



Healthcare Insights

Turning data into patient value



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Foreword

Healthcare is a constant item on the business, economic and political agendas. By its very nature it touches all our lives. Given the significant budgets allocated by government, it also faces intense public scrutiny in terms of service and cost.

Meanwhile, the relationship that has been central to medical care throughout its history – that between doctor and patient – is being transformed by technology. Among the many benefits it offers is the potential to improve patient care by helping to effectively harness information for the benefit of patients – in other words by turning data into patient value.

This publication shares insights from health sector professionals in Ireland and around the world. It highlights best practice in using information to bring about a better result for patients. Unlocking this value lies at the heart of what the KPMG Healthcare practice does best. Information technology and data analytics can help overcome the many challenges facing the healthcare sector. At KPMG we have invested significantly in these areas because we believe the Irish healthcare sector can be transformed through the innovative, strategic use of IT resulting in both patient and organisational benefits.



A handwritten signature in blue ink, reading 'Shaun'.

Shaun Murphy
Managing Partner, KPMG

Turning Data Into Patient Value

Understanding precisely what is responsible for good health outcomes is just one of the benefits to be gained from better data collection and analysis in our health service, according to KPMG's Head of Health and Public Sector, Frank O'Donnell.



In 2016, Ireland is facing a growing and aging population and, with continued pressure on the public purse strings, our healthcare system and the challenges of managing all the data it produces remain ever present.

Frank O'Donnell believes that the health service is a mine of valuable data which can be used to support better decision making and deliver a better quality of care to patients. The challenge is collecting and assessing the data in what is a necessarily complex system.

"The challenge with anything around healthcare is that the whole area is so complicated and complex," he says. "This is partly due to the human dimension. There is a natural element of unpredictability due to this."

Data is collected in various forms throughout the health sector and there exists significant potential to collect, use and share it in ways that help senior decision makers in the sector to make better decisions, deliver better care, and achieve greater efficiencies."

According to O'Donnell, this applies to all levels of the health system in Ireland. "At the most important level, it gives the clinician better data about the patient to allow better decisions and that has to be good. When you move upwards in an organisation, that data can be used for management decisions such as rostering staff in order to meet demand patterns and make better use of health funding."

Population health

A broader view of data allows us to consider population health. This necessitates a shift in thinking around the very definition of healthcare and takes into account various social, economic, physical and environmental factors that affect health. The health of a population is measured by health status indicators and is influenced by social, economic and physical environments, and personal health practices and lifestyles. It focuses on the conditions and factors that influence the health of populations, identifies variations in their patterns of occurrence, and uses the resulting knowledge to develop and implement policies and actions to improve the health and wellbeing of those populations.

Most importantly, population health recognises the complex interplay between the various factors affecting health and uses a variety of strategies to improve the overall health status of the population. Action is directed at the health of an entire population, or community, rather than individuals.

"Data is a key requirement of a population health approach," says O'Donnell. "We need more and better data if we are to realise those benefits. Getting the data is sometimes a challenge. Take primary, social and home care, for example. There isn't much collection of data around what's happening there, it's not well defined and there is little technology to support it. Even where there is a lot of data collected, there is still the question of what use it is put to."

Culture and insight

He points out that HSE and Department of Health reports contain a wealth of potentially useful data which needs to be turned into knowledge and insight. One of the barriers to progress has been ensuring data is better valued.

"When we look at the issues, they can be simple things but difficult to change just the same," he says. "Culture is both a challenge and an opportunity right across the system. We need to create a culture where everyone values data; where they understand that little pieces of data which might appear to be minor and unimportant are actually very valuable when used appropriately and combined with other data. Some corporations actually value data on their balance sheets. That's the sort of thinking we need to encourage in the health service."

Technology

Technology has a role to play. "If you have better technology at the point of care, you can get better data in a more useful form. This will be helped with the development of Electronic Health Records (EHRs) in future. For instance, if you live in Dublin and you are on holiday in Kerry and visit a GP or a hospital there, they will have the full record of your medical history, your allergies, previous prescriptions and so on. That will lead to better quality of care for patients, speed things up and reduces the capacity for mistakes. Other countries have already gone down this road and are quite advanced on it. We need to do that now to prepare for future pressures in the system."

The actual gathering of large volumes of data is less of an issue than what's done with it afterwards, according to O'Donnell. "Sharing the information is where the value is delivered. At GP level, for example, they all have some sort of system to record patient interactions. The question is how that information gets shared appropriately and under the right models of consent. The technology exists to do that but is not yet being utilised."

"If you have better technology at the point of care, you can get better data."



Privacy

There are certain considerations to be taken into account when collecting and sharing sensitive data of this nature. "There is a need to be conscious of security and privacy. There are many examples internationally where these have become difficult issues for health services and we must learn from those. We need to ensure that we define who can access patient information, what can be shared and how it can be shared. Patients have to consent to giving the information and having it shared appropriately. They also need to be confident that the clinician has the necessary information to treat them properly."

From a macro perspective, data collection and analysis can also be used to better plan and design health services. "To begin with, you can use it to analyse behaviours of particular patient groups such as people with diabetes," he notes. "We can use that information to help keep those people out of the health service as much as possible. We need to focus on keeping people well. That's the best way to address the mounting pressures on the health service."

"We have an opportunity to do something at a national level that not many other countries are able to do because of our relatively small size."

Cause and effect

Perhaps the greatest benefit which better use of data can offer is a clear understanding of exactly why things happen in the system. "Very often what we think are the reasons for something happening turns out to be incorrect," O'Donnell notes. "You need to look at a number of data points to see the whole story. People talk a lot about health outcomes. The challenge is to relate them to what is actually happening. Cancer is one area where outcomes have improved but causality is difficult to establish. It's not impossible and that's where data analysis comes in. That's how we can achieve the outcomes we are looking for in terms of improved health and quality of care for the whole population."

Data as a science

Achieving this will require a combination of skills and knowledge. "Data will only take us so far. We need experienced analysts as well, data scientists who understand how the health system works. We need to combine that knowledge of the system with expertise in data to be able to read the signals and draw the right conclusions. If you have the right data, you will be able to look back and gain real insights from it. You will also be able to see the patterns which only become visible over time."

"We have an opportunity to do something at a national level that not many other countries are able to do because of our relatively small size. Our system will be more transparent and accountable, the factors delivering good outcomes will be readily identified and replicated across the system, and decisions will be made based on evidence and good data leading to a culture of continuous improvement." ■

"Data collection and analysis can also be used to better plan and design health services."



The Power of Numbers

Intelligent use of data in the Irish health service

It is accepted that the business intelligence generated from healthcare data can be used to improve the quality, safety and efficiency of patient care. There are certain challenges to be overcome first, however, according to HSE Chief Information Officer Richard Corbridge.



“Getting from data to information is our focus at the moment,” Corbridge says. “We have an awful lot of data but we are not very good at turning it into information and that means we can’t get at insights from the data collected. However, this is common to health services everywhere. Their job is to deliver a health service not collect data. The question is how we get better at the collection and delivery of information. We know we collect lots of data through various systems but we struggle to make it useful after that.”

One of the issues is the absence of an overall national approach. “We don’t have a national system for data collection,” he points out. “In many cases data is recorded using pen and paper, in others it is kept on Excel spreadsheets, and there

are many other systems as well. We are now looking at the wider standardisation of data collection through improved governance and the implementation of a data dictionary.”

