Prescribe Software for Mental Health Treatment

Is Patient Centred Tech more Important than Ever?

A Tipping Point for Digital Transformation
Currently many compounds come to market with companion apps, which support patients during their treatment, offering information on side effects, education on their diagnosis and much more. This is great but we need to deliver more to patients, healthcare professionals and healthcare systems and the rapid development of the digital therapeutics market enables us to do this.

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**Telemedicine: A Tipping Point for Healthcare’s Digital Transformation**

Digital transformation has helped healthcare organisations build a better-equipped system to handle public health emergencies and coordinate care with a more holistic view of each patient’s health. Telemedicine’s rapid growth during the COVID-19 pandemic has also permanently changed care delivery.

**Virtual Mental Health in Our Post-Pandemic World**

Is Patient Centred Tech More Important Than Ever?

**Healthcare CIOs Need to Hone their Focus to Accelerate Innovation in the Post-pandemic Environment**

C-suite and clinical leaders now better understand the power of technology for their success. As such, they are demanding that CIOs come to the senior management table with innovative solutions that will address the biggest business needs.

**Collaboration is Key to Digitally Empowering Patients**

The Rise of eHealth: How Cellular Connectivity is Reducing the Strain on Healthcare Systems

**EPMA’s: How to Implement at Pace During a Global Pandemic**
Welcome

The challenges facing the healthcare industry mean that there is an increasing need to provide value-based care and to deliver treatment using more effective and efficient methods. Digital Therapeutics (DTx) is one area of technology-based healthcare that is beginning to provide the tools necessary to deliver effective treatments using less-resource intensive processes.

Digital therapeutics empower patients, healthcare providers, and payers with intelligent and accessible tools for addressing a wide range of conditions through high-quality, safe, and effective data-driven interventions.

For many years there have only been a small number of DTx technologies that have truly offered the standard of evidence necessary to provide a non-pharmaceutical treatment alternative for the conditions they are designed for. However, recent years have seen a surge in the development of evidenced-based technologies that offer a true digital intervention option for clinical treatment.

Certain medical specialties including mental health and diabetes care lend themselves particularly well to the use of digital interventions and there is a raft of well-proven solutions available in these areas.

However, with healthcare organisations increasingly looking to establish a digital-first approach to patient treatment more, and more digital interventions are being considered as first-step approaches to many common conditions. Things like sleep problems, smoking cessation, dietary changes can all now be approached with a digital mindset that empowers patients to take control of their own treatment pathways, and reduces the intensity of demand for face-to-face healthcare services.

These are exciting and transformative times for healthcare, and in this issue, we look at the opportunities going forward that exist for digital therapeutics, particularly in the mental health space. We also consider what is needed for the reinvention of care pathways that will allow healthcare providers to take advantage of this digital-first approach towards treatment.

Matthew Driver
Editor
A holistic approach to care

It's not just about digital. We believe a hybrid model, with initial in-person psychedelic assisted psychotherapy followed by ongoing treatment via a digital therapeutic, will deliver the most effective mental health treatment. Prescribing a digital therapeutic, which is focused on optimising the long-term response to treatment and minimising relapse, will deliver the most value. We believe this approach will help patients to engage better with their treatment plan long-term. In addition to supporting patients with their primary diagnosis, the digital therapeutic offers the opportunity to support patients with other comorbidities from which they are suffering (e.g. diabetes).

Software ultimately enables truly personalised medicine with benefits that extend beyond the individual. Not only can a prescription digital therapeutic be personalised and 'learn' over time to further refine treatment, but the technology can deliver data sets that can help life sciences companies to create better treatments and more holistic care packages, which deliver better outcomes for patients and healthcare systems.

Building better healthcare systems

Prescription digital therapeutics can have positive implications not just for the individual patient and the future of treatment for one condition, but for the broader healthcare system. By integrating technology, applying software solutions not just to manage mental health conditions but in connection with a range of comorbidities, we can dramatically improve resource utilisation across the healthcare system.

Software enables us to personalise medicine, intervene earlier and more effectively, or identify patients who are relapsing earlier and try a different approach. This can free up the time of medical professionals and potentially reduce the cost of managing a particular illness dramatically over the lifetime of the patient's condition, while delivering better outcomes for the patient.

Ultimately, the successful integration of technology creates value for healthcare systems by enabling them to optimise resources. We believe that prescription digital therapeutics, combined with breakthrough compounds and novel treatments, can revolutionise our approach to mental healthcare. Most importantly, this will not be at the expense of in-person patient care. The hybrid model will enable physicians to devote more time to delivering better care in the areas where it is needed most.

Article by Becky Hutchinson, Commercial Director at Beckley Psytech

Telemedicine

A Tipping Point for Healthcare's Digital Transformation

Virtual care methods have become more and more essential to care delivery and healthcare transformation as a result of the COVID-19 pandemic. Telemedicine emerged as an effective tool for preventing infected patients and people with other health issues from congregating and potentially spreading the virus, and virtual interventions overcame barriers to accessing health services caused by geography, transportation, and fragmented care due to overburdened health systems.

Digital transformation has helped health-care organizations build a better-equipped system to handle public health emergencies and coordinate care with a more holistic view of each patient's health.

Telemedicine's rapid growth during the COVID-19 pandemic has also permanently changed care delivery.

Healthcare as an information-intensive sector needs a platform to store and integrate information across robust networks. To provide the missing link in healthcare technology, we need a health cloud that unlocks the power of the data and provides a platform on which new digital services and solutions can be built with native interoperability.

A new digital reality

In the new digital health environment, providers must encourage care models that hold clinicians and patients accountable in care journeys and outcomes. Population data organized via an analytics-powered virtual care platform can deliver a comprehensive view of demographics to help healthcare organizations streamline their work and prepare for a surge of incoming patients.

Telemedicine should support—not replace—traditional care delivery. High-quality care is founded on strong relationships. Providers can continue to care for their patients in person, but it's important that remote monitoring remains an option for follow-up visits, check-ups, and the delivery of test results or educational materials.

With telemedicine's rapid scale-up in the public health response to the pandemic, we have reached a tipping point, where the patients are unlikely to revert to the previous reality once society recovers from today's outbreak.

The COVID-19 pandemic has changed patient expectations from the virtual care model, raising demands for more coordinated, convenient, and customized care solutions. To offer a personalized care experience, we need a cloud platform to connect the entire healthcare ecosystem across every function, giving a holistic and unified view of every patient.

