

Guide to Business Intelligence and Health IT Analytics

Applying BI and analytics programs within a patient care setting



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In this e-guide:

There is more data than ever that healthcare providers can use to maximize their operational efficiency and improve patient care. But first, they must learn how to extract value from that data.

There's no doubt business intelligence (BI) and analytics tools can be a valuable asset to healthcare practitioners when used properly, but convincing them to use new technology hasn't been a cinch, particularly since there are many security and regulatory concerns.

This guide is a compilation of tips and expert advice on how to apply analytics, BI, and population health management programs within a patient care setting.

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■ Section 1: Business Intelligence

There is more data than ever for healthcare providers to use to maximize their operational efficiency. Information derived from social media and captured on patients' mobile health devices are two examples. This section covers how providers are using business intelligence tools to analyze data and improve the experience of their patients.

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How providers can harness big data in healthcare

Reda Chouffani, Co-founder – Biz Technology Solutions

The meaningful use program adds more specific reporting requirements for hospitals already tasked with storing and reporting data collected from a rising number of health IT systems. The increasing amount of data and reporting requirements has left many wondering if big data in healthcare will lead to a better care experience for everyone involved.

When hospitals began to adopt electronic health records, there was a significant growth in the amount of patient data -- most of which was stored and confined to the [EHR system](#). With the addition of medical imaging and lab data, patient information still stemmed from a limited set of sources. As healthcare organizations continued to adopt newer systems that provide additional assistance in managing patient care, more information and [data silos](#) were brought to the equation.

Then, [social media was added](#) to the mix and introduced a completely different data source as hospitals began to consider additional means to improve patient satisfaction. Data collected from patients' mobile health devices is likely to be more disruptive and more rewarding than information sourced from social media. The proliferation of connected mobile and medical devices and the growing trend of Internet-enabled gadgets are

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challenging many technology professionals to identify new methods for hospitals to harness this data.

The massive [quantity of data](#) that can be mined from all of these systems presents a challenging, but promising, opportunity. There are several ways which patients and providers can benefit from this data.

Patient outcomes

Hospital data can provide significant insights into a patient's conditions and treatment outcomes. There a number of [analytics tools](#) that can process health data including medical imaging, electronic health data or genetic data. Tools offered by vendors such as IBM, Optum and SAS can assist with identifying at-risk patients, or reporting on patient outcomes. Other tools offer a way to process hospital data and push it to medical research registries in order to make it available as part of a bigger data repository [for population health](#) research.

Patient satisfaction

Monitoring and analyzing messages and [feedback from social media](#) is a way to keep up with patient needs, likes and dislikes. These messages can be about a health system, specific concerns about their care or other healthcare processes.

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Evidence-based clinical decisions

[Access to lab results](#), medication and other information allows clinicians a chance to more thoroughly research different treatment avenues before deciding how to care for a patient with a unique set of conditions or medical history.

Predictive outcomes and prevention

Mobile devices and [connected medical devices](#) produce a significant amount of data that can help caregivers monitor and proactively help prevent a patient's condition from worsening. This can be done by setting alerts to trigger when captured data meets pre-determined conditions.

Cost used to be one of the main hurdles for many considering adopting [a big data platform](#), either in hiring the necessary personnel or acquiring [analytics tools](#). Today's marketplace has seen a tremendous increase of vendors, which has driven costs down significantly. As there are more success stories of hospitals improving care and reducing costs through big data, data analytics will gain momentum, putting all the new captured data to good use.

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▶ Must-knows about cloud computing in healthcare

Trevor Strome, Informatics and Process Improvement Lead – Winnipeg Regional Health Authority Emergency Program

Cloud computing has much more to offer than simply hosting email services, sharing photos or backing up mobile devices. Those are functions most often associated with popular cloud services such as [Google Drive](#), [DropBox](#) or [iCloud](#). In many ways, healthcare organizations remain in the early stages of determining [how the cloud fits into the healthcare information management](#) and technology ecosystem. Providers are still calculating how to balance the [possible benefits of cloud computing in healthcare](#) with the obvious security, technical and legal risks.

