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A blueprint for success in healthcare data and analytics (D&A)

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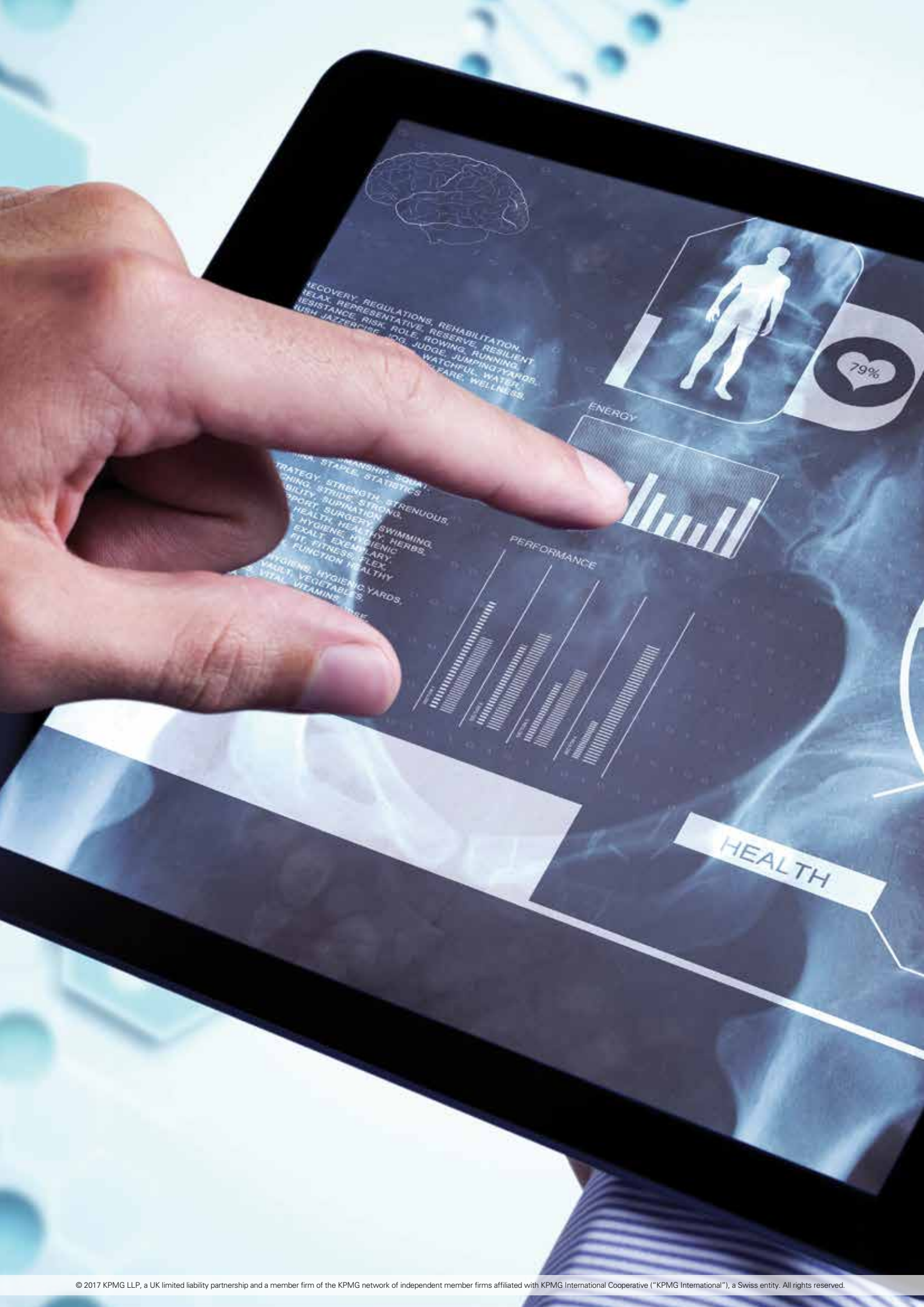

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Master your data, master your future

Analytics will be one of the most valuable tools for transforming healthcare in the coming decade and will enable leaders and decision makers to manage the massive changes they are facing. Understanding and harnessing analytics will enable these leaders to become innovators and at the same time mitigate the risks associated with change. Yet, despite the huge potential of analytics to help improve care quality, make services more efficient and reduce costs, healthcare organizations around the world find it hard to use data to its full potential.

Why do they get stuck? Maybe they're not sure how D&A can be put to practical use to achieve clinical and operational goals. Maybe they struggle to create a compelling strategy and business case to justify investment or find the challenge of data being stuck in silos overwhelming. Maybe they find it difficult to implement their D&A plans amid other competing priorities.

Or maybe they simply get beguiled and overwhelmed by technology.

Whatever the reason, they need help to get unstuck. This blueprint sets out a simple approach for how healthcare organizations can extract greater value from their data and use it as a key driving force behind their operations.