Value drivers of digital transformation in healthcare

Digital transformation has become essential to staying relevant for every industry—especially since the pandemic.

Healthcare has adopted several tech-
As healthcare is digitalized, caregivers can move beyond treating illnesses to facilitating proactive care. They will be able to identify diseases earlier, intervene, and ensure that patients have an active role in their health and well-being. When drafting a virtual care strategy, an organization must identify its overarching goals and objectives defining its role in the evolving ecosystem. Understanding patient populations helps organizations choose the right technology to invest in and the metrics to track to increase ROI.

With telehealth transforming healthcare and shaping the future of care delivery, they will be able to save money, a wide spectrum of virtual care offerings unleashes the enormous potential of remote care and telehealth continues to benefit patients and providers in a multitude of ways. There will always be challenges in healthcare. However, evolving technology will continue to help caregivers overcome those challenges!

As COVID-19 assumed priority in healthcare centers nationwide, other health concerns went untreated, resulting in a decrease in availability of mental health resources with 2 million fewer GP appointments booked in 2020 compared to 2019. According to a Lancet study on resource allocation, there was an initial contradiction in outreach for mental health issues, with the greatest decrease in depression, self-harm, anxiety, and obsessive-compulsive disorder complaints between March–August 2020. This number steadily rose as the pandemic wore on, resulting in double the number of daily calls to Mind’s Infoline in October 2020 compared to 2019. With in-person community resources curtailed, options for receiving mental health support remain scarce in the wake of the pandemic. Compounding this scarcity, as physical health issues went untreated, emotional well-being further declined, not to mention post-COVID PTSD, grief, and long COVID.

One sector that rose in prominence during this past year has been online therapy. As the rest of the world transitioned from in-person to virtual service offerings, psychological therapy was able to join this trend and similarly expand within existing technological capabilities. With the advent of more online therapy, patients in growing need were able to access practical solutions.

Google trends show a 400% increase in “online therapy” searches from the start of 2020, and one smart phone based therapy app estimates a 500% increase in companies interested in providing mental health care for their employees. Further to this increase in digital demand, one Dutch study found that over 80% of practitioners made use of digital tools since May 2020. As such, it makes sense that all health organizations are entering the market, aiming to provide much needed relief for strained resources.

As with any new frontier, the limitations of virtual therapy are still largely in question. The new entrants in this market have been of varying quality, with several publications outlining concerns about whether clients are being exploited by unaccredited online counselling. As traditional providers create an online presence, they may be hindered by poor technological infrastructure, leading to a disjointed patient-provider relationship and confusing service navigation. For example, recently trying to access a free therapy service led to a “page not found” message. These providers may struggle to adapt to an online format, and are competing in an unregulated marketplace that further obscures the ability to discern quality.

Non-professional enterprising individuals may also sense an opportunity, leading them to create virtual therapy companies. These founders may create online profiles while having little to no personal experience in clinical psychology, capitalising on a gap in the market but not fully understanding the landscape. These virtual therapy matching services can use the pressing demand for therapists to their advantage, charging unclear fees, advertising therapists with unknown or overstated credentials.

In addition to unclear quality controls, these private services may offer services by therapists at various levels of training, perhaps unclear to the user. For example, a “psychologist” is not a legally protected term in the UK, so can be used by individuals with a variety of levels of experience and training. Psychologists then require further training and a doctorate degree, as well as registration with the Health and Care Professions Council (HCPC), to use restricted titles such as “clinical” or “counseling” psychologist. This legal protection is different to psychotherapists, which is not a legally protected title. Psychotherapists who are registered or accredited with a professional body are verified to have completed substantial training, often specialising in a particular type of therapy - such as psychodynamic or cognitive behavioural. Finally, counsellors are not a legally protected title and users must do their own research to verify the counsellor’s credentials.

Aside from logistical hurdles, there are inherent adaptations necessary to engage in virtual face to face therapy. These considerations include patient privacy, decreased engagement, and the loss of dis inhibition that occurs in a dedicated therapeutic space. Some individuals do not have dedicated space at home for therapy, and many a session has taken place from parked vehicles. Therapists are learning to adapt to tracking nonverbal cues over screens, and patients are more involved in creating their own therapy environment. Finally, connectivity issues can interrupt a therapy session or limit patient access.

Offering these considerations are the upsides to an increase in online therapy options: increased access, particularly to regions and individuals who have historically and/or continue to struggle to attend in-person appointments, increased flexibility in the patient-therapist relationship, and increased reach as providers are no longer limited to their geographical region. Furthermore, a 2018 study published in the Journal of Affective Disorders found that cognitive behavioural therapy (CBT), a mainstay treatment in mental disorders, was just as effective online as in-person for major depressive disorder and generalised anxiety disorder, among others. In addition to the added possible benefit of speaking from the home environment, unofficial reports have stated that family pets have been assisting with therapy. In an evermore virtual world, the trend is here to stay - albeit as an evolving service modality.

While it is clear that online therapy is here to stay, the balance between in-person and online is still in flux. The nature of therapy delivery will pan out over the coming months as the world slowly wakes up from the virtual realm. One option is a dominance of new blended therapy models, offering integrated online and in-person therapy sessions with self-improvement tools, Virtual Mental Health in Our Post-Pandemic World.
Phrases like ‘patient centric’ have been around for a long time in the health tech community. But do technologies deployed to support patients always work for user needs? It’s a question suppliers should continually ask.

The national Data Saves Lives draft strategy released in June 2021 contained multiple references to how remote monitoring has helped to keep people safe at home during the coronavirus emergency. And in the same month updated guidance from NHS England suggested that trusts and integrated care systems might consider “expanding the use of telemedicine” as they develop net zero green plans.

Rationale behind this momentum for remote care also extends beyond a means to respond to public health and environmental emergencies.

Being able to access professional care support from home can be liberating for patients who want to live independent lives or who don’t want to attend hospital when they can avoid it.

Travelling to hospital can be a stressful experience. Our own customers, who use our remote care platform, have told us about the distress caused for care home residents, for example, who are sometimes hoisted from beds to ambulances. Once in hospital patients can also be at risk of hospital acquired illnesses. And in the case of elderly patients, hospitalisation can lead to further loss of independence – for example, it is believed 10 days in a hospital bed can lead to 10 year’s worth of muscle loss for people aged over 80.