In Ireland that standardisation begins at a very basic level and a data dictionary is being compiled within the HSE to ensure that there is common terminology used throughout the service. “We need to ensure that we are talking about the same things and counting apples and not oranges,” Corbridge explains. “What is an admission, for example? We have to define an admission so that we have a common understanding of it. In one hospital it can be one thing and in another something slightly different – it changes how things are counted.”

The well-covered trolley count is a case in point. The fact that there can be differences of opinion on the totals indicates the need not only for standard definitions but also for reliable data collection and processing systems. According to Corbridge, the easiest way to do a trolley count at the moment is for a hospital Chief Executive to telephone the emergency department (ED) and ask for a physical count of the number of people on trolleys at the time. There is no IT system to handle the task in real time at present.

“Real time data is what is needed,” he says. “The biggest benefit this can bring to a health service is the ability to look at everything that’s happening at any one time. That’s how you make it more efficient. But a lot of health systems



don't use standardised forms and reports. They are collecting a lot of data but there is no real value being extracted from it."

Corbridge says the first challenge is to collect the data at speed and to a standard that can be used across the whole health service. One solution which is about to be deployed is mobile.

"This will enable people to use mobile devices to collect and update data on patients in EDs," he says. "This replaces pen and paper systems and Excel spreadsheets. It is uploaded in real time and where there is a patient administration system (PAS) in place it will provide real time information on what is happening. It means the data is constantly updated and this allows the service to respond to changes as they happen."

The goal is to put the patient at the centre of any new systems put in place. With this in mind, electronic patient records (EPRs) are being set up for epilepsy patients across Ireland. The secure web-based EPR facilitates the sharing of clinical information across the entire health service regardless of traditional organisational boundaries or geographical location. Authorised clinicians and other professionals involved in the care of the patients can access the records.

The Epilepsy EPR will become the repository for healthcare records for all 40,000 people with epilepsy in Ireland. While the EPR offers significant advantages to patients it will also have epidemiological benefits. Large volumes of anonymised data can be analysed to improve the overall care of epilepsy patients throughout the country and to make the national epilepsy programme more effective.

An example of data analysis at work in this area is a project to sequence the genome of 1,000 under-5s with suspected epilepsy. "The information we gather through this project could save up to 90 lives a year – that's a great example of big data in action," says Corbridge.

It is hoped that patients will ultimately own their records and be able to update them themselves. "The key around big data is that when you have quicker access to data and use it to make the service more efficient, we must then put the patient at the centre of everything we do," Corbridge points out, noting that "the EPR will enable proper joined up care for patients."

"Getting from data to information is our focus at the moment."

At first glance it might appear that recording data on new devices and systems might place an additional workload on clinicians, Corbridge believes the benefits far outweigh this. "Clinicians are happy to participate in EPRs if they get something out of it. We are not doing this just to monitor what's happening. We will use the data for secondary purposes such as making the system more efficient and for population health – this will benefit everyone involved including patients and clinicians."

Another step forward is in the form of the new Individual Health Identifier (IHI) system, which will see everyone in the country issued with a unique, lifetime number to track patients through the various health and social care services. Its purpose is to accurately identify the individual, enabling health and social care to be delivered to the right patient, in the right place and at the right time.

In parallel, health identifiers are being assigned to healthcare professionals and organisations to identify the practitioners who provide health services such as hospital and GPs and the locations where the services are provided. This will provide fast, accurate information on a patient's interactions with the health service regardless of health provider or location.

The ultimate goal of the identifiers is better quality and safer care. They are also seen as the cornerstone of e-health systems and are critical to the implementation of EPRs and other e-health solutions such as e-prescribing. These systems have the potential to greatly improve patient safety by improving the sharing of healthcare information between healthcare practitioners. By uniquely identifying service users, it is possible to reduce

the number of adverse events that may occur, such as giving the patient incorrect medication or vaccinations, or admitting an incorrect patient for surgery. The use of health identifiers will also reduce duplication and administration work, making them both time and cost effective.

Most importantly, they are separate to an individual's PPS number which goes some way to ensuring patient privacy and confidentiality.

"The HSE has built the infrastructure required to deliver the individual health identifiers at a national level. Creating the Individual Health Identifiers is a step towards bringing real benefits to clinical practice as a result of access to information. As well as the health identifiers we hope to have the national EHR system up and running by the end of 2019 but if you go to Temple Street Children's Hospital or St. James's Hospital today you can see them in action already. These are really good examples of how they work for the benefit of patients and help improve quality of care."

Overall, Corbridge sees big data and the analytics of data playing a major role in improving the health service in the coming years. "Big data can help greatly with capacity issues, for example. If one ED is full you can redirect ambulances and patients to another in advance. We can use it to match capacity more closely to demand so that services are available where they are most needed now and in the future. We need to get better at using the data for things like that. It is also a very powerful decision tool and we can use it to model decisions that you just can't and shouldn't do by trial and error." ■

"These systems have the potential to greatly improve patient safety by improving the sharing of healthcare information."

Making Data Count

Healthcare providers are sitting on a vast resource of data which could transform the quality of care – if only they could distill the insights they need in a given time, setting and context, says Richard Bakalar, MD, Managing Director, KPMG in the US, and member of the Global Healthcare Center of Excellence.



Healthcare organisations generate massive amounts of valuable data on a daily basis. By one estimate the volume of healthcare data

amounted to 150 exabytes in 2013 – and it is growing at a remarkable rate of 1.2 - 2.4 exabytes a year. The question that troubles most healthcare organisations is: are they really getting value out of it? In developed economies, healthcare providers are driven by common goals: to become more efficient, reduce costs, improve patient experience and healthcare outcomes and innovate in the way they provide care. Investments in digital information can help organisations to realise these aims – if they learn to align the way they use and analyse big data to their core strategic objectives. In the United States, some 80 percent of providers use electronic records to manage information, according to the latest Healthcare Information and Management Systems Society (HIMSS) survey. Yet only 10-15 percent have achieved the highest level of digital maturity.

In a crowdsourcing activity conducted by KPMG in the United States in the spring of 2014, over a third (36 percent) of healthcare leaders interviewed said technology and data together made up the single biggest area for improvement in their organisation. There is clearly much to be done.

Despite massive investments in information systems, healthcare organisations have yet to derive full value from them. The main reasons include:

- Many doctors say they are overloaded with static, backward-looking reports that obscure critical insights, but they cannot access timely data for their current clinical work. Healthcare managers have similar complaints.
- The growth of burdensome regulation, coupled with external demands for more information, are making the situation worse.
- Payers, regulators and providers struggle to compare how primary care physicians, specialists, hospital departments and healthcare institutions are performing relative to their peers in the absence of common quality benchmarks.
- Electronic transactional healthcare and financial payment systems are up and running, but healthcare organisations have not yet acted to aggregate and analyse that data in context with business and clinical intelligence tools.

The cost, effort and complexity of building a system to enable such transformative change might seem overwhelming. But, as the demands for change in the healthcare sector from patients, governments and regulators are not going to diminish, so the cost – and risk – of not making progress with information technology and data-driven intelligence is far more substantial.

Tough targets for information use

The sense of urgency around data use has increased recently, particularly in the US. A Federal mandate for healthcare providers to make 'meaningful use' of information is now being enforced – with penalties for non-compliance. Compliance means not only digitising content, but also sharing it and using

it for the demonstrable benefit of patients. Healthcare providers have to drive new value from their data – or surrender a percentage of their budgets they can ill afford.

Other developed markets have their own targets for record digitisation and improving patient outcomes. In the UK, the Department of Health has recently established a dedicated National Information Board (NIB) to drive advancements in this area. Soon the NIB will publish a set of roadmaps, setting out in greater detail how digital care will be transformed in England and Wales. The good news is that, having invested so heavily in converting records to electronic format, healthcare providers are sitting on a gold mine of data resources.

