Cloud computing
an opportunity for healthcare

How Insights into Data Can Save Lives

Enabling the Future of Healthcare
with Platform Technology

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Foreward

Dear Readers,

With the shift in healthcare workflow from manual to binary, the providers today sit with a huge repository of wealth in the form of data. Data which if utilized properly could be a vital game changer in the way healthcare function today. Thus it is by default that the industry is developing a keen interest in streamlining data & data driven technologies, not only the way it is getting used but also on the way it is getting sourced and maintained.

Keeping Data Driven Opportunities at our top priority, we introduce the latest edition of Hospital & Healthcare Management presenting the views of various leaders of this topic making the magazine an interesting read.

The reading starts with an article "How Insights into Data can Save Lives" by Souma Das, Managing Director, QlikTech India Pvt. Ltd. in which he emphasis that better data insights can not only improve business performance but now we have reached the point that insights into data can save lives.

As Clinical Research Data Sharing has the potential to benefit many healthcare goals, talking in favor of making it accessible to the potential researchers Patrick Homer, Advisory Industry Consultant, SAS Institute Inc. spotlight on the world of endless possibilities where the search for new cures and treatments could be rapid through it.

By harnessing the power of the cloud healthcare organizations can transform themselves to improve operational efficiency. The next comes our Cover Story "How Cloud Computing can Help the Industry Navigate Change" detailing how when utilized effectively, cloud capabilities can enable enterprises to become more agile, reduce IT spending and can also reduce energy costs, carbon emissions and the need to expand data centers.

When it comes to Healthcare the fear of threat to data is automatically contemplated because of its importance. Here comes an interesting read written by Hannes Molsen, Product Security Manager, Drägerwerk AG & Co. KGaA on Strategic defense against cyberattacks and other threats.

As the patients continue to demand more from their care providers, our next writer David Reis, Senior Vice President and CIO of Lahey Health believes in beginning the consumerization of healthcare by bringing care to patients at the time and location of their choice. This requires technology that can provide more comprehensive and context-aware views of patients' data, support for collaborative care across the continuum, and allow health systems to scale their delivery of care in new ways. And thus the title of this article reads as: "Enabling the Future of Healthcare with Platform Technology".

Nancy Pratt, Chief Operating Officer, AirStrip Technologies in our next article focuses on the topic of mobility in healthcare. By reminding us about the basics she states that mobility should not only be thought for communicating outside hospital but changes need to start within the hospital and so she highlights few points of improvements that enables mobility and connectivity, health systems can improve efficiencies, better connect care teams, and speed up decision making – all within hospital walls.

Patrick Helm, Engineering Manager - Advanced Development, Medtronic in the next article speaks on 3D Imaging and how Intraoperative 3D Image Guidance has Revolutionized Neurosurgery by Improving Patient Outcomes.

We, at Hospital & Healthcare Management have also identified the need for a change to establish a better connect with our readers and aim to give you a new experience in our next issue.

We would keep Data & Data Driven Technologies to Define the Next Paradigm Shift in Healthcare as the topic of focus.Until we meet again!!

Yuvaraj Sahni
Editorial Department

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APHM International Healthcare Conference & Exhibition 2017

July 25 - 27, 2017
Event Venue: Kuala Lumpur Convention Centre, Malaysia
Event Organiser:
Association of Private Hospitals of Malaysia
Contact Number: 6017-8821680
Email: majmin8@gmail.com
URL: http://www.aphmconferences.org

Hospital Management Asia 2017

August 23 - 24, 2017
Event Venue: Manila, Philippines
Event Organiser: Clarion Events Asia
Contact Number: +65 6590 3970
Email: infoasia@clarionevents.com
URL: http://www.hospitalmanagementasia.com/

MEDICAL FAIR THAILAND

6 Sep 2017- 8 Sep2017
Queen Sirikit National Convention Center
(QSNCC), Bangkok, Thailand
Email: team@rhca.com
URL: www.medicalfair-thailand.com

HIMSS AsiaPac17

11 Sep 2017- 14 Sep2017
Marina Bay Sands, Singapore
Organiser: HIMSS Asia Pacific
Email: cfong@himss.org
URL: www.HIMSSAsiaPacConference.org

The Health Industry Summit (2017)

15 May 2017 - 18 May 2017
Event Venue: National Exhibition and Convention Center (SHANGHAI)
Event Organisers: Reed Sinopharm Exhibitions
Contact Number (with country & area code): 86-10-8455-6604
Email: yi.pan@reedsinopharm.com
URL: www.thishealthsummit.com

Souma Das
Managing Director, QlikTech India Pvt. Ltd.

Patrick Homer
Advisory Industry Consultant
SAS Institute Inc.

Hannes Molsen
Product Security Manager
Drägerwerk AG & Co. KGaA

David Reis
Senior Vice President and
Chief Information Officer, Lahey Health.

Nancy Pratt
Chief Operating Officer
AirStrip Technologies

Patrick Helm
Engineering Manager
Advanced Development, Medtronic

APHM
International Healthcare Conference and Exhibition
2017

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25th Year
Silver Jubilee

25 – 27 July 2017
Kuala Lumpur Convention Centre

· Theme ·

Leadership, Technology and Innovation in Healthcare

Overview of events
· **25 – 27 July 2017**
  APHM International Healthcare Conference
· **26 July 2017**
  APHM Medico-Legal Conference
· **27 July 2017**
  APHM International Nursing Conference

Partial list of invited speakers

· *Anusha Thavarajah*, Chief Executive Officer, AIA Berhad
· *Ashwin Maduga*, Research Manager, IDC Health Insights Asia/Pacific
· *Farhana M Nakhooda*, Director for Healthcare & Social Services, IBM Asia Pacific
· *The Hon. Jack Snelling MP*, Minister of Health, Minister of Arts, Govt. of South Australia
· *John Lee*, Founder & Principal Consultant, MuziHealth Consulting Pte Ltd, Singapore
· *Mike Wagner*, Executive Director, The Advisory Board International, USA
· *Dato' Dr Narimah Awin*, former Director, Family Health Development Division, Ministry of Health Malaysia & former Regional Advisor (Maternal & Reproductive Health) Regional Office of the World Health Organisation
· *Dr Paul Beaver*, Co-Founder/ Chief Scientific Officer, Fitgenes Australia
· *Sachin Chaudhary*, Partner, McKinsey & Company, Singapore
· *Tami Minniere*, Vice Chair, Joint Commission International

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HOW INSIGHTS INTO DATA CAN SAVE LIVES

The discussions on the future of healthcare are on fire. Health Care should be cheaper, better and more transparent. Meanwhile, the emergence of new technologies provides countless opportunities to meet the challenges in the sector. New developments such as sensors, 3D printing, apps and robots follow each other in rapid succession. The beauty of all these new technologies is that they generate a wealth of data. Big data and analytics in the healthcare sector is therefore of great importance, and now we have reached the point that insights into data, can save lives.
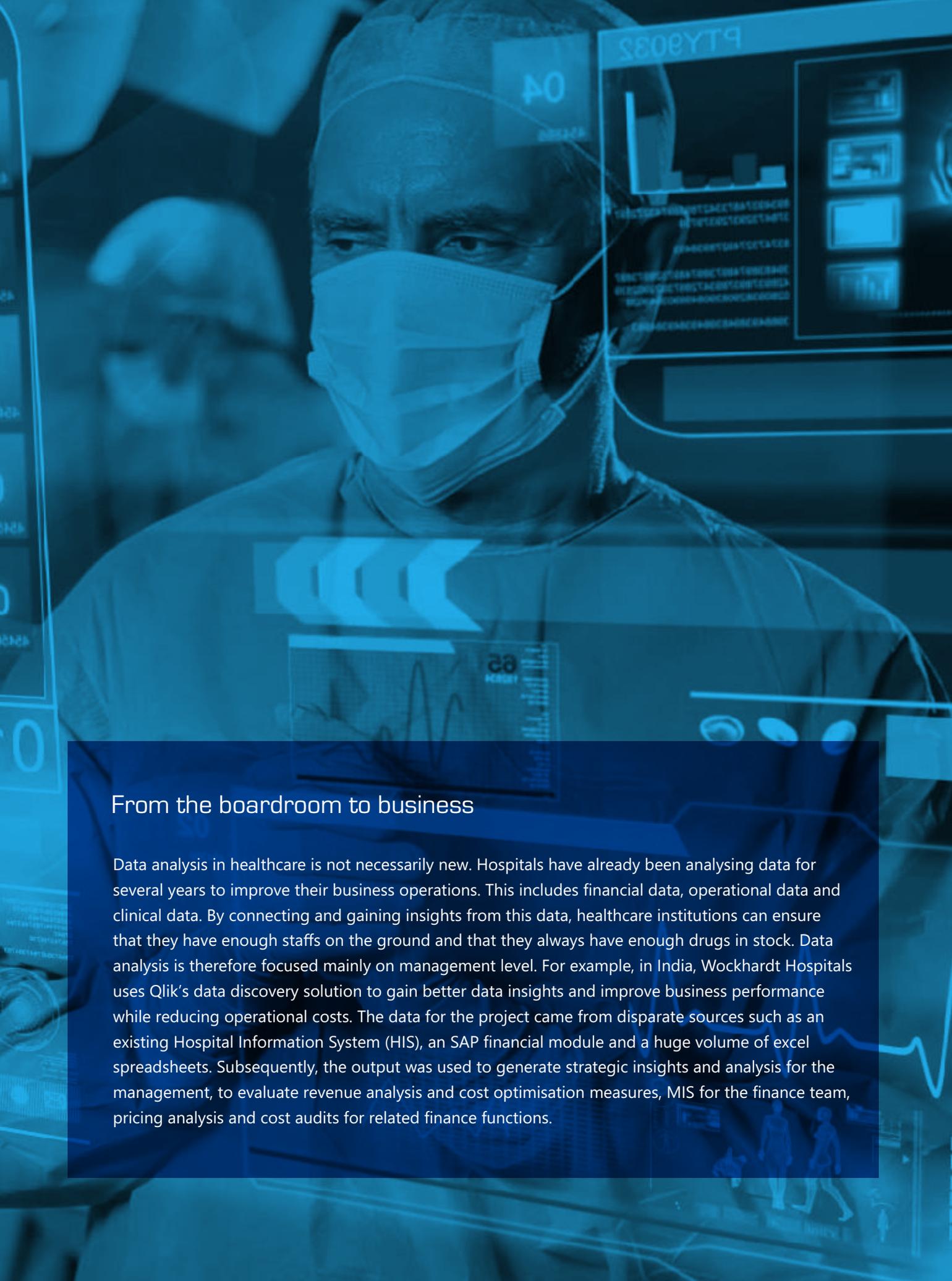
From the boardroom to business

