that they don't feel well or that the pills are upsetting them.

All of this information is collected in real time and the dashboard can be customised to show what ever data is requested by the CRO, or pharma.

Stuart Young CEO of Panthera site management organisation commented: "Confident tracking and adherence to

treatment needs this type of improvement to help ensure that the power of a study is not compromised. Investigators will really like this technology and it is simple to use and understand. We need more technology in research like this which is focused on the patient."

Unfortunately patients who do not adhere to the agreed regime have been known to mislead the trial monitors which can really effect the results of the trial. Another benefit of the Pill Connect system is that it prevents double dosing - a real problem with some older patients. Once a pill is dispensed the cap locks until the next dose is due.

CEO of Elucid James Burnstone commented: "We have had a lot of interest from some of the largest pharmas and

CROs as the device is not only simple and inexpensive but also provides a great deal of information on the dispensing pattern. If for instance we note that Saturday morning is a problem because the patient is playing sport we can work with the patient to find a solution which fits in with the protocol."

As well as providing a customised dashboard for the monitoring organisations the system also can show the patient in graphic form how they are doing and rate them compared to other people in the trial.

The Pill Connect system has been through a number of robustness trials which has shown a 100% reliability both in the cap dispensing and the phone reporting back the data. It is presently undergoing trials with several major pharma companies. ∎

Study Shows Diabits App can Predict Blood Sugar Values 60-Minutes into the Future

Bio Conscious has completed an in-house study demonstrating that its Diabits app is capable of predicting blood glucose levels 60 minutes into the future, an improvement on industry-leading continuous glucose monitoring companies that offer only 20-minute predictions.

Diabits is an artificial intelligence-powered diabetes management app for people with type I and type II diabetes who use a CGM to monitor their daily blood sugar fluctuations.

"The ability to accurately predict glucose levels with the Diabits app helps users improve blood sugar management by increasing the time that they have to react. This enables proactive management of highs and lows to help them stay within a healthy glucose range for a longer time during the day and ultimately keep them healthier," said Amir Hayeri, CEO of Bio Conscious. "Additionally this information could be transmitted to a pump or a smart insulin pen to calculate

the precise amount of insulin needed and the optimal time for injection. This can further minimize fluctuations and excursions beyond recommended glucose range."

Maintaining daily blood sugar is imperative to maintaining the strength of the immune system. Data out of Italy showed that 35.5% of those who died from COVID-19 had Diabetes. The International Diabetes Federation reported that when people with diabetes develop a viral infection, it can be harder to treat due to fluctuations in blood glucose levels.

The study used the FDA-approved Padova simulator provided by the Epsilon Group. The study included 30 virtual patients, and measured the predictive accuracy of the Diabits algorithm. Each virtual patient was entirely unique, and represented a possible profile of a real Diabits user's glucose metabolism.

Two different blood sugar prediction mod-

els were trained and tested for each patient. The first model, Production, is the algorithm which is used in Diabits today. The second model, ICE, is a more advanced version of Production which puts a more substantial weight on food, insulin, and exercise information. The results of the simulation showed that in general while the Production model is highly accurate, the ICE model will slightly outperform the Production model in most cases.

As a result of this study, the ICE model was implemented into Diabits. Today, if a user inputs food or insulin information, the ICE model will be automatically selected and used for that user's predictions. If a user does not input this additional information, the Production model is automatically selected. ∎

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