The challenge now is for data to be unlocked from transactional system silos, where it was used primarily for efficient record-keeping (for example for financial, clinical or operational scheduling use). Combined together, it can be used in innovative ways to support executive-level decisions or deliver timely insights to clinicians – and even patients themselves – thereby helping to deliver better care.

Patient, help heal thyself

A mental health initiative in Canada illustrates the possible rewards. The Mental Health Engagement Network (MHEN) project – conceived by Lawson Health Research Institute in collaboration with Canadian telecoms and Internet provider TELUS – has given 400 participants greater control over their mental health, allowing them to track their moods and medication and communicate directly with care providers between scheduled sessions.

GO FIGURE: DATA GENERATED BY HEALTHCARE

Why healthcare providers complain
about information overload

1 MILLION

Images are added to
the UK National
Health Service
database every day



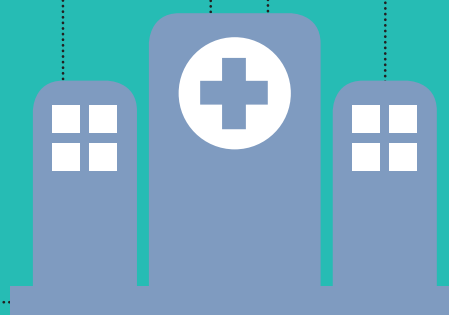
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21%

of US adults
say they use
technology
to track their
health data

15%

of US hospitals
were using the
cloud to store
images in 2013.
This is expected
to exceed 50% by
the end of 2016



26%

of US hospitals
participate
in social media



500,000,000

People around the world will use
a healthcare app this year

43,000

medical apps
are now available
on iTunes

Sources: Demi & Cooper, Pew Research Center, Time, UK government, US
Food and Drug Administration, Wall Street Journal, research2guidance

The facilitating technology (provided by specialist health IT company Get Real Health in partnership with Microsoft) helps patients monitor and manage their conditions using customised online and mobile tools. Because patients are empowered with all this information as their health changes over time, their sessions with their care providers are more productive, leading to more informed, collaborative decisions about treatment options. As monitoring continues between sessions, care providers will receive an alert if a patient documents the same mood in their health tracker three or more times in a row, allowing them to intervene when necessary.

Advancing clinical research

Taking data-sharing a step further, once everyday transactional healthcare data can be turned into timely intelligence

and insight, it can be shared throughout the healthcare sector and with the life sciences industry to inform clinical research, and the creation and accelerated delivery of new drugs and treatments. This is the ultimate vision that health authorities work towards.

Getting to this point, and even the intervening steps of maturity, is much more than a technological challenge. It requires alignment from stakeholders from right across the organisation (and beyond) if all parties are to embrace projects positively.

This common vision and commitment needs to be more than skin deep. If it is lacking, there is a significant risk of new systems being rejected however good they are – as has happened so often with health IT in the past. Assuming that everyone wants the same thing, sees

the value in working towards these goals, and can set up appropriate governance that includes every stakeholder, there are specific steps healthcare organisations can take to deliver tangible, measurable value from their operational data.

Creating order from chaos

As long as the requisite data has already been digitized, and is stored in a non-proprietary format, consolidating it so that it can be better visualised, analysed and shared as context-specific insights should not require a significant incremental investment.

For a relatively modest supplementary cost, healthcare organisations should be able to unlock substantial latent value from existing data by creating a consistent platform for information management capable of crossing functional and organisational boundaries.

First, it must be possible to aggregate data from different sources without corruption, duplication or gaps in the information. So if specialist clinicians want to segment and analyse data about diabetic patients, they can be sure they are getting the complete picture based not only on confirmed cases that have already been coded, but also suspected cases indicated by other medical notes or lab data.

All of this requires that data is stored – or accessible – in a standard format that can be understood by other systems. Here, lessons can be learned from the experience of moving medical images such as X-rays from one set of systems to another. This task used to be onerous: migrating digital files could take as long as a year. But healthcare providers have learned that, if they store the content in a vendor-neutral archive (VNA), it doesn't matter if they later change front-end systems or need to use the content elsewhere, because the stored format lends itself to flexible re-use.

As it is all but impossible to predict how future systems and requirements will develop, using standards-based archives to hold critical data is a robust approach that will help ensure that valuable data assets can be repurposed and reused.

Various studies have suggested that the multipurpose use and re-use of data could be worth billions of dollars to the healthcare industry. Yet the real opportunity may be bigger still: efficient, innovative use of data could help the industry develop new, more sustainable models of healthcare that put the patient first and enable better outcomes, however limited the resources.

Understanding the practical challenges

That transformation will only be realised in the long run if managers are realistic about the challenges that lie ahead in the short term. Turning data into something of value is a much tougher task for healthcare organisations, than it has been for companies in the retail and financial services sectors. Healthcare organisations start at a disadvantage, having a fraction of the budget for IT relative to their income. While retailers and financial institutions might have 20 percent of their annual revenue to allocate to IT-enabled innovation, healthcare organisations are lucky if they can spare 1-2 percent. So it is no surprise that the sector is 10-15 years behind the curve in its digitisation and exploitation of data assets.

While retailers and financial service providers deal with huge volumes of transactions, each of these files has only a limited number of fields and ways that the data needs to be looked at. In healthcare, the numbers of patients may be relatively manageable, but the range and complexity of the data recorded is vast. There is similar disparity in the numbers of systems used to collect, store and display this data. In financial services, there might be three or four core systems on an IT network. In healthcare, the number is likely to be closer to 200. All of this adds up to a lot of variables for a data warehouse to cope with – and for healthcare providers to translate into something meaningful that will help them identify and track high-value variations or gaps in care and deliver better quality outcomes.

That's why so many big data initiatives in healthcare are still at the 'advanced pilot' stage, being tested out on limited populations by forward-thinking clinicians excited by a vision of how things could be in the future. This 'start small' approach reflects a recognition that there is a lot of work still to be done in determining where the real value might be in an organisation's data, what quality looks like, and how all of this might inform new delivery models.

It is also a prudent way to test and develop the business case for investment. As peers begin to see what success looks like, this will fuel enthusiasm and commitment to initiatives more broadly across the organisation. It makes sense to include internal marketing and communications teams throughout any projects so they can promote the vision, control expectations, and pass on good news at key milestones. Momentum doesn't just have to be maintained, it has to be seen to be maintained.

D&A IN THE DNA

Benefits of a data-driven culture

From volume to value

Linking multiple data sources can enable organisations to make the shift from volume-based healthcare to value-based and, where appropriate, allow them to take on greater responsibility for a population's health.

Analyzing the cost of care

Data can provide insights into how to create better, more cost-effective delivery models and ensure that clinical decisions about care are linked to financial and clinical outcomes. For example, identifying opportunities to care for patients in lower-cost settings, changing treatments or informing other decisions will improve value for patients and those paying the care bills.



Promoting consistent care

Unwarranted variation of care can be eliminated by implementing decision support, peer benchmarking and comparative data dashboards at the point of care and at management level.

Supporting clinicians in real time

Giving automated medical surveillance tools to clinicians in real time can prevent errors, enable a fast reaction to worsening conditions and spot trends in infection rates and other sources of concern about patient safety in hospitals and communities.

Drawing on business intelligence

Using data to create business intelligence systems paves the way to much more sophisticated resource management, helping to predict demand and improve patient satisfaction. Moving all data into a single, unified database to enable these capabilities is no longer necessary.