Data analysis in healthcare is not necessarily new. Hospitals have already been analysing data for several years to improve their business operations. This includes financial data, operational data and clinical data. By connecting and gaining insights from this data, healthcare institutions can ensure that they have enough staffs on the ground and that they always have enough drugs in stock. Data analysis is therefore focused mainly on management level. For example, in India, Wockhardt Hospitals uses Qlik's data discovery solution to gain better data insights and improve business performance while reducing operational costs. The data for the project came from disparate sources such as an existing Hospital Information System (HIS), an SAP financial module and a huge volume of excel spreadsheets. Subsequently, the output was used to generate strategic insights and analysis for the management, to evaluate revenue analysis and cost optimisation measures, MIS for the finance team, pricing analysis and cost audits for related finance functions.

At a more holistic level, there is still a huge profit to gain by also allowing the healthcare professionals and patients to get started with data analysis. This will give them instant insights into their treatment efficiencies and the costs of a certain treatment. On the other hand, aspects such as patient satisfaction and productivity can be visually displayed directly. Ultimately, this enables healthcare professionals to determine the best treatment at a patient level, reducing waiting times at the emergency room while saving costs.

The healthcare system in India is complex. Investments in healthcare is still inadequate for a country such as India. Technology can aid healthcare providers to deliver more affordable healthcare. Data generated in the healthcare sector is growing at an exponential scale and it is imperative that healthcare organisations implement a business intelligence system that can leverage this data, is user-centric and provides the ability to provide quick access, analysis and dissemination of information. Data analytics can enable healthcare organisations to deliver better patient care while driving optimal operational efficiencies and growth.

A good example of how data analysis can improve healthcare would be Noord-Holland Noord (NHN) Safety Region. Along with the cardiologists of the MCA (Medisch Centrum Alkmaar) and AMC (Academisch Medisch Centrum), the ambulance

service of the NHN Safety Region was in search for a solution to shorten the time between the reporting of a heart attack at the emergency room and the angioplasty in the hospital. The goal is to achieve a lower mortality in heart attacks and a better quality of life after a heart attack. To accomplish the objective, NHN Safety Region has developed a dashboard that visualises every single step of the process in the emergency room, the ambulance and the hospital. This provides insight. By analysing this, several improvements can be made in the process, aimed at a faster turn around on emergency care. It sometimes happens that a patient is brought to a more distant hospital, as the operating room there is available more quickly. Ultimately, NHN was able to reduce the total time of the call up to operation with 20 minutes (national standard: 120 minutes). In an acute care chain in which every second counts, this is phenomenal and life defining, and of great social importance.

Predict Complications

The Sahlgrenska University Hospital in Sweden, one of the largest hospitals in northern Europe, is another interesting example. The hospital has more than 2,700 beds and approximately 17,000 employees. The hospital had three wishes:

1. Identify the best treatment for severe head injuries and provide physicians with a tool that they could better predict complications during surgery.

2. Provide faster access for medical professionals to critical information in case of emergency craniofacial surgery.

3. Gain insight in patient data. The problem is that this data is stored in various databases, or in the hospital itself, or to other physicians or health care facilities. A 360-degree view of the patient was almost impossible.

To fulfill these wishes, the hospital started working with data analysis. The results were above expectations. The complications in craniofacial surgery were reduced to zero. This will save the hospital 750,000 euro a year in resources and a further 1 million annually on unnecessary tests. By analysing many surgeries, doctors are now able to predict whether and which complications will start to occur. By means of data-analysis, it was also clear that the longer a patient is in the hospital after the surgery, the greater the risk of postoperative complications. The hospital therefore decided to shorten the duration of the stay, making more beds became available and costs were reduced.

Data as a lifesaver

The first truly compelling examples of data as a lifesavers have now seen the light. As the healthcare industry increasingly deploys new technology, there is also more data at our disposal. Data analysis therefore will play an enormously important role and new initiatives will follow soon. The main challenge is to collect all data that is usually stored in different systems from different parties. This makes it sometimes difficult to (quickly) to gain insight into certain data or to make connections. With the right knowledge and business intelligence software, this is possible. Ultimately, this leads to a situation where everyone can take smart decisions on a daily basis. This can be a nurse or a board member of a major healthcare facility. The benefits range from a decrease in the number of read missions, shorter waiting times, reduced length of stay, better treatment outcomes, increased safety to lower costs of care. Do you already have plans to use data to save lives?

About Author
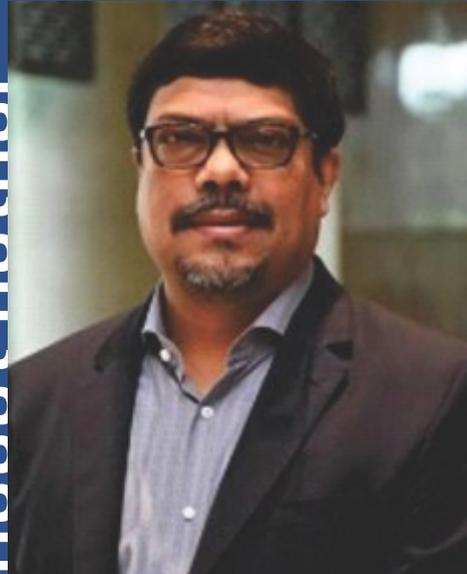
SOUMA DAS
Managing Director, QlikTech India Pvt. Ltd.

As Managing Director of Qlik in India, Souma manages the company's operations and leads the team to drive growth, revenue and customer satisfaction for many organizations using Qlik visual analytics platform across the country.

Souma has over two decades of sales and business development experience, growing and sustaining the success and momentum of large information technology (IT) organizations in India. He was previously the Regional Vice President and Managing Director of In for in India. Prior to that, Souma built and headed the Indian operations for Citrix Systems for close to a decade as Vice President. He also built a successful business for IBM in India for six years, after starting his career as a system engineer in Wipro Technologies.

Souma graduated from the Executive Management Program at Duke University - The Fuqua School of Business, and has a Master of Science in Computer Science and Applications from Jadavpur University. He also holds a Bachelor's degree in Mathematics from the University of Calcutta. A frequent speaker at technology conferences across India, Souma is passionate about growing revenues for businesses, and mentoring executives to help them thrive in leadership roles.

CLINICAL RESEARCH DATA SHARING PROMISES NEW CURES AND TREATMENTS

Clinical research generates extensive amounts of data, yet most of it is siloed or generally unavailable to a larger pool of willing potential researchers. If this data were liberated to the masses, we would venture into a world of endless possibilities where the search for new cures and treatments could be accelerated. From curing cancer to combating cardiovascular disease, clinical research data sharing has the potential to benefit many health care goals.

Clinical research data sharing for cardiovascular scientific discovery

The Duke Clinical Research Institute (DCRI) is at the forefront of this movement to engage in data sharing and research transparency, as noted by Drs. Eric Peterson and Michael Pencina.

"We're trying to promote the message that more better research can be done if we come together and share," says Pencina.

DCRI is the first academic institution to share their data with the general research community around the world, believing that better, faster and more innovative research will happen if academic institutions share their data.

The DCRI is releasing data from their Duke Databank for Cardiovascular disease. It contains de-identified patient records of more than 100,000 procedures on more than 50,000 patients. Approved researchers will have access to the data to test clinical hypothesis, develop clinical trial protocols and assess long term outcomes and trends.

"Researchers who have good questions can ask questions of that data, analyze it in a protected environment, and ultimately make discoveries that hopefully will help heart disease patients in the future," says Peterson.

Results with clinical research data sharing

Secondary analysis of clinical trial research data has already yielded amazing results. For example, Project Datasphere , one of the initiatives of the CEO Roundtable on Cancer, was founded by former President George H.W. Bush who challenged the industry to be "bold and venturesome" in the fight against cancer.