One [definition of cloud computing](#) from the National Institute for Standards and Technology states it is "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

According to a white paper titled [Cloud Computing in Health](#) by Canada Health Infoway, cloud computing models support three ways of provisioning computing resources as services:

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- Software -- Applications such as monitoring and dashboard apps, content delivery, communications, and finance tools
- Platforms -- Such as middleware, databases and identity management systems
- Infrastructure -- Such as storage, CPU and networking

The white paper further states that deployment of these three services typically occurs in one of four ways:

- **Private** -- In which IT services are dedicated to a single organization
- **Community** -- Provides common services for organizations that have a shared purpose or business domain
- **Public** -- Offers IT services that are made available openly to a range of customers
- **Hybrid** -- In which some combination of private, community and public deployments are arranged to meet an organization's unique IT requirements

Rather than being a one-size-fits-all offering, it is clear that cloud computing offers a variety of services and deployment models from which healthcare organizations can choose in order to address current gaps and future needs in business provisioning.

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Who needs cloud computing?

There are many reasons why healthcare organizations should [consider the cloud](#) to be part of their services delivery strategy, including important economic, technical and innovation benefits.

Most providers have invested heavily in their health IT infrastructure in the form of clinical and business software, hardware such as application and database servers, and extensive high-speed data networks. Due to continuing [budget constraints](#), healthcare IT executives are under pressure to rein in costs while continuing to meet minimum service levels and deliver applications with the speed and availability that today's healthcare professionals require.

Healthcare organizations invest in health IT to be able to provide clinicians and administrators with information to make better, evidence-informed decisions. In many cases, the rate of change in many organizations is outpacing their IT department's ability to keep up with the newest software, processes and [regulatory requirements](#). This is causing health IT provisioning to be a limiting factor in innovation and healthcare transformation, rather than the enabler that health IT was once envisioned to be.

The potential of cloud computing in healthcare is to enable providers to be more proactive and nimble in meeting changing regulatory and market demands by focusing their resources on the best use of technology. A cloud

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platform allows providers to offers this value to clinical and business end users beyond merely keeping servers, software and networks up to date.

Benefits of cloud computing

Healthcare organizations exploring cloud computing options need to identify where their greatest health IT-related needs are in order to determine if and how cloud computing offers an advantage. Provisioning of certain IT services over the cloud offers some distinct benefits over traditional self-hosting of the software, hardware and other networks associated with [modern health IT](#).

Several commonly cited benefits of cloud computing include:

- Reduced cost pressure -- Depending on the exact deployment approach, healthcare organizations will pay for only the cloud computing resources they use.
- Speed and flexibility -- Cloud service options can be configured to meet the unique and changing needs of individual clients.
- Increased scalability -- Using cloud services, providers can increase the processing or storage capacity they require, rather than purchasing hardware that will sit idle until needed.

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Risks and drawbacks of cloud computing

The security of healthcare information and the protection of individuals' privacy are major concerns facing the healthcare industry. It is a challenge for IT teams to keep their systems updated and protected from current threats, both external and internal, to their organization. Cloud computing providers are known to double-down their efforts to ensure the security of cloud resources.

Healthcare organizations understand that the use of the cloud is not without risk, and this is perhaps one of the most significant barriers to cloud adoption by healthcare organizations. A report from the Cloud Security Alliance, *The notorious nine: Cloud computing top threats in 2013*, identifies nine major security concerns associated with use of the cloud. Here are six of them:

Data breaches: Perhaps the most significant nightmare scenario associated with storing health-related information on the cloud, [data breaches](#) occur when sensitive or personal information is exposed to or stolen by individuals with no right to view that information.

Data loss: The cloud is not immune to sensitive information being deleted and rendered irrecoverable through an accidental or malicious act.

Account hijacking: Phishing, fraud and software vulnerabilities are used to gain unauthorized access to services and/or data on a cloud service.