New solutions to old problems

Around the world, healthcare organizations face similar challenges: increasing demand for services, growing healthcare costs and exceedingly demanding expectations from consumers about the care they receive.

While conventional responses to these problems have delivered some improvements, few have succeeded in genuinely 'bending the curve' and helping health systems achieve the triple aim of better health, better care and lower costs. Doing this means finding new solutions to long-standing problems. D&A can help.

It's harder than it looks

Increasingly, leading healthcare organizations are turning to new analytical tools to power the next wave of improvements in patient safety and experience, care quality and service efficiency. But it's not easy.

In KPMG's work with healthcare leaders around the world, we find many are struggling to understand what the rapid shifts in D&A technologies and methods mean for their organizations. They're trying to come to grips with challenging issues like:

- providing evidence to inform real-time decisions in changing environments
- sharing health data across care settings so it can be used by providers, payers, regulators and others
- assessing the clinical and commercial value that D&A investments are likely to create
- managing large, complex data sets in a highly regulated environment with strong public interest
- changing culture and behavior around data use.

Working through these challenges and realizing D&A's full potential requires a long-term commitment and a willingness to invest in new skills, new ways of working and new technologies. Organizations and healthcare systems that are prepared to make the investment will see huge benefits.

Seizing the opportunity

Advancements in analytics technologies like cognitive computing, machine learning and predictive analytics are already transforming a wide array of service industries and have the same potential in healthcare. These tools — along with smart devices connected together to form an 'Internet of Things' — create opportunities to gather insights from new and existing data assets and use them to transform care.

New frontiers in medicine (particularly the emergence of genomics) and the trend towards more personalized care will mean that health organizations will become increasingly reliant on analytics to achieve their clinical and operational objectives. Electronic medical records (EMRs) and clinical information systems create further opportunities to use analytics to create value.

To seize the opportunity, healthcare leaders and managers need to understand how to drive value from what will increasingly be one of their most important assets: data.

Starting from the right place

KPMG's global experience in supporting data-driven transformation has taught us that success with healthcare D&A starts with getting some key things right:

- aligning D&A to your overall strategy
- making sure analytics add value to care processes and the business
- implementing practical solutions that people want to use
- leading from the top and communicating the benefits you're aiming to achieve.

This blueprint offers lessons on how to do these things well. Whether you're already well advanced with your D&A journey or just getting started, we hope it gives you helpful ideas and insights about how to get the most from your data assets.

A clear strategy and plan are key to D&A success

The explosion of D&A is revolutionizing business. To borrow the phrase coined by UK mathematician Clive Humby, data is "the new oil." While oil was the fuel for innovations in the 20th century, data promises to play that same role in the 21st century.

But while many in healthcare acknowledge data is an asset with huge potential, getting concrete value from investments in D&A is not easy.

As with so many things in life and business, finding effective solutions to complex challenges starts with having a clear understanding of the problem you're trying to solve and then finding ways to solve it. Healthcare D&A is no different.

However, because many efforts in the world of D&A are focused on implementing exciting new technologies rather than solving business problems, many analytics initiatives fail to deliver the benefits they've promised.

Against that backdrop, the challenge for healthcare organizations is threefold. First, they must genuinely understand the clinical and operational questions they are trying to answer through D&A. Second, they need to identify the most appropriate tools, techniques and capabilities for answering them. Finally, they need to **embed those** in a clear **and executable** D&A strategy and plan.

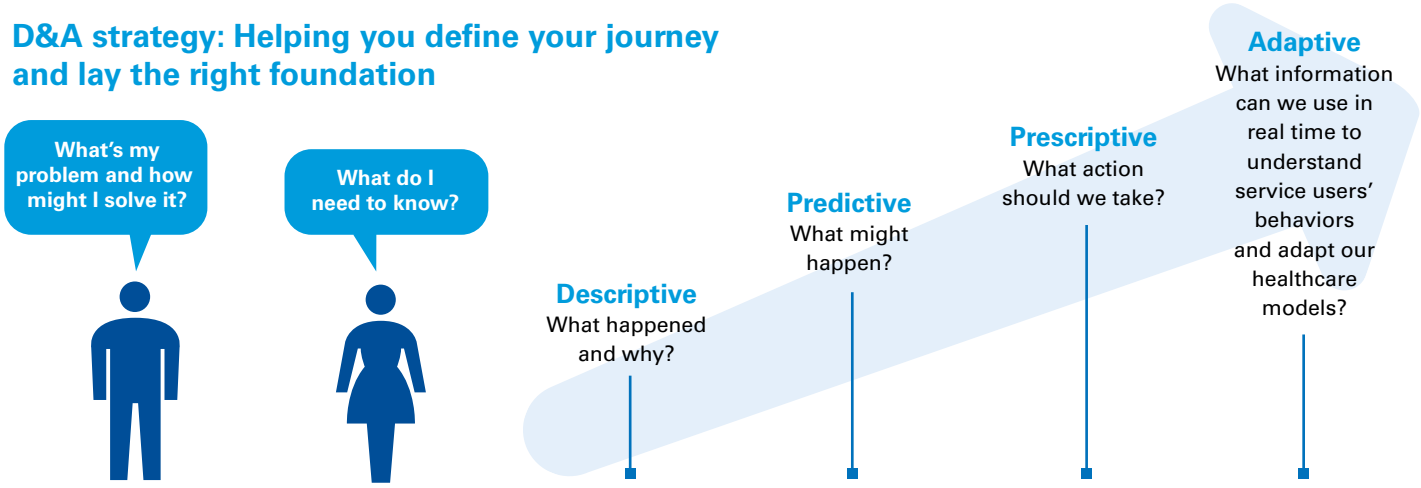
In short, business objectives should drive information requirements, which in turn should influence decisions about the applications and data architecture that are right for a given need. The interdependency of these factors means that an effective approach to D&A must take account of this complete picture and offer a staged approach to investments and benefits realization over time.