Project Datasphere paved the way to share, integrate and analyze collective cancer research data into one single location and currently contains data from 34,000 patients and a base of more than 1400 researchers accessing the data for new discovery.

So far 15 articles, abstracts and posters based on Project DataSphere data have been accepted by peer reviewed publications. No doubt, this is just the tip of the iceberg. Project Datasphere recognizes that the true power comes from increasing the volume of data about patients, and the group is actively working towards a 100,000 - patient goal.

Through Project Datasphere and other programs, clinical trial data sharing is firmly entrenched in the pharmaceutical industry. It is our hope that other academic research institutions follow in the footsteps of the DCRI and Project Datasphere – to overcome any internal challenges and liberate historical clinical research on a data sharing platform. We would welcome the opportunity to share our experiences of this voyage of discovery.
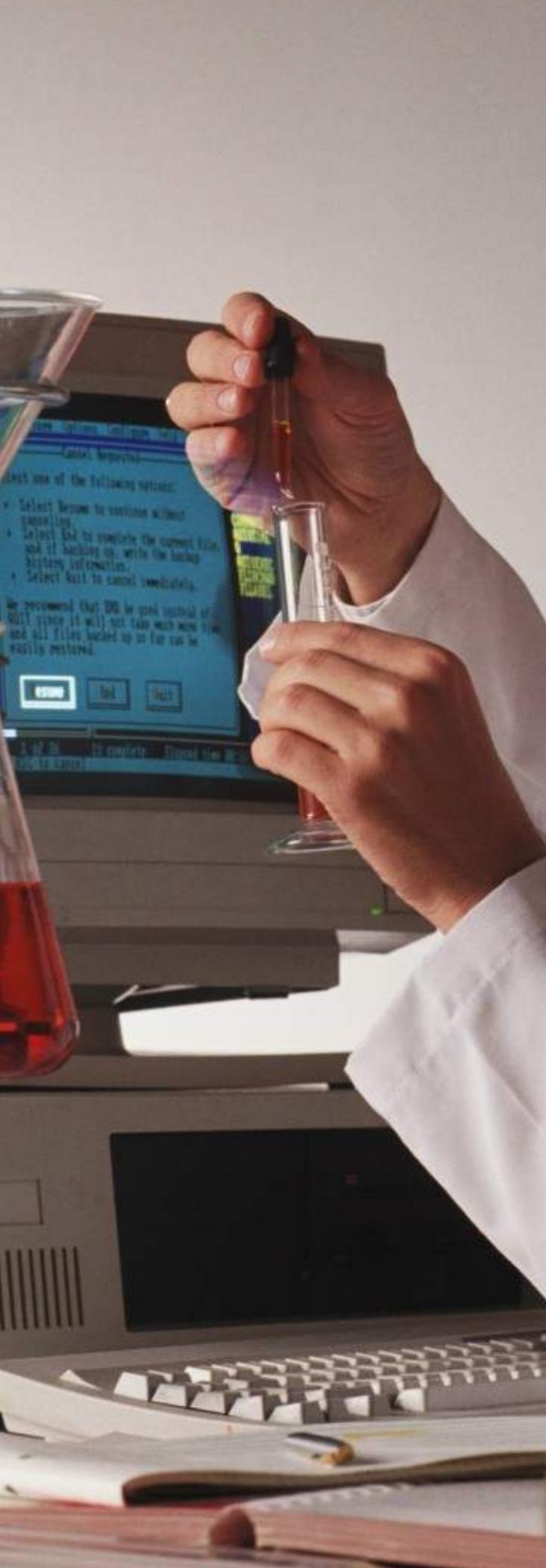
PATRICK HOMER

Advisory Industry Consultant
SAS Institute Inc.

Patrick Homer leads the Commercial Life Sciences practice at SAS, where he has been responsible for developing a number of advanced analytical applications, such as predictive modeling for physician segmentation, demand forecasting for inventory optimization, social media analytics, master data management for physician spending reporting, visualization of real world data, as well as launch sequence pricing optimization. Prior to joining SAS, Homer spent 20 years working in the pharmaceutical industry, starting his career in sales, then progressing to running sales teams before moving into business development at Quintiles for sales outsourcing.

HOW CLOUD COMPUTING CAN HELP THE INDUSTRY NAVIGATE CHANGE

In this changing environment, cloud computing can be an enabler of organizational transformation. Harnessing the power of the cloud, healthcare organizations can create dynamic infrastructures that improve operational effectiveness and dexterity by optimizing and accelerating IT resource and service delivery. Clinical and business boundaries can be erased by simplifying access to information, and connecting people as well as business functions across formerly siloed systems, while improving the economics of their IT infrastructure.

Forward-thinking organizations are turning to more advanced technology that can take the information in systems and records and deliver it as cloud computing services. Cloud computing can provide a resilient technology infrastructure that delivers continuously available information-based services. When utilized effectively, cloud capabilities can enable enterprises to become more agile, reduce IT spending, as well as develop and deploy applications faster. Cloud computing can also help reduce energy costs, carbon emissions and the need to expand data centers.[1]

Because cloud computing automates virtualization, the provisioning process is streamlined and shortened—instead of taking days to weeks of manual provisioning, an automated process can complete the task in minutes. IT infrastructure resources can be delivered more quickly, and the solutions sitting on that infrastructure can be globally available and scale dynamically.

A recent IBM Institute for Business Value study, which surveyed 750 CTOs, CIOs and other technology executives in 19 industries, including healthcare, highlights the strategic importance of the IT infrastructure. Over 70 percent of organizations recognized the important role IT plays in enabling competitive advantage and optimizing revenue and profit. Yet less than 10 percent of respondents reported that their existing IT infrastructure is fully prepared to address the proliferation of mobile devices, social media, data analytics and cloud computing. Despite the stated importance of IT infrastructure, only 22 percent of companies surveyed have a well-defined enterprise IT infrastructure strategy roadmap in place.[2]

This research highlights the challenges healthcare organizations face as they grapple with the new era of IT. The first step toward transforming the enterprise with cloud computing begins with the preparation of the IT infrastructure for more advanced cloud computing strategies. Complete transformation to the cloud is a journey not limited to infrastructure, though it is a fundamental business shift in how IT services are developed, financed and delivered. Cloud computing enables healthcare organizations to rapidly develop platform services in preparation for the digital health revolution and the growing importance of remote care services utilizing information from the Internet of Things (IoT).[3]

SaaS helps improve delivery of hospital services

A Canadian hospital needed to streamline clinical processes to improve patient operations and enterprise workflow, while simultaneously providing a mobile experience for clinicians. The hospital was able to reduce implementation time through IBM® BlueWorks Live, a business process management software as a service (SaaS) offering from IBM. Implementing the mobile process-management technology improved the hospital's throughput and patient experience. The outcome was a 15 percent improvement in staff productivity within three months.[4]

With the ability to support real-time analytics across data and organizational silos, and address management and cost challenges stemming from exponential growth of data and sprawling infrastructure footprints, cloud computing provides an effective approach for optimizing operations across the entire organization. As a tool for business model innovation, cloud computing can help healthcare organizations meet the imperatives of a transforming industry, to become more efficient, information-driven and patient-centric. Cloud services can help organizations to:

- **Build sustainable healthcare systems:** Create an efficient, flexible organization that proactively manages requirements and opportunities to help overcome the operational challenges of controlling costs, improving efficiency, complying with regulations, optimizing resource utilization, and enabling better visibility across the infrastructure.

- **Collaborate to improve care and outcomes:** Improve the quality and efficiency of care while cultivating patient centricity by overcoming challenges in the implementation of electronic medical records, promoting collaboration within and among care teams, and integrating secure, trusted information for analytics, evidence-based decision support and personalized care.