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Denial of service: Authorized users of a cloud service are denied access to applications and data as a result of a deliberate attack that causes an intolerable system slowdown.

Malicious insiders: [Malicious insiders](#) are employees, former employees or business partners who inappropriately use their privileges to access private information.

Insufficient due diligence: Organizations expose themselves to great risk if they don't fully understand their cloud service provider environment, the applications and services associated with it, and the incident response and security duties required of them.

Most of these [security concerns](#) also apply to a healthcare organization's self-hosted IT infrastructure. These issues should give pause to healthcare organization and spur them to ensure that [prospective cloud providers](#) expertly and completely mitigate these risks, and that a strategy and action plan are in place to identify and address evolving and emerging security and privacy risks.

There are clear [benefits and risks associated with cloud use in healthcare](#). There are opportunities for significant financial, technological and service-related benefits that come along with adopting cloud computing. Yet, as with most emerging technologies, there are risks (both known and unknown) that must be mitigated to realize the potential benefits and, most importantly, to [ensure the security](#) and privacy of any data stored in the cloud. Healthcare executives must balance the risks, benefits, and business and IT needs of

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the organization to best determine if, how and where cloud computing should be featured in their health IT provisioning strategy.

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Five areas of focus for a healthcare business intelligence program

Trevor Strome, Informatics and Process Improvement Lead – Winnipeg Regional Health Authority Emergency Program

Depending on the background and experience of whom you ask, healthcare business intelligence can mean business oriented activities such as reporting and decision support all the way to more technical analysis of data warehouse content. Still other perspectives may be more encompassing and view business intelligence as a strategic information infrastructure to enable evidence-based business and [clinical decision-making](#).

[Business intelligence](#) (BI) is a term that has different meanings to people within healthcare. The challenge for healthcare professionals to agree what [BI is](#) may make it difficult for healthcare organizations to establish an effective BI program of their own.

In her book *Healthcare Business Intelligence: A Guide to Empowering Successful Data Reporting and Analytics*, [Laura Madsen states](#) that healthcare BI is "the integration of data from clinical systems, financial systems, and other disparate data sources into a data warehouse that requires a set of validated data to address the concepts of clinical quality, effectiveness of care, and value for business usage."

[Madsen's definition](#) is important and immediately appealing because it encompasses healthcare BI from all the necessary angles. Her definition

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ranges to cover the technical to the cultural facets of healthcare organizations.

Madsen's five tenets of healthcare business intelligence

Madsen's five key tenets of healthcare BI include data quality, leadership and sponsorship, technology and architecture, value, and cultural change.

Data quality -- Having good data [for analytics](#) and quality improvement begins with the effective management of data. While growing volumes of data presents an exciting potential for use in quality and performance improvement activities, it is by no means a trivial task to ensure that this data is available -- and usable -- for such purposes. High data quality helps to drive trust in and user adoption of BI within healthcare.

Leadership and sponsorship -- The use of BI to support decision-making within healthcare may seem to be an obvious solution. Healthcare organizations, however, show amazing variation in their implementations. How well a healthcare organization supports the use of [BI and analytics](#) manifests in both the resource support of teams and the commitment of these organizations to use the technologies to enhance decision-making and improve outcomes. According to Madsen, "Long-term sponsorship requires full engagement and a knowledgeable staff."

Technology and architecture -- Madsen asserts correctly that BI is not an IT activity. It does, however, require the appropriate technical infrastructure

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and support activities. Given the siloed and somewhat discontinuous state of data in many healthcare organizations, Madsen writes that "investing in best practices associated with data modeling; extract, transformation, and load; and solid BI applications will ensure performance and scalability." In other words, without the proper technical and management structures in place, BI and analytics will be unable to provide the high-value insight that most healthcare organizations expect and require.