A strong D&A strategy should answer the following questions.

- What are my clinical or business objectives? How will data help address them?
- What data assets do we have now, and which ones will we need in the future to meet our objectives?
- How do we ensure our data is stored in a way that promotes durable, secure access for analysis that is compliant with standards when we use it?
- How will our data be governed?
- How will data be packaged to enable use and reuse?
- How can we improve data interoperability to 'connect the dots' across clinical and operational data?

And perhaps most importantly, a strong D&A strategy helps an organization move from using data to describe the past to instead using it to help adapt their business for the future.

D&A strategy: Helping you define your journey and lay the right foundation



Data storage — What's the best way to securely store my data while making it easy to use?

Data handling — How do we ensure we handle data in a way that is safe and secure, giving confidence to the people we serve and the regulators who govern us?

Uncover the value in your data

Even the most ambitious healthcare organizations — including those with great D&A strategies — sometimes come up against barriers when trying to drive insight from data. Some may have limitations in their capacity and capability to work with new data sources and analytic technologies. Others may have to overcome a legacy of high-cost D&A projects that didn't deliver their promised benefits. And some may simply struggle to accurately estimate or articulate the benefits of D&A and leave their leaders wondering what needs to be done to leverage the latent value that exists in their data.

KPMG's work with healthcare organizations around the world has taught us consistent lessons about how to overcome these barriers and achieve success with analytics. Among them, strong clinical and business leadership and a durable commitment to execution are crucial.

Our work has also shown us where healthcare payers and providers are investing their D&A efforts.

	Healthcare D&A investment trends	Example
1	Improving clinical and operational efficiency and effectiveness.	Actual length of stay (LoS) for inpatients measured weekly (e.g. hip replacements or stroke patients LoS) and compare this to benchmarks in order to develop specific variance reports that identify opportunities to improve performance by ward and lead clinician.
2	Reducing unwarranted variation in patterns of care by using electronic medical record data.	Maximizing cost efficiency through patient-level costs and doctors' and nurses' ordering practices for high-cost drugs.
3	Optimizing pathways and coordinating care across settings and services.	Labs and vitals for detecting sepsis.
4	Targeting preventive healthcare measures and adopting population-centric approaches to care.	Eye exams and foot exams for diabetic patients or fecal occult blood test (FOBT) for all >50 men and women for early screening.
5	Better understanding of patient-reported measures of experience and outcomes.	Triangulating social media, patient surveys or patient engagement statistics to correlate patient satisfaction.
6	Improving control over real-time management of clinical operations in high-cost or high-risk areas.	An end-to-end real-time theatre module (e.g. control tower) to look at pre to post-theatre performance against a range of measures (e.g. understand utilization, surgeon performance and variance, etc.).
7	Developing and refining reimbursement mechanisms to improve system performance and align payment incentives.	Helping to identify patient cohorts for bundled payments and then looking at avoidable investigations to reduce cost.
8	Understanding the optimal geographic arrangement of assets (e.g. medical laboratories).	Using D&A and geospatial mapping to locate collection centers or fleets (such as ambulances).
9	Improving the design and resilience of analytics operations and positioning them for future success.	Investing in strategic support to develop enterprise architecture and understand organizational D&A maturity level.

Four key lessons for success in healthcare D&A

Align analytics initiatives to the organization's strategy

- Investments in analytics only add value if they are aligned to your strategy and provide answers to the most pressing clinical and operational questions you face.
- A realistic understanding of your organization's readiness to embrace D&A is crucial to planning for success. Getting effective governance and a solid enterprise architecture (data, people, processes and technology) in place are critical.