Empowering patients

Patients are engaged in their care through remote self-monitoring, personalised care planning, health education, diagnosis, and treatment tracking and alert/reminder tools that are linked to social networks. Telehealth can extend care to under-served populations.



Staying focused

Approaching initiatives selectively and incrementally helps keep projects focused on specific use cases and groups of users. One of the objectives of 'meaningful use' ventures is to allow individual frontline users to find the information they need to support a query. This means they will not only be able to call up the data they want at the point of need (rather than having to wait a month for a specialist information analyst to produce a report, by which time the need may have passed), it also means being able to distill and interpret insights at a glance. This demands data query, extraction and presentation capabilities that allow findings to be visualised differently – using customised, user-friendly dashboards – geared to each user and the specific task at hand.

At KPMG's Healthcare practice, we refer to this as 'thought flow' (as distinct from 'data flow' or 'workflow') – presenting information in the right way at the right time to the right person to support the right decisions.

University Hospitals Birmingham NHS Foundation Trust in the UK provides a good example of tailored data to match individual thought flow. It uses customised self-service reporting to support its Clinical Quality Strategy, by monitoring clinical indicators and outcomes, and staff performance.

Its senior leadership team uses simple dashboards populated with real-time data to inform activities such as physician prescribing behaviors, which in turn affects mortality rates. This allows the Trust to demonstrate its relative safety

record – something that is increasingly important as the NHS begins to give patients more choice in which hospitals they go to, and provide more information to the public to make these choices.

Logistical issues

Another challenge is how to address concerns about privacy and security as healthcare organisations strive to share patient data for analysis. Although the risks are no more onerous than in a financial or retail context, healthcare data is more emotionally charged. There are many ways of tackling this, from stripping out personal identifiers for more population-based studies of data, to providing multiple levels of controls about who can access data and in what context. The important thing is to define the criteria early on so that the right measures are built into policies, IT strategies and systems.

Often, the hardest part with any new IT-enabled change initiative is getting started. KPMG's network of professionals can help organisations identify where they are today on the continuum of maturity for digital information management, and the provider's own reasons for moving to the next level. Together the teams can then map out the next steps to delivering something tangible that will deliver real payback, a step change in care quality, and inspire other parts of the organisation – and external parties – to take-up complementary initiatives.

Another important area where the KPMG team can help is in calculating who all the beneficiaries of the new improvements will be, so that healthcare organisations

can begin to form appropriate partnerships – thereby potentially sharing the load and the financial burden for any new investment.

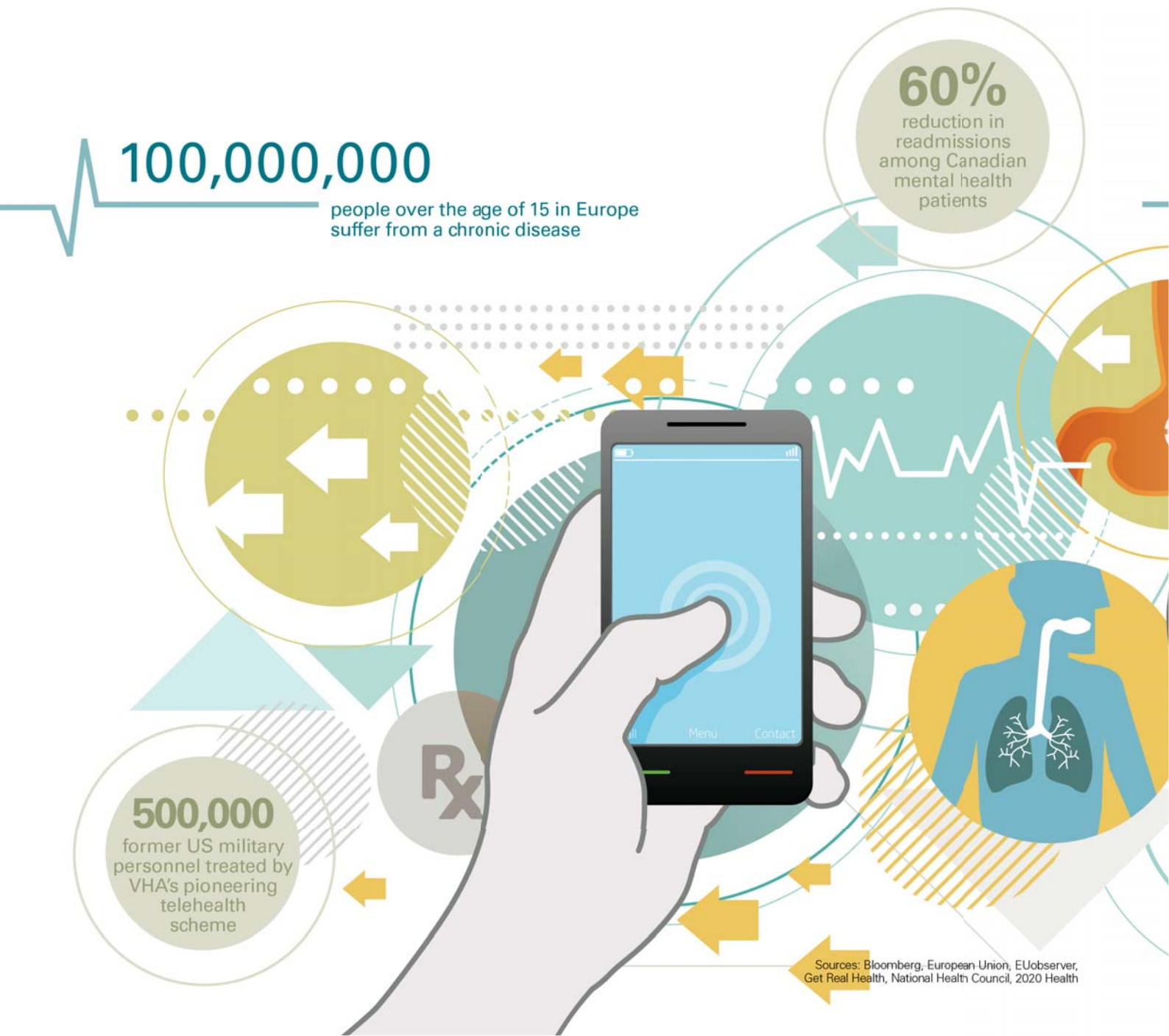
Extracting tangible value from big data isn't a smooth or predictable business. Investments are incremental, where organisations build on success, learn from defeats and think hard about the information they need that will deliver most for the organisation.

Yet, in healthcare, the potential rewards are obvious and transformational. Most providers are on the same journey – the goal is to deliver better care more efficiently. Big data can help them achieve that. ■

“Retailers and banks may spend 20% of their revenue on IT innovation. Healthcare organisations are lucky if they can spare 1-2%.”

Could Technology be the Cure?