Value -- As part of improvement initiatives, many healthcare organizations consider value provided to patients during [the course of care](#) as an essential indicator of quality and performance. Healthcare organizations should similarly consider the value derived from their investment in BI. One way to achieve value from BI within healthcare is to focus its capabilities on problems and issues whose resolution would result in high-impact and high-value change.

Cultural change -- The barriers to transformation in healthcare are rarely clinical, process, or [technology-related](#), but stem from the fear, uncertainty, doubt and politics that result from change. BI professionals are often at the forefront of change within healthcare and need to collaborate effectively and diplomatically with many other professional groups -- including clinicians, administrators and IT professionals -- who may not understand how BI can benefit healthcare.

Collaboration, Madsen writes, is the glue that holds a good BI team together. This collaboration starts with a single encompassing definition of healthcare BI and an understanding of how BI can be leveraged within the organization. Building on the five aforementioned tenets, the many professionals from

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multiple disciplines working on healthcare improvement can begin to use the best evidence available and align improvement efforts and capabilities with the objective of achieving [their stated clinical](#) and business goals.

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■ Troubleshooting tips for BI and clinical analytics issues

Trevor Strome, Informatics and Process Improvement Lead – Winnipeg Regional Health Authority Emergency Program

Business intelligence and clinical data analytics are critical to the business and clinical operations of most healthcare organizations. They are both primarily business-oriented activities, helping to inform clinical, quality improvement, and business operations decision-making.

Despite being business focused, there are many technological aspects that influence whether or not [business intelligence](#) (BI) and clinical analytics function properly. This may be forgotten when [dashboards are working](#) well, reports are being used, predictive models are holding true, necessary decisions are getting made and they are influencing appropriate reactions.

Issues will arise (even in functioning systems)

However, as is the case with any technical endeavor, issues can arise at some point, even in properly functioning BI and analytics systems. There are many potential points of [failure in analytics systems](#) because of the number of stages between data entry by system users on through to processing and, eventually, decision-making by healthcare leaders and clinicians. Examples of the issues that can arise range from a data entry, validation or

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other data quality issues, a flaw in business rules logic or algorithms as well as technical infrastructure issues.

Severe consequences can arise when things go wrong with analytics and BI systems. Users of such systems may begin to lose trust in their output and revert to more "gut-based" decisions. Worse yet, though, is that business and/or [clinical decisions](#) may be based on inaccurate information.

Troubleshooting analytics and BI issues

When I had more hands-on involvement in software development, issues with code would invariably arise that would require efficient troubleshooting skills to prevent a minor issue from becoming a big problem (both technically, and from an end-user's stress management perspective). Many of those software troubleshooting skills are directly relevant to how I now deal with clinical analytics and BI issues. A brief summary of my analytics and BI troubleshooting approach is as follows:

- *Don't panic!* Tensions will naturally run high when employees lose use of [decision-making tools](#) they've grown to rely upon. Don't let this anxiety force you into a "solution" that may not be fully thought out.
- *Identify the scope and root cause of the issue and any associated risks.* Find out what tools, reports, dashboards, etc. are affected and how the problem is manifesting to stakeholders and end users. Find out what [the risks are](#), what decision-making processes are affected and how they impact clinical and business operations.

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- *Communicate with impacted stakeholders.* Ensure that all affected stakeholders are made aware of the problem, and how it manifests, so they can change their decision-making approach if necessary. Also keep them apprised of the progress toward a resolution of the issue.
- *Determine the root cause of the problem.* Taking the time to truly understand a problem helps [address root cause](#), not merely its symptoms. For example, if a data quality issue is causing problems, it's best to address the process or source system causing the issue, not simply applying a patch to the report or dashboard.
- *Mobilize resources to fix the issue.* Once a possible source or root cause is identified, alert and mobilize the appropriate technical and analyst resources such as database administrators. Keep in mind that resolving for some issues -- such as those relating to source-system processes or data validation -- [may involve](#) more than a simple technical fix. These scenarios may require training of end users, or more extensive communication.
- *Test and validate the solution.* Every fix needs to be thoroughly tested to ensure that the problem is resolved and that other (unintended) consequences and negative downstream effects have not been introduced. Some of the biggest technical disasters that I've seen have occurred because untested or partially tested software was placed into a production environment before it was truly ready.
- *Deploy the application.* Once it has been tested and validated thoroughly, the system can be deployed into the production environment and/or released to stakeholders.
- *Communicate with stakeholders.* After deployment, inform your stakeholders that it is available. They must also be told of any changes that were made that would impact [how end users interact](#)