Improve clinical and business value by creating an evidence-led culture

- By clearly articulating the clinical or business benefits that analytics initiatives will drive, you can start to prioritize investments and approaches to capturing value.
- Switching focus from one-off projects to the development and embedding of durable analytics capabilities will improve buy-in and empower users.
- Consistent clinical and business ownership of analytics activities will help ensure that analytics initiatives deliver value to patients and end-users.
- Performance measures that track and motivate progress towards goals can be tied to executive compensation.

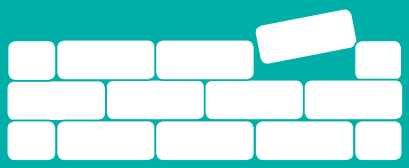
Lead from the top and engage the business early

- Executive-level backing is critical.
- You also need to establish a common language, stripping out jargon for non-technical service users.
- Get end users, clinicians and business owners involved in project design from the very start to ensure that what's measured is what matters most.
- Create space for front-line staff to work with data and put insights into context. Senior clinical support is especially important for projects in clinical areas.
- Celebrate wins and ensure they are visible to a broad cross section of stakeholders. Measure and demonstrate benefits.
- Collectively, these factors create momentum, build confidence and help support future investments.
- Recognize that analytics enables change but that it's people who make organizations successful. Don't expect data to do it all.

Flawless execution improves speed-to-benefit and builds confidence

- Iterative delivery approaches (such as Plan-Do-Study-Act) empower users in design and promote opportunities for innovation and continuous learning.
- Agile program management helps bring forward the realization of benefits.
- Strong, consistent use of enterprise program management processes and tools helps improve delivery success. This, in turn, builds user confidence and creates buy-in for future investments.
- Be explicit about what drives value and work hard to reduce overhead associated with legacy reports and activities that no longer serve a useful purpose.
- A marker of success is that D&A becomes like the oil we put in our cars. We don't think about it very often, but it's essential to the way we travel.

Be honest about your starting point



Realizing the benefits of analytics isn't straightforward and demands honest assessment of your starting point. It's critical to stage your investments in people, process and technology to ensure they build on solid foundations.

Too often, organizations waste time and money by prioritizing investments into new technologies without having the right foundations in place or a clear plan for how to build them. The result is expensive investments in technology that achieve little because the underlying business architecture isn't sufficiently ready.

To help avoid this pitfall, organizations need to have honest assessments of how mature their D&A capabilities are and realistic views of how they'll improve them over time. In our experience, it helps to have a framework for making that assessment.

The table below gives just such a framework. It is adapted from the Healthcare Information and Management Systems Society (HIMSS) 'Adoption Model for Analytics Maturity' and shows eight stages of analytics capability maturity. It offers examples of the kinds of analytics capabilities that can be achieved at each level.

In KPMG's experience, many healthcare providers globally are currently at maturity stages 3 or 4. For some, it's a huge achievement to have reached that level, and they're starting to see the benefits of their investments and efforts. Others are still at stages 1 or 2, and the most ambitious are planning for how they move to highest levels to take advantage of benefits that predictive and prescriptive technologies can offer.

Whatever the current state of maturity, the key is to be realistic about the staring point and the desired destination.

HIMSS maturity stage	HIMSS Adoption Model for Analytics	Example of what this maturity level might look like in practice
7	Personalized medicine and prescriptive analytics.	Comparing individual patient parameters against a much larger population. Using sophisticated algorithms to flag patients at risk of deterioration, or readmission to hospital.
6	Clinical risk intervention and predictive analytics.	Predictive modeling of cost profiles by patient cohort. This supports planning by showing who uses services most.
5	Enhancing quality of care, population health, and understanding the economics of care.	Stitching data together across organizations or systems to work across organizational boundaries, then identifying 'high-cost' users to help plan services.
4	Measuring and managing evidence-based care, care visibility, and waste reduction.	Segmentation analysis to help identify patient cohorts and develop new clinical care or funding models.
3	Efficient, consistent internal and external report production and agility.	Comparing clinical metrics and indicators (e.g. benchmarks for the number of bed days inpatients spend in hospital) or producing standard safety reporting indicators for peer-level comparison.
2	Core data warehouse: centralized database with analytics competency center.	Analyzing metrics from patient administration and back-office systems (HR and workforce) to gain productivity insights.
1	Foundation building: data aggregation and initial data governance.	Interrogating clinical interactions and resource use in a business unit.
0	Fragmented point solutions.	Inefficient, inconsistent versions of the truth. Cumbersome internal and external reporting.

Source: Adapted from HIMSS Adoption Model for Analytics Maturity (http://www.himssanalytics.org/amam)

Data governance: Is your organization prepared?