Ultimately, technologies that can enable remote care provision, reduce the need for hospital admissions, and promote independence have the potential to be a very good thing for patients. But realising that potential means doing more than using words like ‘patient centric’, it requires technology providers to embrace the concept more fully.

Treating patients as more than an illness

Dignio has been working with a growing number of health and care organisations in the UK, where clinical teams and patients use our remote care platform, along with connected devices in the home, to closely monitor a patient’s status. That might mean using technology to review vital signs, or other important factors related to the individual, which inform professionals when early clinical interventions might be needed.

An important factor in making this work for patients has been to ensure that the platform, which takes the form of an app, can work for the patient across multiple pathways – and that it can be easily adapted to any new pathways by the health care provider.

This means that if a patient using our system has diabetes and goes on to develop cardiovascular disease, mental ill health, or any number of conditions, then the individual doesn’t need to think about using lots of different applications to help to manage each illness.

A person is not a disease unit or a single diagnosis and they shouldn’t be thought of as such by technology providers: they should be treated as travelling across care, encountering different diagnoses as they do so.

If suppliers are truly interested in person centred care then, with the exception of providing any new devices for the patient, expanding the use of the technology shouldn’t come at extra cost. In other words, suppliers of remote platforms should’t charge more per pathway. Technology enabled services should be built around a person, regardless of the illnesses they develop.

Ensuring that no patient gets left behind

It’s also important to get the integration of pathways right. The biggest danger when setting up a technology supported approach, especially where multiple organisations interact with the patient, is the risk of gaps where responsibilities meet, gaps where nobody picks up that something is out of the ordinary for the patient.

When our customers work with us to create digital pathways we map out details of existing care delivery, and their ideal scenarios. Only then should we look at how technology can support the patient, and how the technology will be used in practice, before walking through the digital pathway to ensure nothing, or no one, has been missed.

Usability and listening to patients

Actively listening to our customers in this way is important to ensure services work; almost as important is listening to patients.

Technology suppliers need to make sure whatever they put in front of patients is designed to meet their needs, and usable.

We have found that connectivity between our platform and devices removes the need for patients to manually input information, and in some cases they might only need to press a single button.

Making technology easy and intuitive can make a big difference, and patients well into their 80s and 90s regularly use the platform.

But we don’t want to be complacent. Too often ideas like co-design are misinterpreted as a tick box exercise. We believe it is important to work with patients on an ongoing basis. When we work with our clients we ask them to tell us what patients think, with regular calls in which we elicit patient feedback. If no go for clinicians to have tools that patients don’t want to use.

We want our customers to actively be obtaining feedback from patients on an ongoing basis. If you only do this once in the early stages of a project, you risk creating a false sample of people who are actively interested. We want to know about new users, people who don’t speak English, people who find things difficult and who wouldn’t necessarily come to a panel. They are the people using the technology and we want to know if and how they are using it. We continue to evolve the product in response to that feedback.

Impactful for patients

When services like this become genuinely patient centred, the impact can be significant.

Our customers have measured very significant reduced hospital admissions for patients in their care. But more than that, they have measured a positive impact on people’s lives – people who feel safe, cared for at home and connected to their care team.

One programme in the North West monitoring patients with a wide range of conditions recently reported 100% positive feedback, whilst an Academic Health Science Network recently reported that 99% of patients would recommend an oximeter at home service in which our platform supported Covid-19 patients.

One patient said “I never felt alone. There was always a friendly voice at the end of the phone. I would recommend the service to anyone. The staff involved with my care replied to messages straight away. This is a service the community needs. The app is so easy to use. So is the equipment. Most importantly the service kept me out of hospital and in my own surroundings.”

This type of feedback from our users is heartening, and we will continue to collect it as we try to deepen our understanding of patient technology interaction.
Industry News

First Open Global Blockchain Telehealth Network Launches in 20 Countries

Solve.Care, the blockchain healthcare platform that is redefining the way healthcare is administered, has announced the launch of the first blockchain-enabled tele-consultation network, Global Telehealth Exchange (GTHE), in 20 countries across Europe, Americas, Asia, Africa, Middle East, and Oceania with plans for further global expansion to cover almost all other countries.

GTHE is a secure, peer-to-peer, decentralized network that facilitates teleconsultation services between patients and physicians, across geographical boundaries, and features instant search, availability, and digital payments.

Secured by blockchain, GTHE is the first digital network of its kind, with high levels of privacy, and a global payment facility based on the SOLVE token. GTHE allows any physician who wishes to practice telemedicine to publish their rates, qualifications, and availability, and is instantly accessible to patients on their mobile phones via the Care.Wallet application.

Pradeep Goel, CEO of Solve.Care, said, “We firmly believe that blockchain has the power to revolutionize healthcare. We are making GTHE available in five continents. Our innovative use of blockchain and digital assets addresses the real challenges patients and physicians are facing today when trying to find, access, and pay for healthcare services. The need for secure and efficient transactions, and availability, and is instantly accessible to patients on their mobile phones via the Care.Wallet” application.

According to the report commissioned by digital health company No Isolation it is not surprising that with these additional health concerns the elderly people have difficulty in engaging with technology independently.

Their research found that 1.98, 3.07, and 2.95 million people may have difficulties using touchscreen technology due to dry skin, physical impairments and subjective cognitive decline (SCD) respectively. 30-40% of these people will have dry skin, physical impairments and subjective cognitive decline (SCD) and therefore it is possible that up to 1.98 million people with dry skin find touchscreens difficult to use as a result.

The Problems with Touchscreens

It is often believed that the use of touchscreens is one way to reduce this barrier to entry. Touchscreens are considered as natural and easy to use, and therefore they are often used in products designed to assist the elderly. However, the particular way touchscreens work and are used; could mean that thousands of seniors still can’t able to use them.

Physicians around the world are signing up for GTHE to help minimize administrative work, leaving more time to practice medicine. The solution provides users with seamless medical records sharing and facilitation of continuity of care.

Solve.Care has also announced the creation of an ambassador network in over 30 countries, made up of qualified and respected clinicians who are actively engaged in helping GTHE become more physician friendly.

Digital Exclusion: New Research Reveals how Touchscreen Future Leaves 5.6 million Elderly Behind

New research from health technology company No Isolation has found that there are still barriers in place that prevent elderly people from accessing technology.

In the last decade there has been an increase in the number of seniors who use touchscreen devices and technology, as a way to help cover their social needs. However, in 2019, there were still 2.8 million people aged 75+, 1.1 million people aged 65-74; and 0.5 million people aged 55-64 in the UK who did not use the internet.