- **Increase access to healthcare:** Reduce disparities in access and transform individuals into advocates for their own health by addressing challenges by analyzing patient needs and behavior, adapting resources and delivery networks to meet these needs, anticipating demands, and delivering services to individual consumers and providers.
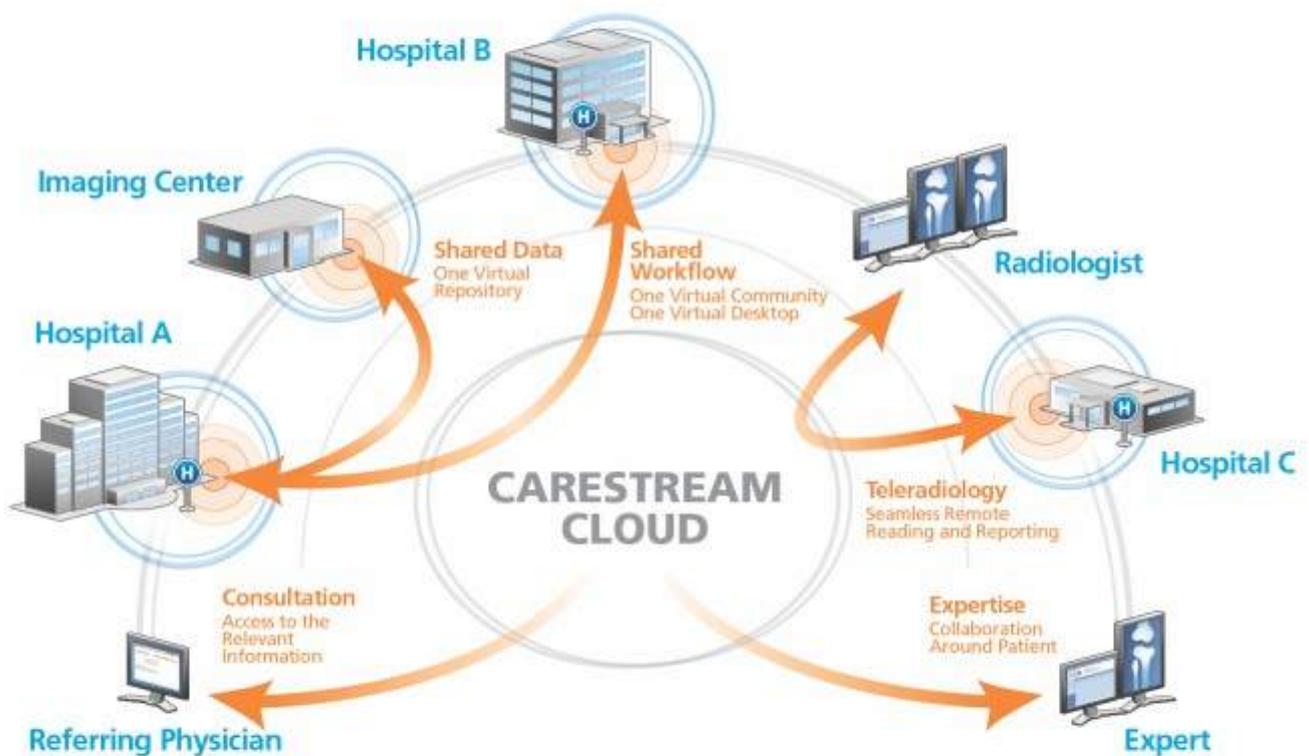
Cloud technology connects hundreds of clinicians for those in need

A nonprofit organization is using an IBM cloud-based social business solution that provides collaboration services to a global network of healthcare volunteers. With a focus on Haiti, the solution supports clinicians by giving them immediate access to critical data and information to help support the healthcare needs of the island's citizens. Using the IBM SmartCloud® for Social Business solution to virtually connect medical workers and volunteers, those on the front lines taking care of patients are armed with an online medical knowledge system that includes treatment options, clinical pathways and best practices specific to the location.[5]

The benefits of cloud computing

Cloud computing technologies are well-suited for organizations looking for proactive ways to meet current healthcare industry challenges. Organizations can use cloud technologies to reveal valuable insights in their data and transform how they make decisions. Cloud solutions can virtually connect healthcare professionals around the globe to collaborate, respond more quickly, enable remote care and share best practices.

Speed: Cloud computing increases the speed of business innovation. Cloud technology supports the development of new applications more quickly than ever before using composable services from a marketplace of APIs. As a result, the organization can gain on-demand access to IT infrastructure

resources—including servers and storage networking—and get feedback faster so the business can adjust accordingly. Healthcare organizations can respond more readily to the needs of the business, and the needs of the patients they serve, as well as their partners, suppliers and employees.

Empowerment: Cloud technology is helping healthcare organizations improve and re-engineer their business processes and workflows, as well as increase engagement and collaboration internally and across their enterprise. By freeing application developers to focus on expanding sophistication, rather than administrative and integration challenges, cloud technology helps IT professionals drive optimization and innovation instead of constantly building and maintaining their infrastructure.

Economics: Cloud technology can help improve a healthcare organization's economics with the ability to bring new capabilities to market ahead of the competition. Using a cloud infrastructure, an organization can buy the IT resources that it needs, when needed, enabling capital to be redeployed by shifting large, upfront expenses to variable expenses. The cloud can also help an organization realize cost savings through automation and standardization.

Build a dynamic hybrid cloud

Across the industry, healthcare organizations are taking a conservative and multi-tiered approach, not focused on either a private cloud or public cloud, but creating a dynamic hybrid cloud infrastructure to combine the best of both worlds to allow flexibility in decision making on deployment models. In fact, nearly half of all large enterprises will have hybrid cloud deployments by the end of 2017, according to Gartner, Inc.[6] Building a hybrid cloud platform allows an enterprise to run applications across on-premises and off-premises environments depending on the needs of the application, data and service provided. Healthcare organizations can transform on-premises capabilities to offer hybrid cloud choices and still maintain an effective governance strategy.

Nationwide cloud infrastructure deployed to improve medical services

To overcome growing operational, management and support issues, a leading healthcare provider with a network of over 20 hospitals in Malaysia engaged IBM to consolidate and centralize its computing infrastructure on the cloud to provide better services to patients and their families. Providing self-service access to information delivered through the cloud also reduced complexity and streamlined operations, allowing the

organization to operate at a reduced cost and with greater efficiency, reliability and flexibility. Using cloud technology also facilitated the rollout of new applications to new and existing hospitals. The shift to the cloud will complement the provider's plan to establish themselves as a major regional player in healthcare services.[7]

For organizations with large IT investments, hybrid models can help maximize the return on their existing IT investments by transforming IT into self-service private clouds. Hybrid

models keep some workloads on the best fit infrastructure and moves others to a public cloud for better economics. An organization can maintain on-premises control of key applications and data while moving other workloads—such as systems that engage with patients or partners—to the cloud for quick access to data and the expansion of new services. This allows organizations to set up development environments quickly and add new capabilities like analytics or mobile software as a service on the public cloud.

Cloud security and regulatory compliance

The promise of business applications and IT solutions delivered through the cloud is compelling because it can provide new business capabilities on demand. However, it's important to note that there are significant security and compliance requirements which need to be addressed as part of cloud readiness and governance when using cloud services. These requirements are addressable through robust security, strategic planning and governance. In the US, the Health Insurance Portability and Accountability Act (HIPAA) and the Health Information Technology for Economic and Clinical Health Act (HITECH) provisions indicate that healthcare organizations, covered entities (CE), and cloud service providers (CSPs) each bear significant responsibility for regulatory compliance. Regulations regarding protected health data compliance vary by country and not all regulations are clearly defined. Companies looking to globalize business services through the cloud need to consider these variations in regulatory compliance as a significant element of any cloud strategy in terms of evaluating and managing risk across many countries.

As with all large technology programs, a key success factor for cloud strategy is governance and the establishment of enterprise level policies to determine the appropriate workloads to run on the cloud. This requires establishing a management system to assess priorities and the business value of specific workloads. Further, an enterprise cloud strategy will need to reflect an integrated view from both the lines of business and IT. Additional governance would be needed for data and security standards.

As cloud computing provides new opportunities to innovate across the business, it necessitates that organizations continually reassess and enhance their security posture and the risk associated with core digital assets—particularly in light of the evolving threat landscape where breaches in health data are increasing and are required to be disclosed to the public in the US.

Based on our experience with clients in healthcare and across all industries, concerns about security can be mitigated by adopting appropriate technologies and implementing plans for continuous risk management. IBM has an extensive security and risk management portfolio that can assist an organization in implementing best practices for security and compliance when adopting a cloud model.

These activities span five areas:

Enhance your security and risk posture: Enterprises do this by establishing a security intelligence program, enabling them to derive timely and accurate insight into their security and risk posture.

Protect your data: Given the increase in data breaches, it is important to ensure the security of provider and patient private data at rest, while also achieving visibility and monitoring of appropriate access.

Know your user: Every transaction starts with a user. Verifying a user's identity and managing access to cloud-based applications and data is foundational to cloud security.

Ensure integrity of your applications: Application-level attacks are on the rise. Scanning and testing cloud applications for vulnerabilities should be part of the development, operations and continuous delivery processes.

Protect against threats and fraud: Network-level attacks are also a concern and mobile devices can be compromised by malware. A combination of malware protection and network and endpoint security management can help mitigate network-level threats and prevent fraud.

While security and compliance in the past have been inhibitors to cloud services adoption, adopting cloud services have tremendous benefits, including understanding that cloud services providers have a more robust security posture than healthcare organizations are able to adopt on their own, given the complexity of security threat landscape. Strategies to mitigate risk by implementing best practices in security and compliance across people, process and technologies, which also include CSPs, are essential in cloud adoptions and transformation.

As with all large technology programs, a key success factor for cloud strategy is governance and the establishment of enterprise level policies to determine the appropriate workloads to run on the cloud. This requires establishing a management system to assess priorities and the business value of specific work loads. Further, an enterprise cloud strategy will need to reflect an integrated view from both the lines of business and IT. Additional governance would be needed for data and security standards.