Data governance is how an enterprise manages its data assets. It includes the rules, policies, procedures, roles and responsibilities that guide overall data management, but also provides the guidance to ensure that data is accurate, consistent, complete, available and secure. It helps with cyber data management, identifying an organization's data 'crown jewels,' prioritizing data sets, and defining who has access, for what purpose(s), and the required consent processes. Successful data governance starts with the correct roles and responsibilities, and implementation must be planned and sponsored at the highest levels of an enterprise. Through data governance, more meaningful insights from data can be gathered to support decision-making and capacity planning in a comprehensive manner within an organization.

Data governance has four components supported by enabling data management services and data quality tools

1. Data stewardship is the accountability for the management of data assets. Data Stewards do not own the data, but instead are the caretakers of the enterprise data assets, ensuring the quality, accuracy and security of the data.
2. Data ownership is the responsibility for the creation of the data and the enforcement of enterprise business rules.
3. Data policies are the high-level and/or detailed rules that an enterprise utilizes to manage its data assets, including enforcing authentication and access rights to data and compliance with laws and regulations.
4. Data standards are the precise criteria, specifications and rules for the definition, creation, storage and usage of data within an organization.

What is a data scientist and does my organization need one?

Over 90 percent of all global data has been generated in the past two years, making the management of 'big data' a crucial strategy for all organizations. Data generated in the healthcare industry is also growing at a comparable pace. This raises questions related to the organizational competencies required for the management of this data.

The emerging role of 'data scientists' in healthcare — who develop, review and fine tune algorithms and models in order to find relevant insights and enhance data quality for analytics — will be key. With backgrounds in operations, research, mathematics, and engineering, they are able to perform advanced analytical problem solving and apply data-discovery tools to provide deeper level insights, which can be used for decision support, as well as reporting, evaluation, and predictive analytics.

As with other industries, healthcare organizations often struggle to find the right analytics professionals, particularly those with experience working in the sector. These skilled individuals can help them extract more from their data and solve the strategic challenges they face. However, modest investments in skilled personnel and infrastructure can help organizations enhance their data analytic capabilities.

More broadly, a variety of human resources needs will be required to support the development of D&A. The HIMSS Adoption Model for Analytics provides a roadmap for the measurement, adoption and maturation of healthcare analytics in an organization by focusing on human resource considerations at various stages. For example, the human resource considerations for stages 0-3 might include:

- CEOs and senior management buy-in at the board and functional levels
- enhanced performance tracking and clinical and technical capabilities
- skilled data scientists to understand, embed and incorporate the use of large data to inform business decisions.

While for stages 4+, the following might be required:

- increased collaboration between clinician and payers
- focused efforts on patient engagement; this might include social media analytics
- personalized treatment through the use of analytics; this will likely require predictive and prescriptive analytics capabilities such as machine learning.

New paradigm for healthcare data and analytics

Global technology megatrends such as social media, mobile, cloud, big data and the Internet of Things are touching almost every industry on the planet. Healthcare is no exception. Growing demand for anytime, anywhere access to information technology has the potential to disrupt all areas of the healthcare clinical and business enterprise and create whole new uses for D&A.

On top of that, our conversations with healthcare executives and information managers around the world have highlighted an increasing need for digital workflow capabilities. These will help create new ways of working and will generate new sources of data that have the potential to transform care delivery systems.

KPMG is well positioned to help lead clients into the 'new paradigm for healthcare analytics'. Many of our clients recognize that healthcare is behind other sectors in using data and technology to transform services. However, they're ready to catch-up and are keen to understand how others in the healthcare sector are innovating. We see the value of analytics as the engine that will help health organizations move towards true 'digital transformation'. Here are just a few of the trends we're seeing.

1 Predictive analytics and machine learning	Predictive analytics and machine learning (computers with the ability to learn without being explicitly programmed) are rapidly becoming the most discussed topics in healthcare analytics. Being able to predict clinical events and subsequent interventions will help health systems and organizations plan services better.
2 Control towers	In healthcare, investments in real-time analytics have tended to focus on managing patients, whether it's operating theaters or intensive care settings. As analytics tools like predictive engines and cognitive computing continue to mature, 'control towers' that display real-time data will become increasingly effective in monitoring and managing how organizations perform.
3 Cloud analytics	Healthcare organizations are moving away from on-premise software as the cloud becomes more trusted, less costly and allows users to connect with each other to share data. This means that it is now easier for more of us to analyze more data and use that to drive service transformation.
4 Analytics as a service	By using 'analytics as a service' solutions, healthcare organizations can access powerful analytics capabilities through web-delivered technologies. These solutions offer alternatives to in-house developed solutions and are a cost-effective way of accessing powerful tools that are being used to improve healthcare services around the world. For example, KPMG in the UK offers an analytics platform designed to fulfill the analytics needs of projects in place-based care, strategic transformation planning and operational cost improvement (learn more at https://powerbi.microsoft.com/en-us/partner-showcase/kpmg-kodehealthcare/).
5 Population health management systems	Care services are increasingly being provided outside of the hospital and citizens are responding to the need to look after their well-being by keeping their own health records in health apps. Care providers are using machine learning to predict the services patients will need and respond to those needs using population health management systems. These systems, which are much like customer relationship management systems in use in other industries, have the ability to use analytics to constantly learn about us and design personalized care services.