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with the system or the information it generates. You probably noticed that communications is mentioned twice. This is because I don't believe you can over-communicate with stakeholders. Their work is being impacted so the least you can do is keep them in the loop.

Getting back to business

As previously mentioned, issues that arise may be limited in scope or may **affect the entire enterprise**. Your response to an issue needs to be proportional to its effects. If a problem can be fixed immediately, then there is no need to follow all these steps. However, there are often many points of failure between source systems and the analysis performed on that data. Finding and addressing the root cause can be time-consuming and complex. In the case of a high-impact issue and/or lengthy fix time, the problem-solving detailed above can help keep your team on track and your stakeholders informed.

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■ Big data 2.0, healthcare analytics and the value of data

Reda Chouffani, Co-founder – Biz Technology Solutions

Cloud computing, large data sets and artificial intelligence are part of the next generation of business intelligence platforms that will change the way we interact with data. The increase of computing power available to business intelligence tools has caused a spike in interest in [big data in many industries -- including healthcare](#).

What some refer to as "big data 2.0" or "data intelligence" is simply the result of [big data and big compute](#). New [analytics platforms](#) are able to tap into data in new and more meaningful ways. Business intelligence (BI) vendors are combining their experience in parallel computing and [machine learning](#) to build a new generation of analytics products that can process information, understand it and return insight.

Healthcare business intelligence tools appeal to care professionals because of their power and simplicity. Executives are searching for platforms that can convert the vast amount of available [clinical data into useful analysis](#) that ultimately leads to enhanced patient care, better operational efficiency and increased revenue.

There are several functions of next-generation big data 2.0 and BI products that are changing the way hospital CIOs derive value from the mammoth

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amount of information that is collected and maintained within health facilities. Some of these are:

Immediate access to reports

Products such as those from [Adatao Inc.](#) are able to process large amounts of data, interpret it and deliver it to end users without the need for data scientists or report writers. This would allow accountable care organizations (ACOs) to quickly receive reports on requests they make.

For example, they could ask for the total number of patients seen during 2014 that are high risks for heart complications and group them by area. Hospitals could ask for data on something like the current rate of patient throughput and arrival to rooms.

Data harmony

Many of the legacy databases in use today require extra work to interconnect and share data with other systems. Microsoft Excel, Access, MySQL and other database engines are examples of tools that offer means to manipulate data.

They are not as flexible when it comes to data that is continuously changing in structure. For that reason, the combination of several different databases -- such as [Hadoop](#) and MySQL -- offers efficient ways to manage large sets of data. Patient information -- including electronic medical records,

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registration, lab systems, and picture archiving and communications systems (PACS) -- is usually spread across a number of systems. It's common for this data to appear in both structured and unstructured formats. The ability of BI platforms to efficiently manage and connect the data creates a comprehensive data set.

Real-time analytics

Access to the appropriate information during patient care is a top priority in healthcare. There are many times where analytics data on a specific condition must be extracted. As [cloud providers add BI](#) to their list of services, it enables hospitals to leverage those hosted services to extract and process large amounts of data and generate meaningful analytics and predictions.

Information accessibility

Access to analytics information should not be limited to a desktop. Many BI platforms are moving their dashboards and reporting to a pure browser-based model. This will afford users the flexibility [to use any device](#), including tablets, desktops and smartphones. Microsoft recently enhanced its BI platform by introducing an alternative to its interactive Silverlight-based chart that allows iOS and Android devices to render its charts in full HTML5. This means Microsoft's BI platform and SharePoint 2013 can deliver Power

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Pivot and Power View reporting capabilities on any modern browser, regardless of the device in use.