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tA major healthcare insurer's traditional approach to software development was too slow to comply with fast-changing healthcare reforms. The company also needed to streamline its process for developing and updating applications. Using IBM DevOps Services on the IBM Bluemix™ cloud platform, the company saved USD2.2 million in three pilot development projects in the first six months, while reducing code defects by 80 percent.[8]

IBM cloud advisory services portfolio

Based on in-depth analysis of a client's business goals and requirements, IBM cloud advisory services offer a combination of cloud best practices and healthcare expertise to help organizations develop and execute a customized, holistic strategy to use cloud computing—to drive not just savings on IT costs, but to support revenue and growth objectives. IBM cloud infrastructure strategy and design services can help define a value-driven cloud computing strategy by using rigorous analysis tools. IBM consultants use a unique cloud

adoption framework and toolset to help analyze an existing environment and determine which cloud computing model is best suited for an organization. IBM specialists can help clients identify the business areas and workloads that, when migrated to a cloud computing model, facilitate reduced costs and improved service delivery in line with business priorities. IBM can also help determine and address cloud computing's impact on IT services, organization and governance for a smoother implementation.

IBM Workload Transformation Analysis for Cloud

Developed by IBM Research, this patent-pending analytical tool and methodology is designed to produce a detailed, quantitative analysis of both business applications and infrastructure components. It provides a prioritized list of suitable workloads for migration to the cloud, as well as insight into the potential costs and migration impacts. IBM has used this same tool and methodology for its cloud migration initiatives, narrowing a list of more than 9,500 applications

from around the world to those that were best suited for the IBM target cloud. Following this structured approach can enable you to prioritize migration of those workloads to realize the advantages of cloud computing more quickly.

IBM has developed an enterprise cloud strategy framework to help clients transform their enterprises and work through the complex changes and interactions cloud technologies bring. The framework is designed around four key elements - infrastructure platforms, data platforms, application and delivery platforms, and business models-to be enabled by the cloud. An effective cloud strategy includes governance across the cloud framework, which extends to both external and internal services.

IBM offers a full range of enterprise class infrastructure solutions optimized to build a cloud computing environment. IBM Bluemix is a cloud-based, platform as a service (PaaS) that allows an organization to quickly and dynamically assemble an application using available building blocks, called component services. With BlueMix, developers can move from concept to solution very quickly, using prebuilt components to build an application. Healthcare organizations have not historically developed applications like other industries and therefore have a critical shortage of developer skills when the need for new services is high. Bluemix services can assist with a critical industry skills gap for IT organizations.

Application and delivery platforms, driving agility and productivity

Business model initiatives, driving innovation and highly competitive market moves

Governance

Infrastructure platforms, highly consumable, security rich and readily available to enable agile execution

Data platforms, instantiating well integrated business intelligence to manage the enterprise

Questions you should consider to identify business opportunities for acceleration through cloud:

- What new business strategies and services could cloud enable?
- Where could cloud accelerate a care or service innovation?
- How can cloud help you engage patients differently?
- Which strategic or operational decisions would benefit from big data or compute-intensive analytics that are more feasibly delivered through cloud?
- Where could broader or better connected networks of expertise improve outcomes and business performance?
- How does your cloud strategy enable mobile, social, analytics and big data initiatives?

Conclusion

Transformation of the healthcare industry is accelerating. Cloud computing offers new opportunities for organizations to reshape their business models and services, design innovative ways of providing better, patient-centered care, and empower individuals to become active participants in their own care.

Healthcare organizations are turning to cloud computing to support new care delivery models and the business capabilities required to navigate the complex technological, regulatory, legislative and cultural shifts occurring in the industry. The flexibility, scalability and access provided by cloud environments make them ideal platforms for information exchange, including the information needs emerging for greater collaboration and personalized patient care in the healthcare industry.

By harnessing the power of cloud computing, healthcare organizations can create dynamic infrastructures that improve operational speed and dexterity by optimizing and accelerating IT resource and service delivery. Cloud is far from being just an IT trend-it offers strategic business value that can help healthcare organizations enhance their operations and provide better, more cost-effective patient care.

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STRATEGIC DEFENSE AGAINST CYBER ATTACKS AND OTHER THREATS

Attacks via the internet are a threat that is becoming an increasingly important issue for hospitals. Defense scenarios are being discussed, employees are being sensitized for the issue and IT training providers are recording growing demand. It is often overlooked, however, that an online attack from outside is only one of multiple challenges faced by hospitals when operating networked IT systems and devices. The incorrect integration of a new medical device, an unexpected event such as a burst water pipe or improper coordination between the IT department and the manager for medical technology of a hospital can also be reasons for disruptions in the hospital IT.
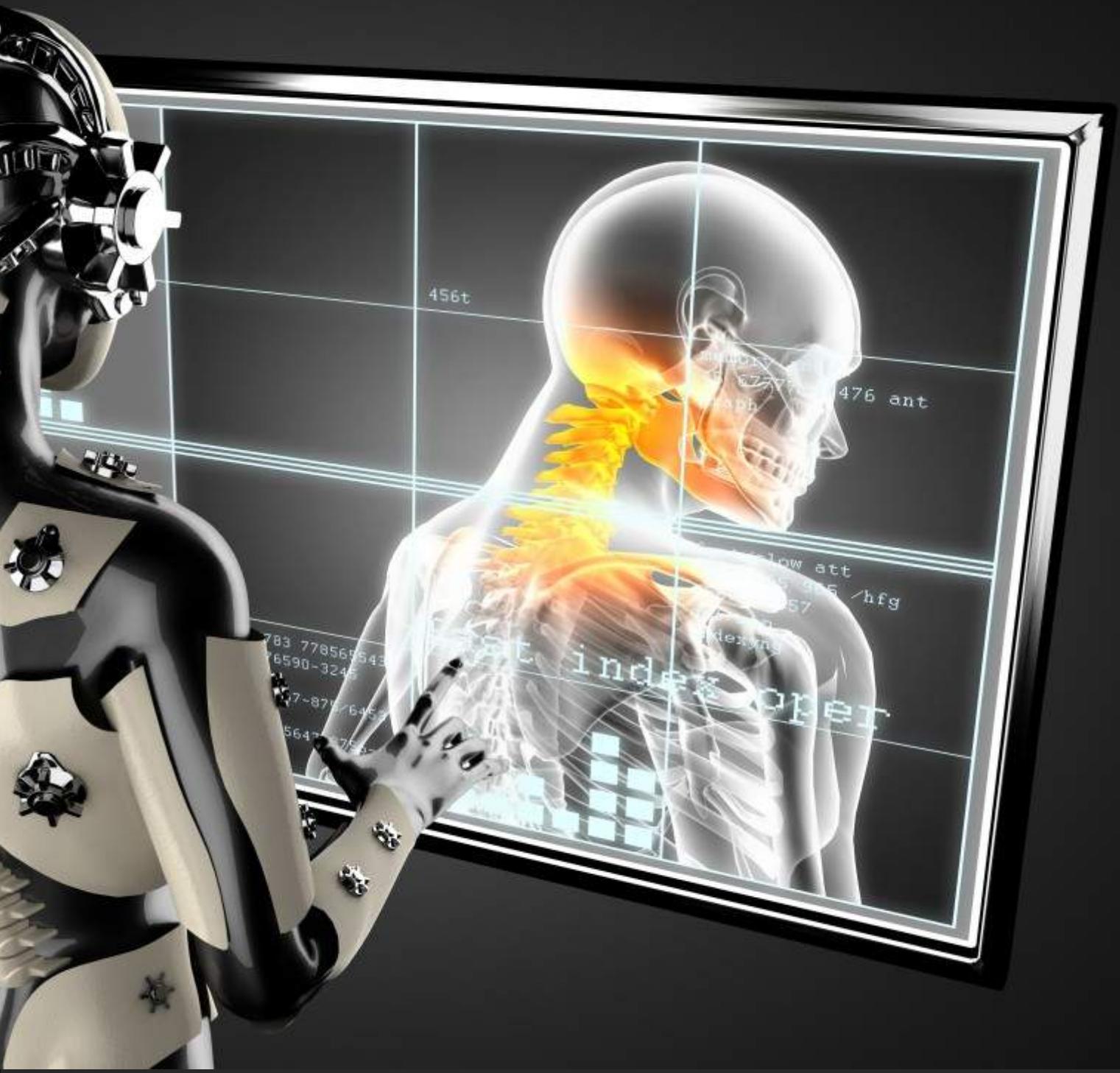
Digital trend remains unbroken

Information technologies simplify the communication between physicians, nurses and patients. X-ray images, treatments, medication – nowadays the physician can simply check the course of the treatment on the tablet directly at the bedside and discuss it with the patient. Important information such as laboratory results or x-ray images are available on screen during a surgical intervention. Hospitals also seek to enhance their workflows with the help of IT: According to a survey by the HIMSS (Healthcare Information and Management Systems Society) in cooperation with DELL*, approximately 84 percent of hospitals expect improved exchange of information and cooperation between the different departments, followed by a more efficient management (approximately 79 percent). Hospital managers will expand their network infrastructure accordingly in the coming years, increase their server capacities and strengthen their investments in more security and mobile end devices.[I]

According to a survey by the HIMSS in cooperation with DELL, approximately 84% of hospitals expect improved exchange of information & cooperation between the different departments, followed by a more efficient management (approximately 79%).