Only 9% of people aged 65-74 made video calls regularly in 2018, with only 7% of people older than 75 doing the same. Over 79% of all digital exclusion was among those aged 65 and over.

Two-fifths (39%) of people aged 50 plus in England say they are using the internet more since the coronavirus outbreak. However, usage has increased more among groups already using the internet regularly and so far, there is little evidence that the pandemic has led to significant numbers of those previously digitally excluded getting online.

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It is a common misconception that when a touchscreen doesn’t respond to your finger, it is because your finger isn’t warm enough. But in fact, touchscreens aren’t detecting the heat of your finger, but its ability to conduct electricity. Capacitive touchscreens (almost all screens used by the average user) generate a small electrical field and it is the disturbance in the electrical field, when your finger conducts the electricity from it, that is sensed by the screen.

Certain characteristics of the fingers can reduce the electrical conductivity of the skin, such as calluses or dry skin; as the thick skin of calluses impedes electricity flow, and dry skin lacks the moisture needed for the electricity to travel.

When we age we naturally lose moisture from our skin, as the skin loses some of its ‘lipid’ content - essentially fats in the skin - that are essential in forming a barrier to hold moisture in. It has been found that we can lose as much as 65% of our skin lipid content over time. Likewise, as we age, we lose sweat glands that can provide vital external moisture when interacting with touchscreens. Dry skin is associated with other skin conditions in the elderly that cause abnormal thickening of the skin.

This issue is common in the elderly: it has been found that, in multiple studies, that 60% of seniors have dry skin. One study even showed that 99.1% of care home residents develop dry skin. It is therefore not surprising that it has been observed in studies that elderly people with dry or wrinkled fingertips have significant difficulty getting tablets to recognised their touch.

11.8 million people are 65 years or older, therefore, being conservative and applying the 60% statistic, this would suggest that 7.08 million people would have dry skin in the UK alone. One study has reported that dry skin meant that touchscreens didn’t recognise the touch of 25% of the participants, with another study reporting the same with 28% of the participants. Therefore it is possible that up to 1.98 million people with dry skin find touchscreens difficult to use as a result.

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Their research found that 1.98, 3.07, and 2.95 million people may have difficulties in using touchscreen technology due to dry skin, physical impairments and subjective cognitive decline (SCD) respectively. 30-40% of these people will have both physical impairments and SCD; 30% accounting for this, we believe that in total 5.6 million unique people over the age of 65 in the UK find touchscreens difficult to use due to health barriers.
Digital-first NHS Could Clear 20m Appointments Backlog in 8 months Rather Than 4 Years

NHS healthcare providers are using DrDoctor to cut unnecessary appointments, releasing clinical capacity to tackle the pandemic-driven backlog.

The NHS could clear the huge backlog of appointments in 8 months rather than 4 years if it used digital-first patient engagement, according to industry experts.

According to the BMA and other sources, more than 20m outpatient appointments did not take place due to Covid-19 over the 12 months to March 2021. It could take the NHS as much as four and a half years – 235 weeks – to clear this using current capacity, which is why the NHS has made it a clear focus of its latest planning guidance.

Now data from a supplier of technology widely used across the NHS shows that a quarter of outpatient appointments scheduled every week could be removed by taking a digital-first approach.

Using technology to ask patients if they need to be seen, and to check whether a patient’s symptoms are getting worse remotely, could release much-needed clinical and administrative capacity. It could release additional capacity of 516,805 appointments per week.

Such a productivity increase would be far and above average growth rates for healthcare. The extra effort would also have to be found from every single doctor and nurse and booking clerk.

Once these have taken place, DrDoctor estimates that staff – already exhausted after months of dealing with Covid – might have an extra 5% headroom to clear the backlog.

Remote patient monitoring and biosensing software company Biospectal is looking to further its aims of democratizing access to health technology with the launch of two independent research and validation studies using its ground-breaking blood pressure monitoring app Biospectal OptiBP™.

Biospectal OptiBP enables anyone in the world with a smartphone to turn their device into a connected, clinical-grade blood pressure monitor in the time it takes to download and install an app. The OptiBP medical-grade smartphone app uses a smartphone camera’s lens to easily measure and record a user’s blood pressure flow via their fingertip. Using proprietary algorithms and optical signal capture methods, Biospectal OptiBP then transforms the captured data into blood pressure values in approximately 20 seconds — half the time of a typical blood pressure cuff.

However, DrDoctor’s experience with leading healthcare providers shows that technology-driven approaches could release the capacity for staff to cut the backlog in a matter of weeks, and without the additional burden on staff.

One such example is waiting list validation, which sees the NHS send digital letters, texts and emails to check that people still need or want to be seen.

DrDoctor customers have used this approach to help cut the waiting list by 3% to 27% in some cases. Taking an average of 10% across all specialities, using digitally-driven waiting list validation means the NHS could clear the backlog in 212 weeks.

Checking that patients need a follow up appointment using digital means has an even bigger impact. This is usually done manually by nurses or booking clerks calling patients during office hours.

Taking a digital-first approach can massively extend this activity without putting an additional burden on staff. This would help provide the NHS the capacity it needs to slash appointments.

For certain conditions and treatments, such as immunotherapy, ‘patient initiated follow ups’ (PIFU) are only needed when an individual’s symptoms require this. That’s not always the case, and often it is down to nurses or booking clerks to check with the patient if they need such an appointment.

With digital patient engagement and remote monitoring technology, patients can let their doctors know continuously if their symptoms get worse and if they need or want to be seen. Doctors too can keep a closer eye on patients who might be at risk, without the need for an in-person appointment.

As a result, the NHS could release an extra 24% of capacity, which could be used to further help reduce the appointment waiting list. This could release an extra 431,743 appointments per week.

Together with waiting list validation, this digital-first approach means the NHS could clear the backlog in 35 weeks – just eight months, rather than the four-plus years it could take.

Whicher continued: “Throughout the pandemic, seeing and engaging patients using a digital first approach has been a major part of the NHS response. We believe that this needs to be enhanced and embedded as business as usual to clear the backlog.

“Digital patient engagement helps release capacity to support those who use existing channels. It can also lay a foundation for more personalized care, that will help the NHS tailor care in ways that address health inequalities. It is the platform for a more productive and sustainable NHS.”