Virtual business analysis assistant

Many of the next-generation BI platforms are able to understand nontechnical, plain-English queries. One example of this is a capability in Microsoft's Power BI called Q&A. Adatao is another. These programs can also be considered virtual report writers and analysts that can generate key performance indicators, score cards and charts within seconds. Providers, nurses and executives can request the information they need and the system provides it in one step.

ACOs, hospitals and other enterprise organizations within the healthcare industry are aware of the value that can be gained from all the data they collect. Unfortunately, concerns around cost, security and lack of resources continue to pose challenges for many IT executives attempting to deploy big data 2.0 analytics tools.

As a new generation of BI products enters the market at an affordable rate, more healthcare facilities are beginning to test them out. Other industries may have been early adopters for some of these BI components, but with the promise of improved patient outcomes, reductions in costs and improved care, these products are bound to be rolled out soon across healthcare.

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Section 2: Analytics at the Point of Care

How can providers mine health data for information without exposing patients' private information? That important question is examined in this section of the guide. Also, learn why some physicians have accepted the analysis provided to them via clinical decision support tools and why others still refuse to consult this form of technology for a second opinion when making a decision about a patient's care. Like every other form of technology, healthcare analytics resources are only as good as their security and backup measures allow them to be. A cybersecurity expert explains how to approach protecting your health IT department from today's threats.

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▀ Analytics for clinical quality: Keep privacy in mind

Trevor Strome, Informatics and Process Improvement Lead – Winnipeg Regional Health Authority Emergency Program

Healthcare organizations are always working to improve the quality of their care and the efficiency of their business operations. Data analytics for these clinical quality improvement efforts require access to a lot of data for determining baseline performance, detecting trends and patterns, and simulating potential outcomes of new processes and workflows.

As I was writing recent SearchHealthIT articles about HIPAA privacy and security, I started seriously thinking about my own practices, and the practices of my team, regarding the access to and use of [protected health information](#) (PHI).

As an analytics professional working within a large healthcare organization, I am required to access and use the PHI of many individuals. Most often, this occurs when I am extracting and analyzing data required for clinical quality and [performance improvement efforts](#) or when I'm assisting with critical incident reviews. Like most healthcare analytics professionals, most of the PHI I access is done through health IT systems such as electronic health records or via data warehouses.

The analytics tools that my group uses or builds typically generate [anonymous aggregate data](#), such as visit counts, times analysis, and other

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data that has been summarized or crunched. For example, [performance dashboards](#), quality reports (such as statistical process control charts), and even predictive and simulation models can be developed with data that is completely anonymous. When we're working with extracted data for other purposes, the data is not always completely anonymous. For example, personal information required for use in a clinical environment may include names, birthdays, or other identifying information -- especially in cases of critical incident reviews or infection control contact lists.

When specific patient data is useful

One of the questions that I have been asking myself, my team and other analytics experts who may work with data that contains PHI is this: Is there ever any need for me to access and use data that is not completely anonymized? The quick answer is yes; there will always be defined circumstances where identifiable health-related information will be needed to improve clinical quality.

The [analytics portal](#) in which my team does the majority of its work contains a few reports that are used for auditing and critical incident review purposes that must have the patient name and other information attached. After all, what good is an infectious disease contact list without any contact information? These reports are in a protected section of the portal, and the ability to view personal information (such as name, insurance number, etc.) is controlled at the system level and linked to login credentials. This way, we can control who has access to personal information, and can audit what they access and when.

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Beyond very specific and approved purposes, do I ever need to see information that identifies an individual patient? I think the answer is no.

When analysts are accessing and analyzing health information, I firmly believe that the default mode should be to always work with totally anonymized data. This should always be the case unless the task at hand clearly and legitimately requires information to not be anonymous. This is the equivalent of a "need to know" stipulation. [Personally identifiable information](#) should be excluded unless it is specifically required.