Next-generation technology will make a big difference to the treatment of chronic conditions, enabling services to be better targeted – and empowering patients, says Roberta Carter, Partner, KPMG in the UK, and Health IT Commentator



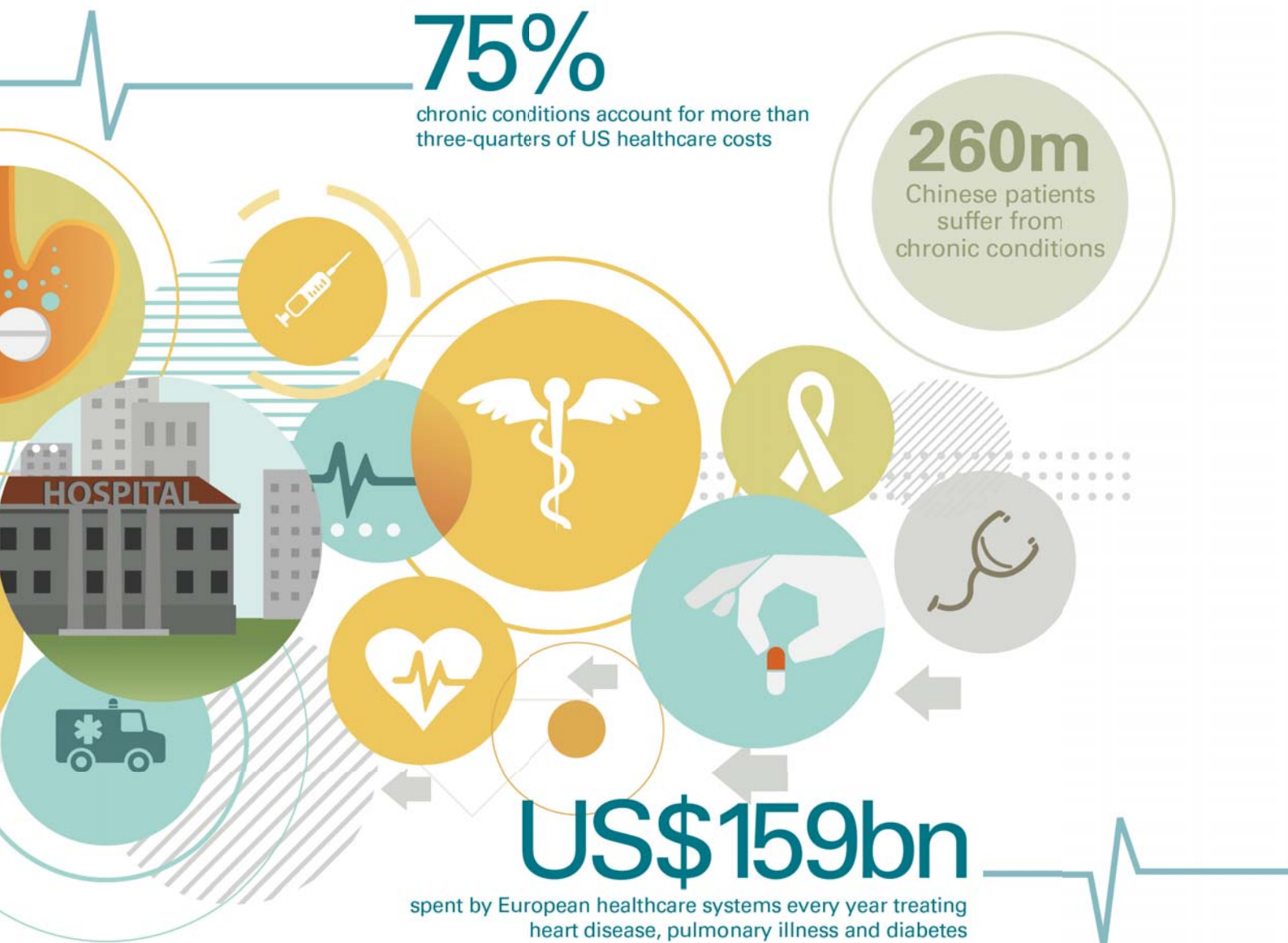
Necessity can be the mother of innovation. As healthcare organisations strive to cope with the relentless, significant increase in patients suffering chronic and long-term conditions, quality of insight – rather than the size of the budget – will be key. In the US and Europe, chronic diseases and conditions account for between 70-80 percent of healthcare costs. By 2020, the National Health Council estimates that more than 157 million American adults will be suffering from at least one chronic condition. Advanced technology – including telehealth applications and ‘big-data’ analytics to prioritise care – could help organisations treat and manage these complex conditions. Patients and caregivers can stay connected and treatment can be provided in the community. New tools will help patients

and their care teams understand more about the patient’s health and take action to prevent conditions worsening, reduce time spent in hospital and improve quality of life. Technology could lay the foundation for a new model of healthcare provision that moves away from reactively treating illness to proactively promoting wellbeing – a strategy that is better for patients, and cost of care.

Prevention is better than cure

Examples of what can be achieved are emerging all the time. MedStar Health, a not-for-profit healthcare system serving Maryland and Washington DC in the US, is one of the organisations testing remote patient monitoring to treat people suffering from chronic conditions. Targeting diabetics who have trouble maintaining blood sugar levels, MedStar

gave individuals a glucose meter linked to a smartphone app, connected to a cloud-based interactive personal health record platform. A simple colour code showed patients if they were within acceptable limits. Patients were given tasks in a personal self-management action plan (weight, medication compliance and exercise) and rewarded if these were completed daily. This simple, cheap, feedback-and-reward system significantly improved patient readings: 88 percent of those on the trial still use the tool. Such initiatives show what can be done if healthcare providers can overcome the obstacles and adopt new technologies. Developing markets – less encumbered by legacy systems – are leapfrogging mature countries, as they seek to maximise the reach of limited healthcare services.



In Peru, a rural medical network in the Napo River Basin now connects 18 rural health centers to referral hubs, giving geographically dispersed patients access to remote real-time evaluation by specialists via video or audio. In Nepal, the Lumbini Eye Institute's telemedicine network links its main center in Bhairahawa with a dozen satellite clinics, improving access to eye health services and allowing for faster triage of ocular pathology. In more developed markets, the healthcare sector's established care pathways – and a degree of disillusionment about technology – have inhibited progress. The process of procuring and implementing new systems is often lengthy and complex. Investments can take an age to approve and don't always deliver as hoped. This might be because targets have changed in the meantime, systems haven't been thoroughly integrated, or because staff have resisted new working methods. The risk of obsolescence is not insignificant – by the time one system has been implemented, technology may have moved on. As development cycles keep accelerating, the only way healthcare organisations can really remain ahead of the curve is for healthcare providers to strike agreements with IT partners that give them the flexibility to draw on the latest technology. Adherence to agreed technology standards can help providers connect and share information between systems, either internally or with other care providers.

Overcoming patient isolation

The Veterans Health Administration (VHA), which looks after American military personnel returning from combat, shows what can be achieved if organisations take a joined-up approach to technology. To provide consistent, high quality care to each individual, wherever they are, the VHA uses telehealth solutions to monitor and interact with patients and their caregivers as they go about their daily lives so they don't have to travel to special healthcare facilities as often – especially critical because 40 percent of veterans live in rural areas that are hard to access. A comprehensive electronic health record (EHR) provides a single view of each patient, built up from acute, primary and secondary care and information from caregivers and families. This is being supplemented all the time, via direct mobile connections to patients and carers. A simple text-messaging facility is used to recommend lifestyle changes to patients, remind them to take medication, and carry out exercise or treatment regimes. Remote support for caregivers reduces isolation and stress, keeping them connected and providing information in a convenient fashion.

After a home-based telehealth pilot, the VHA reported a 30 percent drop in hospital admissions. Estimated to be the biggest single telehealth program in the world, the scheme's reach has been growing by 22 percent a year, making more impact as connectivity becomes more mobile.

More targeted and personalised care

The creation of personalised, community-based treatment plans for patients necessitates more connected systems and a freer flow of information. Healthcare providers should build holistic profiles of patients from data collected at different points (at home, in the community, in hospital, at the doctor's or in clinics). It is imperative that this data is reliable, consistent, up to date, and open to comparison.