Safety – Security – Effectiveness

As hospital networks become more extensive and complicated, hospitals must also think about possible risks in the operation of their IT infrastructure, even if

there are no apparent risks, yet. The key to an effective defense against potential risks is a strategic IT risk management as part of an overall risk management strategy. To increase the security of medical IT networks (MITs), the International Electrotechnical Commission (IEC) in 2010 introduced the standard IEC 80001-1. For the purposes of application of risk management for IT networks, the standard regulates responsibility and provides recommendations for the operators of MITs.[II]

Risk management is not done on an ad-hoc basis but is part of the entire life cycle of the IT environment of a hospital. The standard EN 80001-1 (e.g. for Germany) provides a catalog of measures that outlines three protection targets[III] : In case of network malfunctions or hardware or software defects, a medical product can endanger the safety of patients, users and others. A hospital operator can counteract this risk by introducing a safety risk management strategy. To achieve this, the probability of a potentially dangerous situation – due to external influences such as weather phenomena, maintenance activities or device malfunctions – must be analyzed and counter measures must be taken. Another scenario is the data and system security of the networked

*Participants of the survey were IT managers in German acute care hospitals with at least 300 beds.

hospital IT. In this context, it is important to clarify how securely information can be processed, transferred and stored within the network and where potential sources of disruptions are. This includes potential entry points into the hospital network and possibilities for manipulation by hackers. The third column of the risk prevention strategy is efficiency: The risk manager analyses the hospital processes, to what extent the IT is protected and how both are interconnected. On this basis, workflows can be optimized and at the same time, critical processes and dependencies can be identified.

Not every hospital has the means or capabilities to have its own risk management for its IT infrastructure. Dräger IT specialists in key countries can support them in this area. For the manufacturer-independent risk analysis, Dräger IT specialists take into account information provided by manufacturers, medical technicians, IT personnel and users. Dräger also provides training for hospital IT managers in the coordination of Medical IT Network Risk Management in their hospital.

Cross-departmental cooperation as the factor for success

To what extent a hospital can effectively implement IT risk management does not only depend on specialists. The hospital staff must also change their thinking and optimize their networking behaviors. If different departments such as Clinical Engineering, IT or Purchasing are involved, their respective role in the implementation of risk management must be determined. This can be challenging at times. Experience shows that IT departments, for example, are used to working with checklists rather than identifying risks in discourse and create emergency plans accordingly. How available should the IT network be? What risks are tolerable? The risk manager or hospital manager cannot always answer such questions quickly that are essential for the

About Author

Hannes Molsen

Product Security Manager
Drägerwerk AG & Co. KGaA

Hannes Molsen is the global Product Security Manager of Dräger, a 125 year old family company known, e.g., for medical devices and safety systems. He is responsible for creating and maintaining an environment which enables Dräger to ship devices and applications that are secure to sustain in an interconnected world, throughout the entire system's lifecycle, to protect life, data and system functionality. At Draeger as well as during his activities as self-employed Security Professional he also tests devices and applications, and gives security trainings for developers, product managers and software architects.

Before taking this position, he was working as a passionate secure coder, with over 10 years of experience in web application development, software for embedded systems and interconnected devices. He is also actively involved with the grass roots organization i am the cavalry, supporting the efforts to connect manufacturers and the security research community to become safer, sooner, together. Hannes holds a Master of Science degree in Computer Science from the Hamburg University of Technology.

work of the IT managers. This makes it difficult for the persons responsible to define guidelines. The role of a risk manager can therefore be much more complex than one may initially assume: "Soft skills" such as empathy, good judgment of people and diplomatic talent play a more important role when it comes to negotiating between different departments or people and when trying to build bridges. Staff from departments such as IT and medical technology who worked separately from each other in the past must suddenly – for the purpose of the task at hand - cooperate more strongly. The risk manager assumes the role of the negotiator in this case.

Security inside

The more closely independent medical devices are interconnected, the higher are the possibilities for attacks and their consequences.

Therefore, not only the integration of new medical devices into the existing network plays an important role but also the security features that the devices have themselves. Manufacturers of medical devices should therefore take into account potential security gaps accordingly when developing new products and close them early as possible. This ranges from the first idea for the architecture of a system to the service of third-party components when the development phase has long been completed. Manufacturers must establish a development life cycle for secure products.

To establish this focus on security during the planning phase of a device, all employees of the manufacturer involved in the development must be trained accordingly. Besides a greater awareness for security, the targeted search for safety gaps using tests in certain development phases also

plays a significant role. Product security engineers are specialists that can take care of this process in companies.

Conclusion: When seeking to operate a secure IT network in a hospital, it is not only the protection of individual medical devices that is important. It is rather an integrated process that requires solid analysis of risks and risk calculation. Risk management of medical IT networks is not a selective process but must be carried out constantly during the operation of the hospital. It can only work effectively if all involved departments work together. It also becomes increasingly clear that manufacturers can support hospital operators actively by taking into account product security as early as during the development phase of new products and thinking about how these products will be used eventually.

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*Participants of the survey were IT managers in German acute care hospitals with at least 300 beds.

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Moving Beyond Buzzwords:

ENABLING THE FUTURE OF HEALTHCARE WITH PLATFORM TECHNOLOGY

Across the country, health care organizations are re-envisioning how to deliver care. Major health systems like Lahey Health are seeking out new solutions that allow us to transition from episodic care to wellness – minimizing the impact of disease and managing the health of populations more effectively. At the same time, patients continue to demand more from their care providers. We now must bring care to patients at the time and location of their choosing, and this is the beginning of the consumerization of healthcare. These shifts require technology that can provide more comprehensive and context-aware views of patients' data, support for collaborative care across the continuum, and allow health systems to scale their delivery of care in new ways. Consequently, CIOs face constant challenges to seek out the most effective technologies that will ensure an organization's vision can come to fruition.

Building a Solid Infrastructure for Solutions Integration

As CIOs seek to transform their IT infrastructure to enable these shifts, it is important to avoid being consumed by industry buzzwords. While focusing on the latest trend may seem enticing, organizations will see the most return on their investment if they start by carefully considering what challenges need to be addressed, and then reviewing their existing technology portfolio to see if it can be used to solve them. For example, decreasing inefficiency and miscommunication to improve care coordination is an important goal for Lahey Health. As such, we are implementing secure messaging that allows nurses to have direct communication with attending physicians in near real-time rather than calling into a central operator first to have the doctor paged and waiting for the doctor's subsequent response.

Our platform technology allows us to extract transactional data from the EHR and combine it with claims data in our population health management tool – marrying treatments, costs and efficacy
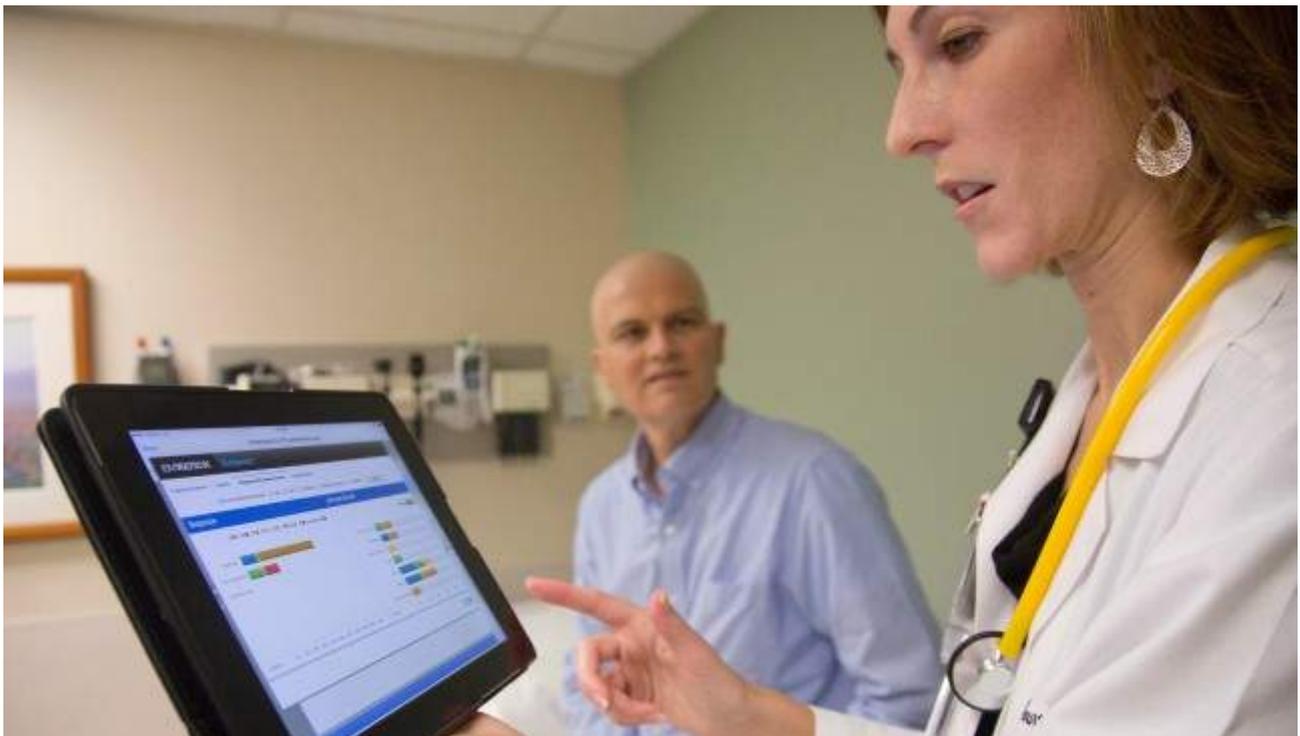
More broadly, many problems within health systems can be addressed with platform technologies that can streamline workflows, increase utility of the chosen solutions, and integrate patient data in an actionable way.