Global Health Research Studies to Use Ground-breaking Blood Pressure Measurement App from Biospectal

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The two new independent global health research and validation studies follow the recent publication of a large-scale, third-party research study in Scientific...
InterSystems Introduces New Service as Part of the Amazon HealthLake Launch

InterSystems has launched its HealthShare Message Transformation Service. Developed for use with Amazon HealthLake, the on-demand service enables healthcare providers, and pharmaceutical companies to convert their existing data formats to FHIR standards to populate Amazon HealthLake and extract the most value from their data.

Amazon HealthLake is a HIPAA-eligible service designed to store, transform, query, and analyze health data at scale. Using the HealthLake APIs, organizations can easily store health data already in the HL7® FHIR® industry standard to a secure data lake in the cloud. Many healthcare systems, labs, and pharmacies still have most of their data in existing (non-FHIR) formats such as HL7 V2, impeding interoperability and the ability to derive full value from their data. AWS selected InterSystems as one of the Amazon HealthLake Connector Partners to develop and introduce complementary products to coincide with the launch of Amazon HealthLake. Solutions such as InterSystems HealthShare Message Transformation Service, which is part of the InterSystems HealthShare suite of products, enable users to fully leverage products such as Amazon HealthLake to derive meaningful insights from their data, like examining trends such as disease progression at the individual or population health level over time, spotting opportunities for early intervention, and delivering personalized medicine.

As an Advanced Technology Partner of AWS — and having achieved the AWS Healthcare ISV Competency Designation — InterSystems continues to assert our position as a leader in interoperability and healthcare customer success,” said Dan Woodlock, Head of Healthcare Solutions for InterSystems. “We welcome opportunities like these that encourage and enable interoperability for healthcare organizations looking to get the most out of their data.”

“With the use of the HealthShare Message Transformation Service by InterSystems and Amazon HealthLake, we will be able to access and transform molecular profile data from the EHR into FHIR to run advanced analytics and algorithms, providing clinical decision support to assist oncologists with personalized cancer treatment options” said Philippe Faurie, Vice President of Professional Services at CareMatch, Inc. “We envision the availability of InterSystems IRIS platform data on AWS Quick Start. InterSystems is also collaborating with AWS on their AWS for Health initiative, helping accelerate Health IT innovation and simplify interoperability for healthcare organizations.”
Leading Clinical Technology Providers Join Forces to Tackle Key Clinical Trial Pain Point

uMotif and Xperiome, a global healthtech company specialising in rare disease are to collaborate through a partnership that will bring value to both life science companies conducting clinical trials and the patients participating in them, offering a new approach to patient recruitment through a community of motivated, research-ready patients and an industry-leading engagement platform to drive retention.

Clinical trial recruitment can take years and, globally, more than 85% of clinical trials fail to enroll on time. uMotif and Xperiome are joining forces to address the pain points that contribute to these delays, changing the paradigm in clinical trial recruitment by providing sponsors with the capabilities to match the right patients to the right studies, at the right time.

Specifically, the partnership will leverage Xperiome’s knowledge bank for the lived experience of rare disease to build a deep understanding of rare disease communities. Xperiome will aggregate insights with a specialized matching engine, to connect research-ready members to clinical and real-world study opportunities. Then, once enrolled, uMotif’s patient-engage app will capture large volumes of high-quality ePRO, eDiary and symptom data in real-time throughout the duration of a clinical study. The easy-to-use uMotif app empowers patients to manage and collect their own data, increasing participants’ engagement in clinical research and understanding of their symptoms and behavior among trial sponsors.

Bruce Hellman, uMotif’s CEO said, “Having access to reliable patient data during clinical trials is crucial and it requires effective patient recruitment and engagement strategies. Xperiome and uMotif share a commitment to eliminating the friction in clinical trial enrollment, reducing the burden on both sites and participating patients. Our partnership is designed with patients in mind, to help sponsors and research professionals capture the best quality data in a way that suits study participants. It’s a win-win for all stakeholders and has the potential to aid in accelerating the delivery of vital therapies to patients who need them.”

Jeremy Edwards, Xperiome’s CEO said, “Finding and retaining eligible patients for trials is a significant challenge for pharma, especially in orphan drug research where populations are hard to reach and participation in research can add significant burdens for patients and their families. We are committed to providing more opportunity for rare disease patients to participate in clinical studies and our partnership with uMotif will deliver a better trial experience once enrolled. By working together, we will provide an end-to-end patient-focused solution that connects patients to research and supports them throughout their clinical trial journey.”

Gemserv Health Helps Liverpool Women’s to Protect its Network with a Segmentation Approach

Liverpool Women’s NHS Foundation Trust has run a successful proof of concept to bolster its network against hackers using the latest in software defined segmentation.

Liverpool Women’s, which is the only specialist trust in the country for women and babies, is now deploying the Guardicore Centra Security Platform across servers running legacy operating systems, with the support of cyber security experts from Gemserv Health.

The move will support the trust in retaining its Cyber Essentials Plus accreditation and has inspired other trusts in the Cheshire and Merseyside Health and Care Partnership to adopt the same approach.

Matt Connor, chief information officer at Liverpool Women’s and cyber security workstream lead for Cheshire and Merseyside Health and Care Partnership said, “As a Cyber Essentials Plus accredited organisation, cyber security is important and we strive to maintain that standard. We have some residual legacy systems, and placing robust security controls around them is essential. We had been working with Gemserv Health on a number of cyber security initiatives, so when they suggested the Guardicore product to provide application level segmentation, we agreed to run the proof of concept.

“The Guardicore solution effectively places a secure wall around systems and applications. It provides that extra peace of mind.”

Gemserv Health provides profeso.
industry news

20 of legacy operation systems, we saw this
Health on the project, said: “In terms
Jay Miah, Liverpool Women’s opera-
product for network segmentation as the
ware attack with reputational conse-
ing attacks and ran a simulation to test
In Cheshire and Merseyside, the cyber
they face a cyber security incident.
nations have good security in place and that
across NHS regions to make sure organisa-
sional services to health and care organi-
has a respected cyber security practice
It is refreshing to see an integrated care
sional services to health and care organi-
what they need that the onset of COVID-19 and demand for telehealth solu-
rating software integrated directly into their smartphone, enabling
invasive optical sensing and a smartphone
rolling price, medical-grade blood pressure measurement and management.
replaced by a non-invasive optical biosensing solution by Biospectal
and connecting actionable data to clinicians around the world.
infarction and stroke. Additionally, in May 2021 two independent global
Biospectal trained its software algorithm using over two million
from nearly 1200 healthcare professionals and consumers, have shown
niave that we are implementing in real-time to support both us
traditional approaches to network
the region are already benefitting. There
websites have good security in place and that

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Cutting-edge Motion Data Technology
set to Transform Physiotherapy

Physiotherapists, ergonomic consultants and other physical health practitioners can now tap into the full potential of world-leading motion capture technology with ease. Xsens’ new Automatic Reporting instantly presents complex movement data in an accessible, easy-to-read report using its online MotionCloud platform.