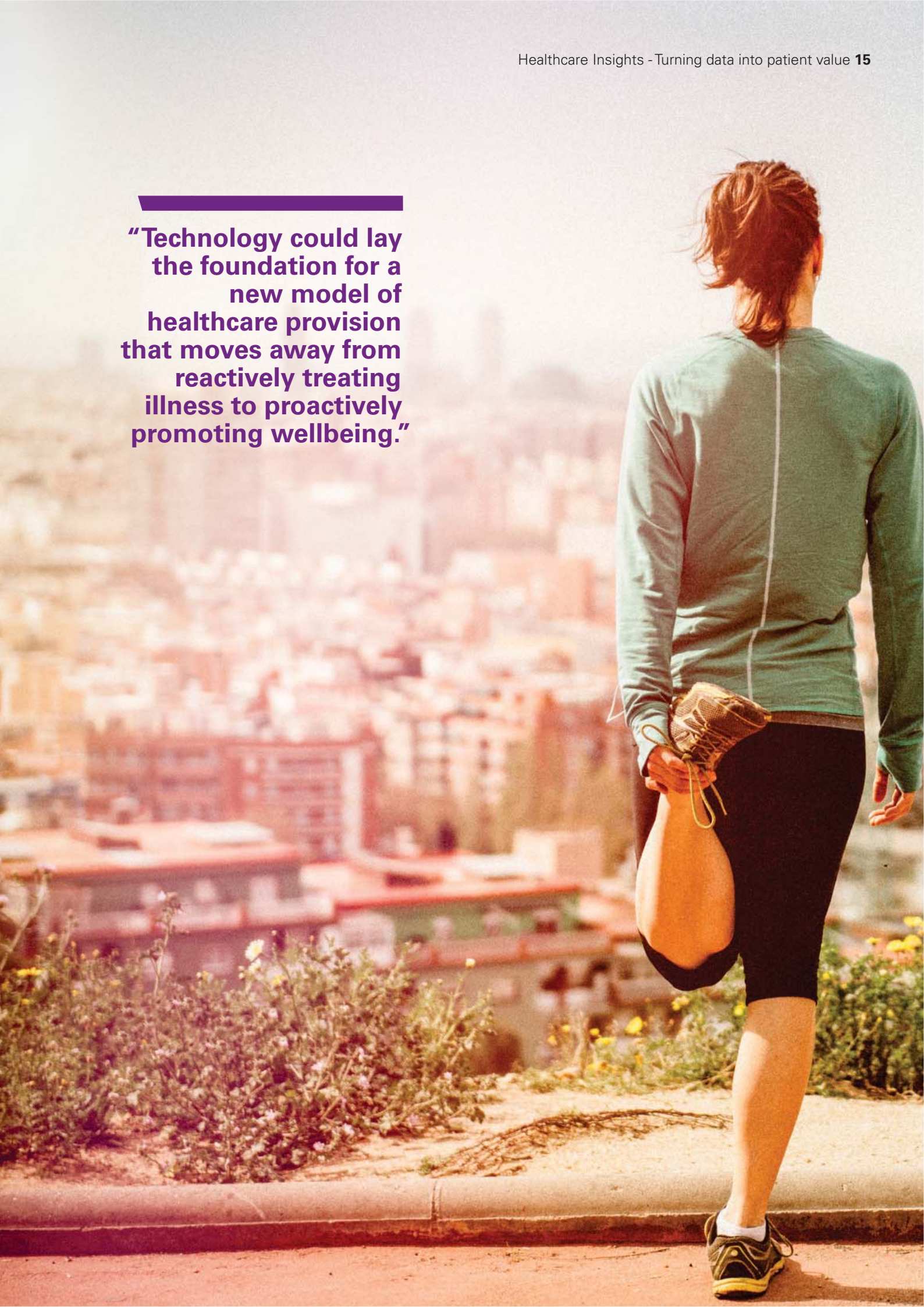
Specialist 'big data' analytics solutions can be extremely useful here. Subtle patterns can be extracted from patient information – so we can learn more about how conditions progress overall and then use that for individuals.

On a broader scale, big-data analytics can inform forecasts about the likely demand on services in a region – for example, based on identified health trends combined with local demographic data. Information about heart rate, blood pressure and blood oxygen levels is more valuable when combined with public health apps that monitor and/or advise on levels of activity, calorie consumption and dietary information.

Easily accessible mobile tools combined with cheap cloud-based data storage and processing can help forecast health outcomes and requirements, enable patients to manage their conditions and encourage healthy behavior by the public. The latest self-help innovations inspiring curiosity include Google's prototype contact lens glucometer, Samsung's Simband (which captures personalised health data, including sleep patterns) and Apple's HealthKit app. If such launches persuade individuals to share valuable information about themselves with healthcare providers for deeper analysis, they could genuinely enhance patients' lives.

Vinod Khosla, co-founder of Sun Microsystems, has even suggested that, with such devices enabling machine-based diagnostics and treatment plans, 80 percent of doctors will not be needed in the future. Such predictions sound extreme but algorithm-based diagnosis and health prediction are already a reality.

“Technology could lay the foundation for a new model of healthcare provision that moves away from reactively treating illness to proactively promoting wellbeing.”



Prevention is better than cure

Examples of what can be achieved are emerging all the time. MedStar Health, a not-for-profit healthcare system serving Maryland and Washington DC in the US, is one of the organisations testing remote patient monitoring to treat people suffering from chronic conditions. Targeting diabetics who have trouble maintaining blood sugar levels, MedStar gave individuals a glucose meter linked to a smartphone app, connected to a cloud-based interactive personal health record platform. A simple colour code showed patients if they were within acceptable limits.

Patients were given tasks in a personal self-management action plan (weight, medication compliance and exercise) and rewarded if these were completed daily. This simple, cheap, feedback-and-reward system significantly improved patient readings: 88 percent of those on the trial still use the tool. Such initiatives show what can be done if healthcare providers can overcome the obstacles and adopt new technologies. Developing markets – less encumbered by legacy systems – are leapfrogging mature countries, as they seek to maximise the reach of limited healthcare services.



By investing in telehealth – and issuing every patient with a smart card that contains all their health information – the Italian region of Lombardy has helped healthcare providers acquire a more accurate understanding of average cost per patient and develop individual care plans for specific chronic conditions. Using big-data analytics, Lombardy has segmented 70,000 patients according to risk levels, enabling it to issue telehealth equipment to high-risk individuals, and give phone support to those designated as medium risk.

The initiative would have floundered without the buy-in of every contributing party. With strong commitment from local politicians, the region grouped doctors into collective businesses and reimbursed them on a per-capita rate for each care plan, with incentives/penalties for good or bad outcomes. As an added incentive, doctors' cooperatives retain 10 percent of any savings delivered. Targeting risky patients has helped Lombardy improve outcomes and reduce costs. Hospitalisation rates have fallen significantly and physicians can now spend more time in the community.

Affordable technology

In hospitals and clinics, mobile devices are making face-to-face time more productive, giving clinicians a more complete picture of a case history at the point of need, so they can deliver better care. In the community, mobile systems have proven they can reduce repeat admissions. In Canada, a trial of Get Real Health's mobile personalised patient engagement and care management system cut readmission rates among mental health patients by 60 percent. As the cost of technology keeps falling, and more telehealth applications become available on a simple subscription basis, innovative solutions are easier to implement. As long as they are approved for secure use in the local healthcare sector, the barriers to adoption are low – and getting lower. The equipment needed to run them is minimal, especially if the systems are remotely hosted. Organisations no longer need dedicated servers to analyse big data – even the most complex calculations can now be performed instantaneously and securely in the cloud. Self-service devices for patients are becoming cheaper and more 'professional'. Readily available home-based blood pressure monitors and blood sugar readers produce results a doctor can trust.