Global case studies

Identifying high-cost service users

KPMG has designed a methodology to help support population health management initiatives, underpinned by analytics.

In the UK, local government and NHS services are being reorganized so they can focus on defining and meeting the needs of people and places for safer, higher-quality and more cost-effective care outcomes. The challenge is not limited to treating the sick in more effective ways but aims to maintain health and well-being by delivering services in the right way, at the right time, and in the right place so that the health of populations is managed as effectively and efficiently as possible.

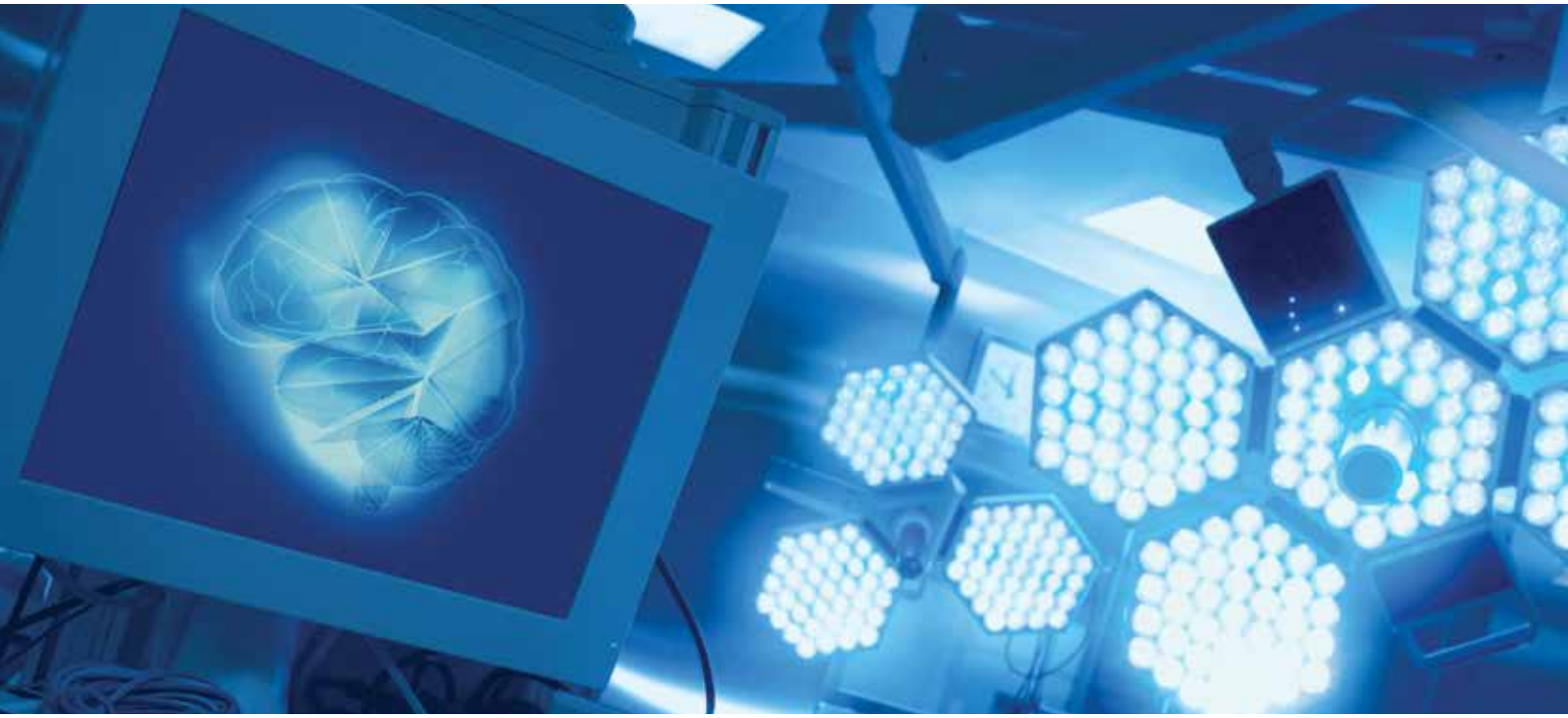
To achieve this goal, the care system as a whole needs to:

- understand the current state of demand
- model what that demand will look like in coming years
- develop transformation and efficiency plans
- reorganize the system to work radically differently.

The key to this is understanding who the most challenging citizens are, why they are challenged and how they can best be helped. This is a sophisticated problem because it requires an analysis of citizen lifestyles, demographics, use of public and private care services, and a detailed assessment of the capacity and cost that is currently being consumed.