Until now, completing a complex analysis of human motion required technical expertise in data scripting and reporting, often unavailable to specialists in physical health care due to time. ‘While high-end universities and research facilities require Xsens’ full motion capture suit and MVN software to conduct larger research, independent professionals only need specific software to conduct larger research, independent professionals only need specific data and less processing. Xsens’ new MotionCloud takes care of the processing, with Automatic reporting designed to display the data in a functional and accessible format tailored to each user’s respective industry.

In as little as two minutes, a full report, graphs, and a digital recording of an avatar completing the movements are generated and stored on the cloud platform. All that’s required is an internet connection and any computer or laptop, providing access to files from multiple locations simultaneously. Physical health practitioners can improve their own understanding of a client’s physical health with easy-to-read data that informs objective rehabilitation and care.

Ralph Speerstra from Pro-F Performance Center said, “Some of the world’s leading sports scientists and research facilities already use Xsens’ motion capture technology to track high-quality, full-body motion data, improving the performance of athletes and discovering new insights into human movement. Being able to use the very same technology in my own practice without the need for any technical knowledge or scientific facilities is incredible. My patients can comfortably perform movements while wearing Xsens Awinda sensors and I can provide high-level insight almost instantly. There’s also the added benefit of showing the patient the data report and digital avatar, elevating the level of communication and trust between us and further emphasizing the efficacy of my business. The addition of automatic reporting has been transformative.”

To ensure each report is presented in a functional and accessible format, Xsens is starting out by releasing two bundles: The RULA Report bundle for ergonomicists and Gait Analysis bundle for physiotherapists — these bundles will be expanded with multiple relevant reports in the near future.

Both bundles are designed to provide the user with relevant data that’s easily readable, bridging the gap between data and analysis. For example, gait analysis – the study of human motion – requires specified data, such as spatial and temporal parameters. Automatic Reporting will instantly display these relevant parameters without any added work required by the user.

Similarly, if a researcher in ergonomics wants to complete an accurate RULA report, instead of relying on the analysis of a 2D video, the user can see all relevant data parameters and a three-dimensional avatar as a visual aid. Users can also estimate joint angles without needing to construct a frame-by-frame analysis.

Peter Hartman, Product Manager at Xsens said: “This is more than a feature launch, we’re aiming to connect to an entirely new community of professionals and provide the most precise inertial motion capture technology on the market in a format that is both accessible and functional. The added depth motion capture brings to physical health care, sports and ergonomics is far beyond anything possible by observation alone – it will significantly expand the service offering of our users and improve the well-being and physical health of people everywhere.”

All of this comes with an entirely new pricing model made possible by Xsens’ MotionCloud, a cloud-based motion capture platform that processes and stores data remotely. Users can choose their desired pricing tier based on the number of reports needed per month. Starting out at £6 per report, users that opt for multiple reports can reduce that fee to £3. Data is stored for free and can be accessed from anywhere by connecting to MotionCloud.

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Healthcare CIOs Need to Hone their Focus to Accelerate Innovation in the Post-pandemic Environment

It’s hard to look back at this recent pandemic without thinking about the profound impact it’s had on our healthcare system. But in many ways, in particular with innovations in technology use, the crisis has led to opportunities for the industry. Healthcare has initiated some very positive transformations in services and operations spurted on by macro-level changes related to regulatory policy and shifts in technology paradigms.

In both policy and technology, many of the changes that were supposed to be short-term emergency measures, implemented only for the pandemic, have surprisingly endured into the post-pandemic era. With newfound courage, that has opened up previously unseen opportunities for large-scale innovation using the power of technology.

It’s argued here that in order to really seize upon these new, bold opportunities that are continually unfolding, healthcare CIOs have to realign their primary focus—if they have not already done so in earnest—from the traditional “keep-the-lights-on” support. Instead, CIOs must now prioritize high-impact, business-valued healthcare software solutions that are adopted at the speed of the business.

Paradigm shifts in healthcare spurred on by the pandemic

Since the pandemic, there have been two key technology-related changes in healthcare regulations, specifically around telemedicine and the sourcing of clinical skills. During the pandemic, for example, the Centers for Medicaid and Medicare Services (CMS) changed payment rules to allow providers “broad flexibilities” to furnish services using remote communications technology. Most major private insurers followed suit in implementing similar rules for payment. As a result, telemedicine and telehealth services spiked almost overnight. Between 60% to 90% of all physicians were using such remote services during the pandemic, up from a pre-pandemic level of only 28%. And while many private insurers have since begun to roll back telehealth policies (despite rising demand), the CMS changes became permanent under the previous administration, and have so far remained so under the current one.

Similarly, before the pandemic, most clinical teams for telemedicine services were restricted to being located in a single state. Early in the pandemic, many states relaxed policies that restricted licensed providers from practicing across state lines. As of April 2021, over 30 states joined the Interstate Medical Licensure Compact (IMLC), which enables providers to apply for licenses to practice in other states, and use of the compact spiked during the pandemic. These policy shifts are also reflected at the federal level, with the greater focus on telehealth. Now, clinical teams can combine over technology to address more complex needs in remote areas. This has created a financial model for providers to not only expand their markets but provide more complex services in those under-served markets because of the flexibility in sourcing skilled clinicians from essentially anywhere in the US.

Healthcare providers are starting to see that these technology-enhanced remote service models have demonstrated that they work and are compelling for the business and the clinicians. On the patient side, patients all across the spectrum are experiencing how convenient and cost-effective it is to just pick up the phone and talk to the doctor and receive basic care. In many cases, patients in rural areas no longer have to travel great distances to get access to care that was not available in their local areas without remote services and the assembly of highly skilled clinicians. Such paradigm shifts are making good sense for patients, clinicians, and businesses and are likely to stay in place as innovators move upon with more technology innovations.