“If you can do mobile banking securely, there is no reason not to have mobile health.”

Breaking down intra-organisational barriers

If healthcare organisations are to provide true patient-centric care, they need to 'see' the individual so they can make the right deductions about their long-term needs. Building reliable Electronic Health Records from different sources is impossible unless healthcare organisations look beyond their own boundaries. At the moment, targets and policies of reimbursement only give 'soft' guidance on intra-organisational collaboration – presenting this as a useful consideration, rather than an essential criterion.

Other practical hurdles include how to identify individual patients conclusively (for example, if many local people have the same name and birth date). There are legitimate concerns about patient security, especially if joined-up care means their data is shared beyond organisational boundaries or fed into centralised systems for analysis. Technology can surmount all these hurdles. As Tim Kelsey, Director for Information for NHS England, noted: “If you can do mobile banking securely, there is no reason not to have mobile health.” The solutions are becoming more accessible and affordable.

Creative investment

The toughest challenge is getting influencers and decision-makers to think afresh about healthcare provision. Being able to see the expected payback of any new systems helps considerably – especially for many of those organisations that have been 'burned' by failed projects.

Translating vision into action

These examples illustrate what's possible if healthcare organisations harness next-generation technology to deliver a bigger vision. The rising demand for services, and growing budgetary constraints, is forcing healthcare providers and overseeing bodies to think laterally.

Five years ago, the largest randomised controlled telehealth trial was completed in the UK. Funded by the Department of Health, the Whole System Demonstrator Trial involved 6,000 patients (3,000 on telehealth and 3,000 on telecare) across three regions of England. In one trial, by using joined-up information and remote monitoring to prioritise urgent cases, community matrons were able to see nearly double the patients a week – compared to before the trial.

After decades of promise, the strategic use of technology in diagnosis, monitoring, and the provision of remote support to patients so they can better manage their chronic conditions is finally on the verge of being adopted in mainstream medicine. The details of how best to achieve this goal are still being crystallized, but some important prerequisites are now clear:

- Holistic, integrated and mobile electronic health records can shift the burden of care from institutional settings to the home and in the community.
- Patients – and the public – must be encouraged to take more responsibility for their own wellbeing and managing their health/conditions.
- To facilitate this self-management, the most pressing need is to create a single view of the patient, drawing data from across the healthcare ecosystem (to produce a similar service to that experienced in banking). Reimbursement models need to reward performance based on quality and appropriateness of care and by incentivising patients to help care for themselves.
- If physicians, caregivers and patients are to create new models of care, technology companies (hardware and software vendors, integrators and service providers) need to fully embrace mobility.

Success requires strong leadership. The use of modern technology to improve care for people with chronic conditions is inevitable, whether individual providers embrace it or not. Organisations need to decide which is the larger risk – bold action now, or no action at all. ■

“The toughest challenge is getting influencers and decision-makers to think afresh about healthcare provision.”

Key Considerations



Roberta Carter
Partner
KPMG UK

The key factors to consider when harnessing technology to help manage chronic health conditions

Identify a compelling reason to change

It's not just the budget. While technology can be driven by finance, efficiency and practicality, it is the moral imperative that makes it work for the VHA. They needed to look after veterans returning from military service from across the world. They couldn't be asked to attend clinics and travel great distances, particularly if they are unwell, so it became a moral imperative. The lesson for healthcare providers is that to keep your medical teams engaged in making the level of change that needs to be made, they need to understand why they are doing it and that it's not just about efficiency. There is a moral imperative that speaks to the heart of why people go into healthcare.

Define a digital strategy

Don't focus exclusively on IT infrastructure. Consider every aspect of your engagement with patients, clinicians, families, caregivers, staff and the community.

Keep projects manageable ...

... but also scalable. The EHR is the bedrock of an effective patient population management strategy. Beyond primary and secondary data sets, healthcare organisations need to incorporate information from caregivers, family members, patients and, in due course, from social media (for example, using feedback from patients to help decide investment in new services).

Choose an open architecture

New, cheaper, better and more inherently mobile technology will keep emerging, so IT supplier agreements and the back-end architecture should be flexible enough for front-end capabilities to be updated.

Invest in analytics

Collecting vast amounts of data is only valuable if something significant can be deduced and done with it, so the purpose needs to be clear at the outset.

Engage patients

A two-way process of engagement helps both parties. Mobile technology is ideal for connecting with patients and carers in a natural, intuitive way.

Engage clinical staff

Coercive 'encouragement' – such as fiscal penalties for avoidable readmissions – can drive regime change but reward mechanisms are more effective. Sharing the benefits of improving services and better outcomes creates goodwill and encourages acceptance of change. Reimbursement should be linked, at least partially, to patient feedback – from individuals and groups via social media analytics.

Remove usability barriers

Many great IT systems have failed because they required extensive training, weren't very intuitive to use or had a clunky user interface. Clinicians and patients much prefer systems that make their lives easier and more productive.

Track consistently

If you're not measuring something, you can't improve it. By tracking the impact of change, healthcare organisations can plan to get more things right.

The Value of Effective Data

Paul Henderson, Head of Health Analytics, KPMG UK explains how health analytics can be used to create a better, more efficient health service with better patient outcomes and a healthier population overall.



Paul Henderson is Health Analytics Solutions Director with KPMG. He splits his time between Dublin and London and has particular expertise in using data and analytics to improve the UK NHS. He believes lessons can be learned from that experience, here in Ireland.

NHS England recently published a 5 Year Forward View that highlighted a set of challenges that the NHS would need to address. The document brings together the collective experience of professionals throughout the health, well-being and care management community, to produce a consistent view of what needs to be done by commissioners, providers and those involved in strategy and policy. A desire to improve population health is a key goal in helping manage the demand on pressured services and improve the health of the nation in general.

Henderson recognises the part that data and analytics will play in modelling population health to predict and manage demand, which is a universal problem that impacts on us here in Ireland, as much as it does the UK. The NHS' funding pressures are well documented, however he feels that "You can't simply

continue to increase funding without trying to manage demand. In particular, Commissioners face a number of challenges, such as managing demand now and in the future and it is great to see NHS England working that problem through with a prominent focus on population health analytics."

Demand for services is complex. In the UK many agencies provide many types of services in many ways so getting a consistent view of demand can be difficult. However modelling is possible and can help service commissioners and providers alike proactively manage the problem.

"There is a science to that," says Henderson. "When we think about this in KPMG we look at who has demanded services historically and then look at their behaviours, their backgrounds, where they live, where they shop, if they exercise, how they engage with social media; all the things that retailers would look at when they are deciding where to open a new shop, for example. One of the key areas where analytics can help improve health services is demand prediction and management. "You look at the population, find the people who are using services, predict their behaviours, and attempt to predict how they are going to use services in future."

"This is not about giving Fitbits to the worried well."

A challenge in gaining this insight into likely demand is then understanding how the healthcare system can use that data to drive change. Data is at the heart of the reform agenda in the UK, however it must be used to be truly effective.

"One profound difference between the UK and Irish health services is the role of Primary Care professionals in the commissioning process."

"You can use very sophisticated analytics to improve the cost effectiveness of the service and to engage proactively with patients in order to get the positive outcomes we are all looking for," he adds.

He cites the example of child vaccination. "Prevention is clearly important and so measures like improving the way we vaccinate our children can help. Of course, you have to find the children and they can be dispersed very widely around the country; you have to develop a vaccination programme and you can risk stratify to identify hard to reach groups of people. If you don't do this you are storing up problems for the future. The expenditure and resources devoted to the vaccination programme are small in scale compared to the long term costs of not vaccinating and the consequent future burden on the health service.