In order to address this, KPMG in the UK facilitated the legal and effective sharing of data between stakeholders in the integrated care process, gathered data that was in the public domain, and merged it with data that could be gathered under the terms of our data sharing agreements. From this, we created a cloud analytics platform that enabled further analysis of the consolidated data set. Using open data we were able to diagnose the challenges faced by care systems, generate a view of typical service users' challenges, and then suggest how a case for change could be created. We then modeled the case for change using different analytics approaches such as population segmentation, care pathway analysis, locality planning and risk assessment.

The output was a well-evidenced case for change, underpinned by, for example, capitated budgets so that plans for managing high-cost patients were robust. Following this, KPMG worked with the client to define indicators that enabled the care system to understand the outcomes it needed to deliver and track progress. The indicators were translated into contract metrics and underpinned payment incentives and the financial flows that were key instruments of change. Having supported the transformation, we then used our analysis of high-cost users to ensure the care system managed care in a sustainable way.



Real-time management of theatres and the implementation of a clinical command tower

For one of the largest not-for-profit providers of private hospital services in Australia, an opportunity was identified to simultaneously improve the quality of patient care and experience, the experience of visiting surgeons and physicians, and to materially improve the performance of the operating theaters. Historically, operating theaters have been challenging environments for transformation. While foundational analysis always yields opportunities for improvement, making changes and getting them to stick is always challenged by the need for durable clinician engagement and effective management control systems that are technically and culturally appropriate for the environment.

KPMG Australia established a program of work to deliver on the client's vision for a technology-enabled 'clinical command tower'. The benefits were realized through the following five parallel streams of work.

- The development of sophisticated visualizations of theater performance that promote proactive problem solving and identify bottlenecks and delays. These visualizations are interactive, enabling users not only to see what is going on but to interact with and make changes to key parameters in real time.
- Design and development of a physical space that makes the best use of the new data visualization tools.
- Design and development of a one-call service to smooth late bookings for specialists.
- Procurement and implementation of real-time location service technologies to improve data quality and promote more efficient work practices.
- Implementation of 5S lean practices within the operating theater complex to improve the organization of key equipment, in turn improving efficiency and staff experience.
- The convergence of real-time data, physical space, and new roles has ensured not only that the data delivers insights, but that it is acted upon in a timely way to avert issues and improve the quality of care.

Strategic planning using big data

As one of Canada's largest healthcare organizations, the client was under increasing pressure due to tightening government reimbursement for health services. As a result, they needed a comprehensive strategy that looked at both how they could expand their core offerings to align with emerging health system priorities and to find new income streams by expanding into new channels and services.

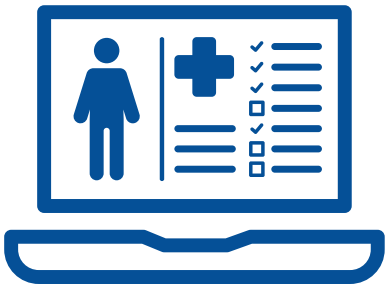
The client engaged KPMG Canada to do the following.

- Undertake a comprehensive review and develop a strategy covering multiple lines of health services. Our team was able to leverage its deep expertise in multiple healthcare market sectors, from digital health to emerging diagnostic services like genomics, to help the client understand the current and future landscape.
- The client needed the team to develop a data-driven process for enhanced planning and evaluation of opportunities. The new process helped identify where the most attractive options were, including specific targets to pursue (e.g. patient populations, geographic hubs or specific locations to expand into the community). The team did this by integrating disparate data sets, including patient-level data and financial performance data as well as external market research and census level data sets, to build a dynamic 'big data' planning tool. This tool provided the client with a powerful asset that allowed them to quantitatively evaluate expansion opportunities and the highest priority drivers and locations that would maximize funding (incorporating economic, demographic, competitive, health, trade and other market projection data and refreshing the analysis as needed).

How KPMG can help

D&A give healthcare organizations powerful new ways of using insight and innovation to solve problems. However, as we've already discussed, getting the most out of D&A isn't easy.