To be effective, a large-scale effort such as population health management requires taking data from multiple sources to provide a full view of patients' overall clinical picture, the interventions from clinicians and claims data. Although the EHR itself has a myriad of quantitative and qualitative data, it doesn't include cost or reimbursement data. Therefore, at Lahey Health, our platform technology allows us to extract transactional data from the EHR and combine it with claims data in our population health management tool – marrying treatments, costs and efficacy. This allows us to effectively analyze the data and evaluate independent variables that can be used to adjust treatments and behaviors and drive toward a wellness state.

At the same time, telehealth has the ability to meet many of the demands of consumers and can cover several different use cases, including patient/doctor e-visits, clinical consultations, and tertiary care. Since all of these offerings share common technologies - like video conferencing – an integrated platform allows a comprehensive system to be applied in a variety of ways to meet the specific needs of care teams.

Interoperability is Key

Healthcare is transitioning to a digital business. Workflows are constantly changing and our effort to improve IT technologies will never end. By seamlessly working platform technologies into workflows, health systems will improve the care delivery experience for both clinicians and patients. The key to this is solutions interoperability – not just the exchange of data, but the sustainable and scalable interoperability that ushers in care transformation.

About Author

David Reis

Senior Vice President and
Chief Information Officer
Lahey Health.

As part of his role, he provides leadership, support and direction for information systems through collaboration, education and relationship building. Previously, David served for more than four years as the Vice President and Chief Information Security Officer for the organization.

RE-THINKING MOBILITY & WORKFLOW EFFICIENCIES WITHIN THE HOSPITAL

Care delivery best practices are constantly changing to optimize efficiency and safety, and look considerably different compared to just a decade ago. The digital healthcare transformation has ushered in promising opportunities to use technology to improve nurse and clinician workflows, monitor patients remotely, and provide secure paths for communication between care team members.

The availability of these solutions has enabled the industry to place an increased emphasis on mobility. However, it is interesting to note that when we think of 'mobility,' our first thought is usually mobility outside of the hospital walls. For example, we talk about how remote monitoring helps patients to be monitored at home, or how secure messaging platforms help doctors connect with nurses to make care decisions when they are not on-site.

Yet, in a recent visit to a customer site, some of the most interesting conversations I had centered on mobility and improved workflows within the hospital, including how mobile device technology is helping improve productivity.

Thinking Small Scale First

Healthcare facilities are big. Health professionals spend their time on their feet and on the move. There is an enormous amount of transportation that occurs within a hospital. By introducing technology that enables mobility and connectivity, health systems can improve efficiencies, better connect care teams, and speed up decision making – all within hospital walls.

These improvements happen in three ways:

• Better communication on the move: A 2006 study found that nurses can walk upwards of 4-5 miles in a 12 hour shift. The larger the facility and units, the more walking we do. With a solution that connects nurses to the rest of their care team, nurses are better able to weigh in on patient care instantaneously, whether they are on a road trip to radiology or talking with a physician in another part of the hospital. In addition, it's easier for the physician to find the nurse caring for their patient using the mobile technology.

• Clinicians can get an early start on their day: As healthcare evolves, the demands on physicians' days are changing as well. With access to labs and other data in advance through a secure mobile platform, physicians are better able to prepare for the coming day; thereby improving efficiencies and helping them manage their patients. During my recent customer site visit, one nephrologist talked about reviewing the labs results of his patients on his phone the night before as well as on the elevator while en route from one patient to the next. This access sped his process for seeing patients.

• Organized chaos during high times:
Mid-day tends to be the busiest time for health systems, as staff work to admit new patients and take care of patient discharges. By giving physicians the ability to make quicker decisions, and connecting nurses to their care teams from anywhere within the hospital, there is an opportunity to streamline and accelerate what can otherwise be a chaotic time.

Mobility and Workflow: Change Needs to Start within the Hospital

We talk a lot about the benefits of improving mobility and workflow, and securely connecting the care team outside hospital walls. While it is true that this type of connectivity is beneficial to all – from clinicians to nurses to patients – there is an opportunity for similar improvements within the hospital as well. Improved workflows are always a goal for health systems. By starting with addressing areas for workflow improvements within the hospital, health systems will be in a stronger position to tackle more complicated workflow and mobility challenges down the road.

About Author

Nancy Pratt

Chief Operating Officer, AirStrip Technologies

A healthcare industry veteran with a proven record of success in driving effective IT strategies and operational improvement over many years, Nancy Pratt is now spearheading the next generation of innovations at AirStrip.

Nancy is committed to delivering the level of clinical effectiveness required in a post-Affordable Care Act world while executing the AirStrip value proposition: transforming healthcare through mobility and interoperability, and optimizing operational effectiveness both internally and with clients. An American Society of Quality Certified Six Sigma Black Belt, Nancy served most recently as Senior Vice President, Chief Quality and Safety Officer at St. Joseph Health. Nancy previously spent ten years as Senior Vice President – Clinical Effectiveness of Sharp HealthCare in San Diego and led the initiative that resulted in Sharp HealthCare receiving the 2007 National Malcolm Baldrige Quality Award. In both positions, Nancy also served on the steering committees responsible for strategic IT decisions.

Before that, Nancy served as Vice President of Clinical Services at CliniComp, Intl., where she supervised product design, implementation, training, testing and quality including technical documentation of newly developed software applications and enhancements.

An experienced manager in cardiovascular care and trauma, Nancy spent more than 20 years as a critical care nurse in a variety of settings. A retired U.S. Naval Reserve Lieutenant Commander, Nancy began her career in the Nurse Corps and led clinical programs and operations at the Medical University of South Carolina and Sentara HealthCare.

INTRAOPERATIVE 3D IMAGE GUIDANCE HAS REVOLUTIONIZED NEUROSURGERY BY IMPROVING PATIENT OUTCOMES

Spinal surgery cases have substantially increased over the last few decades due to better technology to diagnose and treat spinal conditions. Surgery often involves single to multi-level vertebrae fusions with the use of pedicle hardware for the treatment of deformity, tumor, trauma and degenerative conditions.
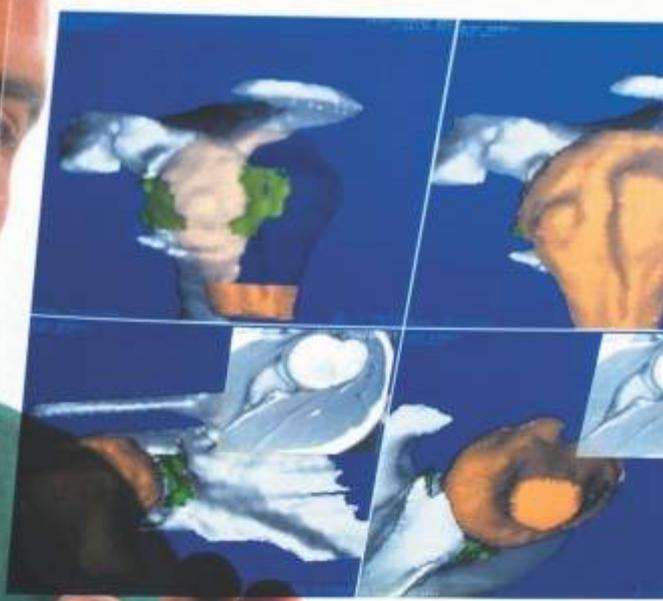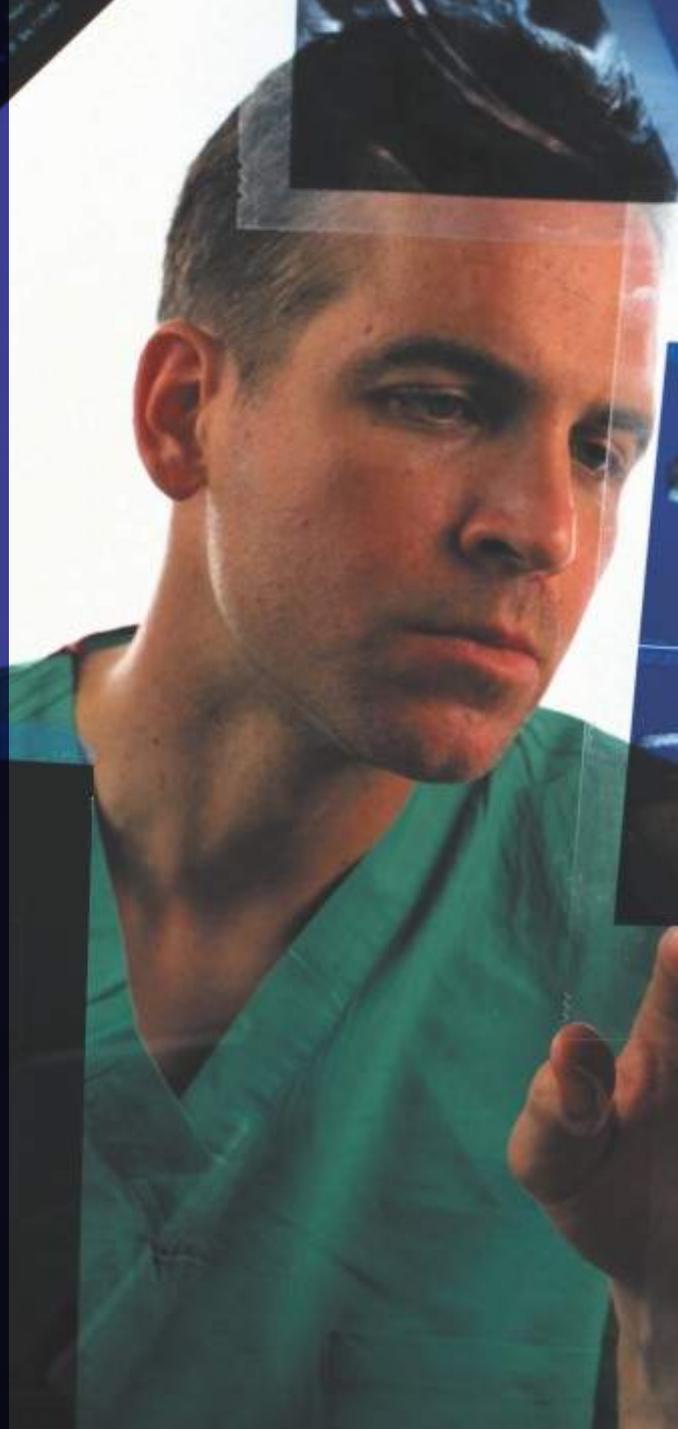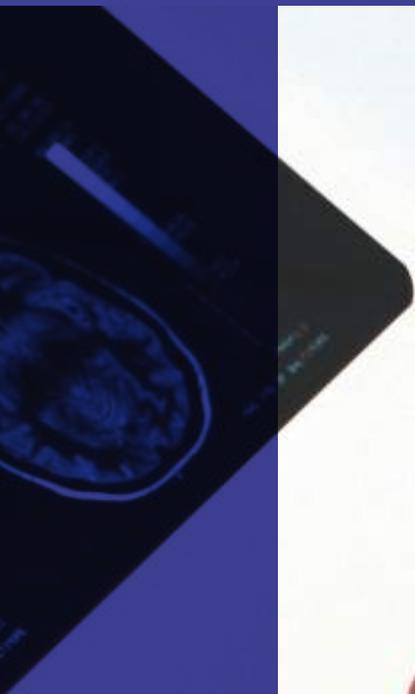
Clinical outcomes depend on a number of factors accurate selection and sizing of implants, correct placement of hardware, and final alignment of the spine. Pedicle screw misplacement may lead to inadequate biomechanical fixation, poor bone fusion or neurological or neurovascular injury. Traditional spinal surgery was conducted using intra-operative fluoroscopic systems (C-arms) to guide the placement of pedicle screws.