This sudden strong tilt towards a technology-focused provision of care paradigm is reflective of the direction healthcare was already headed with digital transformation efforts like the adoption of a comprehensive Electronic Health Record system. However, the crisis was a push (or perhaps a shove) in the right direction to accelerate technological innovation.

Before the shutdowns, healthcare providers were very skeptical and risk-averse about using new technologies. Senior leaders were like ice skaters skirting the edges around a freshly frozen pond, wary of fully venturing onto the ice, no matter how thick and secure that ice was likely to be. That is, is it now safe to use technologies like telemedicine, cloud computing, and even artificial intelligence? Then, suddenly, the pandemic swooped in like a wind blowing them out onto the pond, and now they see the ice out there is firm. That is, they now see that such long-established technologies and practices like telehealth, remote working, and off-premise solutions are already quite sound and powerful to use strategically and innovate upon.

Just before the pandemic started, for instance, the hospital CIOs were primarily focused on the on-premise systems and expanding their data centers. When it came to the cloud, they were still pretty risk-averse: What happens if there’s down time? What about security? The usual concerns and hesitations. But then the pandemic forced organizations to maintain their systems with remote teams, and it became clearer that they didn’t need a bunch of analysts and engineers sitting in data centers. Companies began to consider the cloud more seriously and to realize they could do it both securely and cheaply.

The services and the solutions that are now in the cloud are just phenomenal. The organizations that haven’t been moving in that space are going to get left behind because it’s simply going to become way too price-prohibitive, and it’s going to become much more challenging to ensure robust security.

C-suite and clinical leaders now better understand the power of technology for their success, are more open to cloud solutions and advanced technologies like artificial intelligence and robotic process automation. As such, they are demanding that CIOs come to the senior management table with innovative solutions that will address the biggest business needs and are aligned to the unfolding of new business strategies.

Leadership advice for the post-pandemic environment

Even with these recent revelations within the C-suite, IT leaders still face organizational challenges in bringing new possibilities to life. The goal is to be recognized as more than a cost center and bring more value to our organizations. We’ve done enough of the “plumbing” already—that is, laying down the infrastructure to facilitate the five data “rights”: Getting the right information to the right person in the right format through the right channel at the right time. It’s now ever more important to take that foundation and build upwards and outwards, and beyond the “four walls” that we’ve been used to in order to deliver more value for the business and end-patients.

So what does the acceleration of value-driven innovation mean for the CIO in the post-pandemic era? To help unpack that big question, let’s start by framing what CIOs focus on most across two dimensions: Tech and business-focused activities, and internal and external focused activities. What that looks like is the diagram below, with some examples that fit into each of the quadrants.

The lower-left corner is where CIOs traditionally get stuck, focusing on internal and highly technical concerns like data centers and devices—complex maintenance items that are rarely understood outside of the IT department. In order to really be a leader for the business in the post-pandemic environment, you have to also move through the other three quadrants more readily and really focus on the upper-right-hand quadrant: walking through the other quadrants, we have on the upper-left-hand side things like integrations and interoperability that are enabling organizations to operate beyond the four walls of the hospital, but still be very technical. Then, if we turn our focus to the lower-right-hand quadrant, we have things like business intelligence and predictive analytics solutions.
Healthcare CIOs Need to Hone their Focus to Accelerate Innovation in the Post-pandemic Environment

The future of healthcare is changing rapidly, driven by the revolutionary advancements in technology. The healthcare sector is facing unprecedented challenges due to the COVID-19 pandemic, which has accelerated the adoption of digital technologies. This has led to an increased demand on a strained healthcare system, requiring healthcare providers to find innovative ways to meet the ever-changing requirements of healthcare organisations.

Collaboration is Key to Digitally Empowering Patients

By Hazel Jones, Head of Health, Made Tech

COVID-19 has drastically changed the way healthcare organisations operate in order to treat patients and keep the public and staff safe during the pandemic.

One of the biggest changes has been the adoption of new technologies. From virtual visits through to patients being able to decide their own health status, digitisation has provided patients and the health service with new and innovative ways to engage with one another as we navigate our way through this turbulent time.

To the surprise of some, the rapid digitisation of health services has largely been embraced by patients. This was highlighted in a recent study by the Health Foundation, which found that around three fifths of users increased their use of technology to access care during the first phase of the COVID-19 pandemic, with 83 percent of users viewing their experience positively.

The innovation quadrant can no longer be sub-optimized and delegated out to others as we focus on the lower-left quadrant—where the most money and time is being spent, where many of the big issues exist, and where many CIOs often feel the most comfortable. But that well-trodden lower-left quadrant by itself is not keeping up with the business nor providing what the business wants. The post-pandemic environment. We need to gain ground in the upper-right.

At this point, any CIO who's not focused like a laser beam on the innovation quadrant is not only getting left behind but they are getting left behind rapidly. There is a tsunami of challenges that is upon us and we need to take the energy from that tsunami and harness it with innovation, otherwise, we could all just get washed away. So I say let's ride the wave, skate in the middle of the pond with confidence, and be the business so that we can continue driving positive change for our industry.

The pandemic was a catalyst for sustainable change in the healthcare industry as it was in so many aspects of business. Recent macro-level regulatory changes and a renewed belief in technology from non-techies are two major factors in the healthcare industry's transformation. Now, technology has once again become strategic and properly placed in senior leadership discussions. But in order to bring high-impact value to the business table, CIOs need to purposefully steer the adoption of technology innovation by owning the innovation quadrant with the same verve as we have owned the ‘keep-the-lights-on’ quadrant for so long.

The Rise of eHealth: How Cellular Connectivity is Reducing the Strain on Healthcare Systems

By Mark Appleby, Business Development Manager at Wireless Logic

eHealth is a steadily growing industry that advanced hand-in-hand with connectivity and digital communication. For years, eHealth solutions have allowed healthcare providers the flexibility and freedom to take care of patients remotely, gradually easing the demand on a strained healthcare system that was under pressure even before COVID-19 took its toll.

When the COVID-19 pandemic began, hospitals and their staff were quickly overwhelmed with priority patients. Struggling healthcare systems needed to allow as many patients as possible to receive medical care from the safety of their own homes, reducing overcrowding and unnecessary contact that could further transmit the virus.

As well as reducing the impact on ongoing healthcare systems, cellular-enabled solutions offer a resilient and secure way to meet the ever-changing requirements of healthcare organisations.