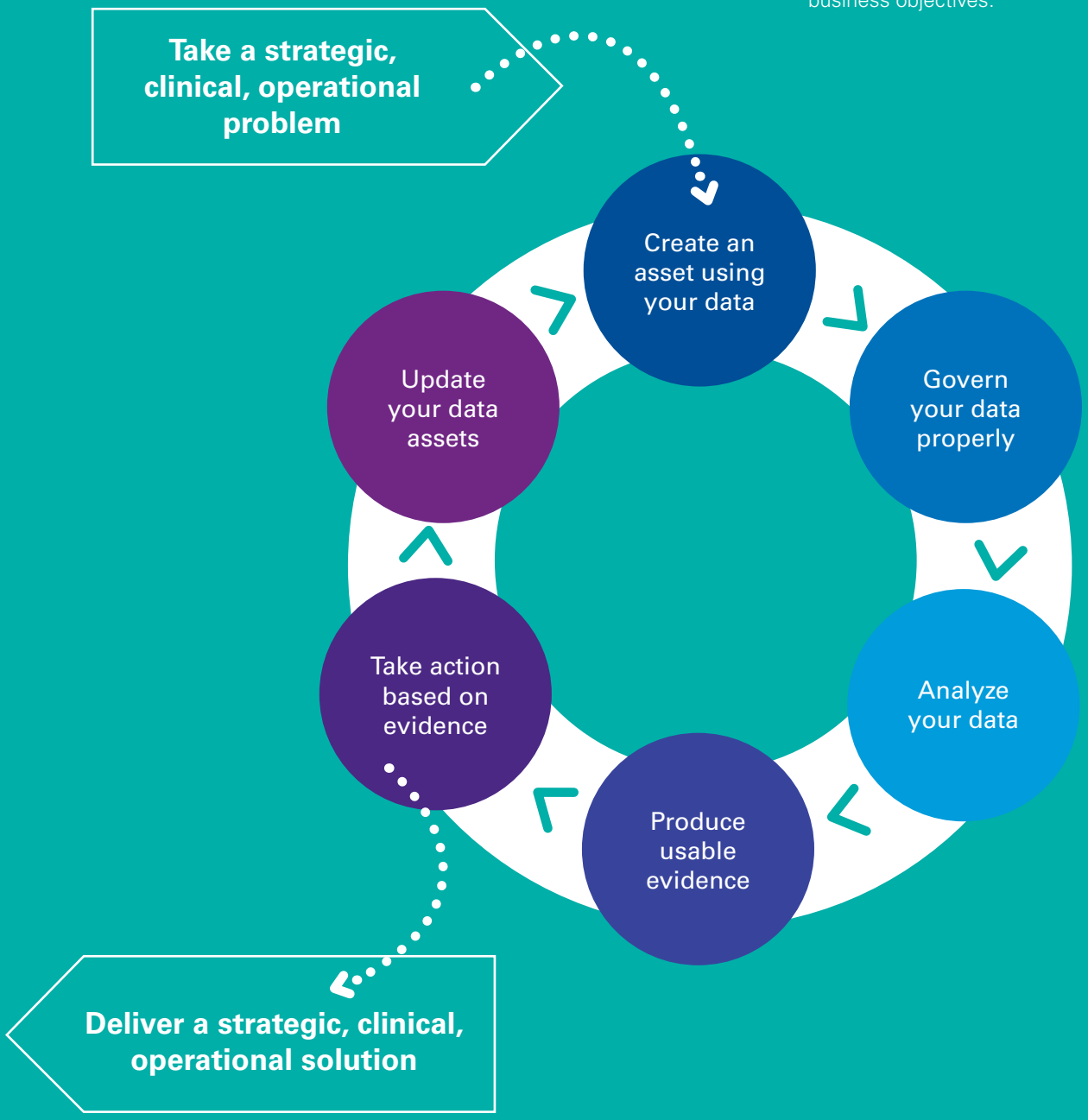
At KPMG, our teams have helped healthcare clients build D&A solutions that tackle clinical and operational problems faced by organizations around the world. Through our experience, we've identified 10 factors that are key to success.



1. Develop a D&A strategy that clearly supports your clinical and business strategy.
2. Honestly assess your analytics maturity level and have a clear plan for how you'll move up the maturity curve.
3. Invest in communications and clinical engagement to bring clinical teams and other staff on the analytics journey.
4. Use an iterative approach when designing, developing and testing new solutions.
5. Get solutions into the hands of end users as quickly as possible.
6. Use globally recognized standards and terminology to improve the interoperability of clinical data.
7. Establish good data practices and embed them into the organization, with a focus on data quality.
8. Ensure that data governance has a specific focus in your organization and that accountabilities are clear.
9. Ensure your analytics operating model is set up to deliver your analytics strategy.
10. Create a program management function that's focused on flawless execution.

Summing up

- By leveraging valuable data assets, healthcare payers and providers can develop a whole new set of capabilities to help them respond to continued demands to improve safety and quality, deliver better patient and consumer experiences, reduce unwarranted variations in clinical care and contain costs.
- While there is huge potential value in new technologies such as machine learning, robotic process automation and cognitive computing, the organizations that are most successful in extracting that value are those that have focused and invested over time in laying the foundational elements of good data management.
- Changes in delivery models such as 'analytics as a service' and cloud computing have improved the access that providers have to analytics solutions that do not require long-term capital investments.
- With the right planning and support, healthcare organizations can accelerate their journey along the maturity curve and start making practical use of analytics to help achieve clinical and business objectives.



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Publication name: A blueprint for success in healthcare data and analytics (D&A)

Publication date: September 2017