The same data and analytics that help identify epidemiological issues in parts of our population can be used to identify cohorts of actual and potential patients and enrol them into vaccination programmes.

Of course delivering efficiency gains in the health services is still top of mind for most Chief Executives. The UK health service faces a challenge in the form of its government mandated deficit reduction programme. "You can save money in a number of ways," Henderson notes. "You can become more efficient at what you are doing. Some of this has already been done and there is more to do. You can stop providing some services but that needs to be done carefully to avoid generating more issues than it solves. The other way is to improve the overall health of the population and there are some really interesting innovations happening in that area." Examples included primary care services embedding the use of equipment like digital scales and electronic blood pressure cuffs into the core clinical process of providing homecare for the elderly. "The GP gets the information and can monitor the patients' health status. It also helps people to take responsibility for their own health and wellbeing. You can't just tell people to take responsibility, you've got to engage with them, encourage them, and give them the tools to do it."

This is a good example of modern technology-driven trends such as telemedicine finally landing service benefits and savings as a result of appropriate adoption. "This is not about giving Fitbits to the worried well," Henderson says. "If you give people the technology that will keep them out of hospitals or care homes and allow them to live independently, or with support in their own home, then everyone wins."

With an ever increasing number of data sources comes the challenge of being able to see the wood for the trees. Henderson remains hopeful and believes the health services have a growing amount of the right resources to deal with this issue. "There are people with statistical capability in the health services, but there is a need to align them with the problems faced by the system. We need to get the CEOs to talk to the statisticians. This will only happen when the statistics are of proven value in solving the issues that the CEO faces."

The value of effective data as a key enabler of change is being promoted by a number of communities of professionals in the UK. For example, one profound difference between the UK and Irish health services is the role of Primary Care professionals in the commissioning process. GPs are leads of the clinical commissioning groups (CCGs) that are responsible for a local population. Visits to EDs, therefore, by their patients are paid for out of their budget. GPs therefore have two main interests in reducing these visits – the first is to improve the quality of care and health outcomes for their patients and the second is to ensure that their budgets are not used up by unnecessary ED visits. Effective data is key to understanding whether these interests are being satisfied.

Henderson notes a story of a GP he has worked with in the UK. "If you are a GP and can predict which of your patients are likely to go to ED as a result of their asthma you could get a district nurse aligned to the practice with a specialism in asthma. If you couple that with some health promotion work and then monitor the people who go to ED and follow them up to find out why you can help them avoid future visits. Frequently, their issue has been poor understanding of how to use their medication and that can be easily dealt with by a nurse specialist."

Another area where analytics can come into play is improving the performance of the health service organisationally. "One of the things we need to pay attention to is our ability to staff the health service. We use what we term decision science to help. We are using this to improve the way organisations work and deploy the most capable and best aligned people at the appropriate levels. Those organisations perform better because they are managed better, for example they enable people with transformative capabilities to do their jobs."

Decision science is a relatively new discipline. It involves using a wider and deeper range of data sets to think around a problem and using data science to build predictive models. In this case the science is looking at a range of factors which affect staff performance, not just the conventional metrics like vacancies and turnover rates but also workload, attitudes to work and spatial data about surroundings and relationships with colleagues. Henderson believes that, "These new insights into, for example, population health and patient and staff behaviour will help us manage service pressures and give us the best chance of responding to the demand for a 21st Century set of global health systems that are key to enabling us all to live longer and healthier lives." ■

"We call it decision science. We are using that science to improve the way organisations work."

Putting the Patient at the Centre

Patients need to be convinced of the benefits of electronic health records before they can be introduced according to Professor Jan A. Hazelzet MD PhD CMIO / Professor in Healthcare Quality and Outcome, Department of Public Health in the Netherlands.



The Netherlands is only now moving towards establishing a national electronic patient record (EPR) system as a result of a major setback in 2007. "We had a political failure eight years ago when the government attempted to force people to participate in a national electronic medical record system," explains Jan Hazelzet, Professor in Healthcare at Erasmus University Rotterdam.

"They tried to do this without explaining what kind of data was going to be shared and people naturally reacted very negatively to this. We are now approaching it much differently. It is important to convince people of the

benefits of such a system, tell them what information will be shared, why it is needed, and ask for their permission."

Despite this reverse he believes the system is now moving in the right direction, albeit from a rather poor position. "The way it is now when a patient goes to their GP the GP knows a lot about them. But when the patient is referred to another care provider they have to tell their story all over again. And this is repeated over and over again. Even in the same organisations we have instances of patient information being stored in different systems which are not shared."

This situation is about to change, however. "The different systems in The Netherlands have agreed on a standardised form and dataset for patient records. This will mean that it won't matter where the patient is, the same information will be recorded. We are using a minimal dataset and with standardised terminology to ensure that the data is consistent."

The SNOMED (Systematic Nomenclature of Medicine) system has been chosen as the standard. "This is used in 27

countries around the world and has been translated into several languages. It is the most important standard for this type of information. If you use SNOMED you can take the data almost anywhere and it will be understood. This information is the basis for everything. If you don't have it how can you continue care in another organisation?"

"The system starts with different caregivers and that is wrong."

He believes the current system structure is not suited to patient needs. "The system starts with different caregivers and that is wrong. You need to start with the patient. Everyone is born somewhere, lives somewhere, and has interactions with the health system. We need to record what treatments they have had, if they have allergies and other important information about them. This has now been accepted by the two main hospital organisations.



We are now discussing it with the IT systems vendors. We are asking them to implement the dataset in their systems."

This should not present a major issue for those companies as the dataset includes information under just 17 headings.

"We include basic details such as name and address as well as very important items such as medications the patient is on, procedures they have had, any instructions such as 'do not resuscitate', if they have oxygen supplies in their home, if they are a wheelchair user and so on."

Having this sort of information held in one record accessible whenever and wherever it is needed will bring real benefits to patients. "What is happening now is that nice fancy health apps are being designed for smartphones but these don't make much sense if the patient has to update their information every time. The records will be updated automatically. Point of care documentation will only have to be prepared once and will be capable of being reused many times."

The health system will also benefit. "You can use the records to obtain information

in an anonymous way and this offers the basis for secondary use of the information. It will be possible to look at the length of stay for patients with the same conditions in different hospitals, for example. It can also be very useful for epidemiological purposes."

And the proposed system is being designed to minimise the possibility of errors. "We will use codes and terminology appropriate for physicians. At the moment patient information can be recorded in free text and this is very complicated for a computer to read."

It is hoped to have the new system up and running by the end of the decade. "We have to convince the patients and the IT vendors. We hope to have it in place within the next two to five years."

He believes there are lessons which Ireland can learn from the Dutch experience. "Because of the past experience our health ministry is very cautious about the introduction of electronic health records. We know that patients need to be convinced and that is why we are proposing a minimal dataset. It will only contain the information which is absolutely necessary and is capable of

being completed in just one way, rather like your income tax form. You file your tax form electronically and it can only be used in one way. I believe the majority of people will say yes when they are given all the information and they understand that the records will only contain the data that is needed to improve the quality of their healthcare."

Given that the roll out of electronic patient records has been delayed by up to 13 years as a result of the mistakes made in the first attempt this is a valuable lesson for any country with plans to implement a similar system. ■

"You need to start with the patient. Everyone is born somewhere, lives somewhere, and has interactions with the health system."



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Produced by: KPMG's Creative Services. Publication Date: December 2015. (1312)