While these systems greatly facilitated the procedure, they suffered from limitations including image distortion and radiation exposure predominately to the surgical team. Further, because most C-arms are limited to providing 2 dimensional (2D) projections of the anatomy, the surgeon had to mentally transfer complex 3 dimensional (3D) anatomical detail including pedicle trajectories and their proximity to critical anatomical structures such as the spinal cord or great vessels onto these 2D images.

By the early 2000s, advances in intraoperative 3D imaging technologies (CT and cone-beam CT systems) combined with computer-aided navigation systems were revolutionizing the way these surgeries were performed.

In 2006, Medtronic launched an intraoperative cone-beam CT to the market: the O-arm. Based on flat-panel, solid state x-ray detection technology, the O-arm provides high-resolution fluoroscopic images as well as 3D volumetric images. This means more comprehensive imaging and enhanced decision making for surgeons. Driven by these and other key features, such as its breakable gantry and automatic registration for navigation, the O-arm is changing the paradigm for spinal surgery. This technology has been shown to:

• Increase the accuracy of pedicle screw placement, reducing the likelihood of revisions due to symptomatic, mal-positioned screws. Numerous peer-reviewed studies have demonstrated that surgeons using the O-arm coupled with Stealth Station navigation achieve pedicle screw placement accuracy rates between 93% and 100%; compared to rates between 72% and 92% for conventional methods [1-3]

• Reduce surgicalcomplications[1,5-8]

• Reduce radiation exposure to surgeons and staff [9]

• Provide critical information enabling surgeons to perform more complex surgeries [10-16]

• Empower surgeons to adopt less invasive techniques which reduce tissue trauma, the use of medications, and post-operative pain, allof which contribute to speeding patient recovery time

From a hospital economics perspective, these tools support efficient workflows by supporting the imaging needs of multiple ORs simultaneously. Hospitals can reduce incurred cost associated with revision surgery due to misplaced symptomatic hardware [17]. Costa et al. have estimated a 3.8%cost reduction associated with using the intraoperative imaging (O-arm) and navigation when compared with preoperative imaging and navigation [18].

Others have estimated that at an average re-operation cost of $27,768, the revision cost avoidance translates into monetary savings between $72k and $216k for a case volume of 50 to 150 cases, respectively [19].Further more, as surgeons improve their ability to perform minimally invasive procedures, hospitals realize the financial benefits associated with decreased risks of infection, decreased blood loss and reduced hospital stays-translating into savings estimated between $146k and $440k for case volumes of 50 and 150 cases respectively [20-23].

In 2015, Medtronic announced the launch of its second generation O-arm imaging system. Built on the success of the original system, this system added two new main clinical features: a larger3D field of view (40 cm compared with 20 cm) to support stereotactic procedures and pelvic trauma procedures, and a number of lower-dose imaging protocols. The stereotactic feature changes the hospital workflow-hospitals no longer need to coordinate between radiology and the OR to attach and then image the stereotactic localizer. Instead, the O-arm allows all imaging to be performed in the OR, reducing patient and hospital burdens.

The lower-dose imaging protocols provide surgeons with additional options to manage overall patient dosage for the total procedure. This is especially critical in pediatric deformity or in cases that require

multiple images, such as long spinal constructs or stimulation lead placement in the brain.

More than ever, hospitals are under pressure to improve the standard of care, while reducing overall costs. The adoption of these technologies will continue to grow as technology development drives additional value such as improved surgical planning tools and expansion to broader surgical specialties. Finally, future developments to integrate surgical robots and navigation technology may enable even more precise localization and real-time execution of surgical plans.

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He received a Master's of Science and Doctoral degree in Biomedical Engineering from the Johns Hopkins School of Medicine in Baltimore, Maryland. After completing a Postdoctoral Fellowship at the University of Virginia, he joined Medtronic, Inc., where he currently is a Medtronic Technical Fellow and leads an engineering team in the Restorative Therapies Group (RTG). His team focuses on advancing the role of intraoperative imaging so as to improve surgical outcomes of various neurosurgical procedures.

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Company Associate

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Dräger

Dräger is a leading international company in the fields of medical and safety technology. Founded in Lübeck in 1889, Dräger has grown into a worldwide, listed enterprise in its fifth generation as a family-run business. Our long-term success is predicated on a value-oriented corporate culture with four central strengths: close collaboration with our customers, the expertise of our employees, continuous innovation and outstanding quality.

"Technology for Life" is our guiding principle. Wherever they are deployed – in clinical settings, industry, mining or emergency services – Dräger products protect, support and save lives.

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IBM is one of the world's largest providers of information technology (hardware, software and services) and business to business solutions. IBM's worldwide business model is built to help clients succeed in delivering business value by becoming more innovative, efficient and competitive through the use of business insight and information technology (IT) solutions.

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Lahey Health

Lahey Health is what's next in healthcare, providing a full continuum of integrated health services close to where you live or work. It is comprised of nationally recognized, award-winning hospitals-including an academic hospital and medical center, and community hospitals—primary care providers, specialist physicians, behavioral health services, post-acute programs such as home health services, skilled nursing and rehabilitation facilities, and senior care resources located throughout northeastern Massachusetts and southern New Hampshire.

Medtronic

Medtronic plc (www.medtronic.com), headquartered in Dublin, Ireland, is among the world's largest medical technology, services and solutions companies - alleviating pain, restoring health and extending life for millions of people around the world. Medtronic employs more than 88,000 people worldwide, serving physicians, hospitals and patients in approximately 160 countries. The company is focused on collaborating with stakeholders around the world to take healthcare Further, Together.

AIRSTRIP°

AirStrip® (www.airstrip.com) provides a complete, vendor- and data source-agnostic enterprise-wide clinical mobility solution, which enables clinicians to improve the health of individuals and populations. With deep clinical expertise and strong roots in mobile technology and data integration, AirStrip is empowering leading health systems globally as the industry continues to evolve at a rapid pace. Based in San Antonio, Texas, AirStrip allows health systems to unlock the full potential of their existing technology investments with a complete mobility solution that provides access to critical patient data across the care continuum. AirStrip is backed by investments from Dignity Health, St. Joseph Health, the Gary and Mary West Health Investment Fund, Sequoia Capital, Qualcomm, Inc., Leerink Partners, Hospital Corporation of America (HCA) and the Wellcome Trust. AirStrip's base of visionary clients includes HCA, Tenet Healthcare, Dignity Health, St. Joseph Health and Ardent Health Services.

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