With the COVID-19 pandemic, this provides the perfect opportunity for hospitals and trusts to expand their technological capabilities, further digitally empowering patients while achieving greater value and outcomes.

While now might seem the perfect time for health bodies to advance their digital transformation, there are challenges they face in doing so. The main barriers to technological innovation is that these processes can be difficult, time-consuming and also costly.

To meet these challenges, healthcare organisations shouldn't see digitisation as an initiative that they need to take on by themselves and should instead be looking to collaborate with others to drive innovation.

Collaboration between multiple hospitals & providers to identify, test, fund and implement new solutions can bring with it a range of benefits, including increased patient empowerment and digital transformation.

By coming together to develop and implement new digital technologies, health bodies can bring down the costs of implementing new software and platforms. This is because the funding of solutions can be split between each of the bodies involved, rather than taken on by them individually as it would be if they were to go it alone.

Working together in this way can also help reduce design and delivery pressures on healthcare bodies. By collaborating to co-build new solutions, the people power needed to put these in place can be split between everyone involved, with each organisation managing a different part of the project. This means that less strain is put on one organisation and its employees, ensuring that the process is streamlined, efficient and the appropriate time and care is taken.

As well as this, collaboration can ferment innovation in the wider industry. Through open sourcing their projects and innovations, other trusts and hospitals that weren't involved in the collabora-
One of the effects of the pandemic on the eHealth sector was an accelerated adoption of eHealth technologies. For example, there is a significant need for existing healthcare systems to adapt in order to meet the challenges of the COVID-19 pandemic and the increase in an ageing population, focusing on meeting patient needs, keeping care-workers safe and ensuring processes are working efficiently. At the same time, new connectivity solutions can be embraced and implemented to address ongoing and upcoming issues for the post-COVID-19 era. The pandemic has further highlighted the need to embrace these solutions and has accelerated the adoption of eHealth technologies.

Cellular connectivity has quickly become a key enabler of eHealth and related technologies, providing a controlled and secure method of communication that can work from any location. Managed cellular connectivity offers the potential to add significant levels of security when transferring data (as opposed to Wi-Fi or other connectivity methods), as well as the ability to provide connectivity for a large number of devices simultaneously. Specifically in the age of IoT, having extremely reliable and low-latency connectivity is paramount, particularly when even the slightest of delays can have the potential to cause severe consequences.

Security of eHealth

With private health data being transferred between people, locations and devices, the consequences of a data breach would be severe, whether the subject is personal health data, the results of a medical study, or pharmacy records. Wireless communication links are vulnerable to security threats such as eavesdropping, hacking and spoofing. Without secure links, external parties can access critical patient information or even manipulate data, potentially leading to fatalities. In addition, there is a risk of network disruption and reputational damage through loss of customer data and intellectual property.

Cellular connectivity and emerging technologies have played a significant role in reducing the impact of the COVID-19 pandemic and will continue to support a very strained healthcare system. When properly deployed, cellular connectivity enables secure, rapid and efficient communication between the hospital, remote care staff patients, and disaster response teams.

For healthcare solution providers, working with the right Managed Service Provider will ensure the right connectivity, network, security and hardware are selected to tailor a flexible and scalable solution to meet the requirements of the healthcare organisation, particularly as we see new and enhanced applications being developed.

Finally, with the ongoing development and rollout of 5G technologies, this will further drive innovation and open up new and more effective ways of working. Once 5G coverage has been significantly improved (current coverage is only focused on major cities), healthcare systems will also benefit from increased speeds, more reliable coverage and crucially, reduced latency.

To find out more, please visit: https://www.wirelesstec.com/sector/health/
EPMA’s: How to Implement at Pace During a Global Pandemic

| The Journal of mHealth | July / August 2021 |

Building your network

I joined the EPMA project with experience of working at five trusts and implementing several different systems, so I had a ready-made network of colleagues that I went to for advice. I also reached out to Taunton and Somerset NHS Foundation Trust and University Hospitals Plymouth NHS Trust, who were both implementing Better Systems. Their advice, as well as that from internal networks within the trusts, proved invaluable.

As with all digital transformation, resistance to change can be an issue so we involved the end users – our doctors, nurses, pharmacists and anaesthetists – from the start. We asked them what their pain-points were, their day-to-day challenges, and addressed their concerns. By doing so, we fostered a rollout by consent, creating an atmosphere of ownership and partnership.

We had a team of people unified against challenges, rather than a battle against internal resistance.

We made sure that we were present and created in-person encounters (as much as Covid procedures allowed), joining ward rounds and giving end-users a laptop so they could practice using the system. We also organised a roadshow in the canteen, where people could ask us anything and stood at the staff entrance from 7am to speak with workers as they arrived to start their shifts.


Incentivise

Another COVID-related challenge was that in-person training was not an option, and increased workloads meant that staff had less time to engage. We had to move training online, which gave staff the autonomy and flexibility to learn about the system at a time convenient to them, but reduced the likelihood of them completing the training ahead of implementation on their wards. To tackle this, we incentivised engagement by getting the training course accredited with the Royal College of Nursing, which gave nurses a nudge to complete it as they knew they would have a certificate for revalidation.

In addition, we also paid for a Saturday shift of a junior doctor, who helped with transcriptions and supported the on-call rotation, while on-call doctors did their training. He was then able to show colleagues how to use the system effectively.

Be present and available

During roll-out, as an implementation team, we were on hand to assist with any additional training or troubleshooting. We were available from 7am until 10.30pm – the core hours that the wards needed our support. We were then available outside these hours through an on-call system, which ensured that staff felt supported and reassured that help was available if they needed it. In addition, we put steps in place so that staff from wards that had gone live could support others, particularly if requests were clinical, and we adapted our training based on issues that arose, resulting in fewer support calls as the rollout progressed. To be available 24/7 is tiring, but the trust welcomed the support, which gave them confidence in us, the system and the ability to proceed.

Find success

We wouldn't have been successful in our implementation if we were discouraged by the challenges that came our way. We all work in clinical environments, and unexpected events do happen. So, when they arrive, don’t just put your blinders up. Use your team and the skills that you’ve learned from going to site visits – from having a clear target and stakeholder management and having a good team structure. Look for a workaround to any issues that arise and reach out to your network for advice and whether they have encountered similar challenges. It may require more work, but the satisfaction is so much higher when you hit the targets in the end. ■
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