How to protect anonymity

As mentioned above, one solution for preventing accidental or unauthorized access to personal information is to partition all identifiable and sensitive information off in the database, granting access on a user-by-user basis. This is a common solution, but requires the careful setup of user access privileges by database administrators.

Another solution that has worked well in my group and others is the creation of an "analytics sandbox" that is a copy of the most commonly used data elements from our source systems but is completely anonymous and stripped of all identifiable information -- separate from the database that contains PHI. When we built the sandbox, we took care to ensure that we included only fields into which private information could not be entered; this meant we avoided most fields into which text could be freely entered. The analytics sandbox is the data set on which we can run complex statistical

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analyses, build and [test predictive models](#), and test dashboards and other analytical tools without risk of breaching an individual's record.

One benefit of working exclusively with de-identified data is that it can reduce the risk of a breach of personal health information to almost zero, especially if the data is being transmitted between researchers or analysts.

Consider that one of the biggest risk factors for an information breach is the accidental disclosure of data caused by sending identifiable health information to an unauthorized individual. This could include sending paper records to the wrong address or emailing information to an unintended individual. If you've ever hit "reply all" instead of just "reply" on your email application, you'll know how easy it is to send sensitive information to the wrong people. In addition, if a [laptop or memory device](#) is lost or stolen, de-identified data cannot be used for nefarious purposes even if the additional protective measures (such as disk drive and file encryption) that were taken are breached.

All users of health information that I know, myself included, consider ourselves to be responsible and respectful stewards of the data we use. As such, we rarely consider ourselves at risk of an accidental or [intentional breach](#). However, both accidental and criminal breaches of security and privacy do occur. As responsible professionals, it is incumbent upon us to regularly review our own security practices to ensure we are not unnecessarily accessing, using or viewing private health information, or unintentionally increasing the risk of a breach of PHI.

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Analytics a way to keep clinical operations in check

Trevor Strome, Informatics and Process Improvement Lead – Winnipeg Regional Health Authority Emergency Program

Healthcare organizations are undergoing an incredible amount of change. Regulatory changes, financial pressures and quality and performance issues are the biggest issues on providers' plates. To head off problems in these areas, healthcare organizations require insights into their business and clinical operations to understand past and current performance (and predict future performance), identify where problems exist, and evaluate efforts to address those problems.

Healthcare providers and payers alike are rapidly turning to analytics to face these challenges. Analytics doesn't simply comprise **business intelligence** (BI) or reporting packages layered on top of a data warehouse or other data source. Analytics is the system of tools, techniques and people required to consistently and reliably generate accurate, validated and trustworthy business and clinical insights.

Because analytics that provides insight into business and clinical operations results from a complex system, not just one product, healthcare organizations are challenged to discern whether they are getting maximum insight from their **deployed analytics**. Most healthcare organizations are adopting a more analytical culture and are basing more of their decisions on

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the data available to them. Unfortunately, if much of their evidence comes from static reports based on old or low-quality data, these healthcare organizations are likely not achieving the level of analytical performance that may be possible with the data they possess.

To help objectively assess a healthcare organization's analytics capabilities, there are a few good business intelligence and analytical capability maturity models that can be applied to healthcare. For example, HIMSS Analytics deploys the [DELTA Powered Analytics Maturity Suite](#). In essence, this maturity suite consists of the five components of [Tom Davenport's DELTA model](#):

- Data: Breadth and depth
- Enterprise: Approach to managing analytics
- Leadership: Passion and commitment
- Targets: First deep, then broad
- Analysts: Professionals and amateurs

According to HIMSS Analytics, the DELTA Powered Analytics Maturity Suite "helps you assess your healthcare organization's analytical maturity, including how well it is leveraging data and analytics to empower decision making and drive organizational strategy." The suite defines five levels of maturity:

- Level 1: Beginner
- Level 2: Localized
- Level 3: Aspiring
- Level 4: Capable

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- Level 5: Leader

Although not designed explicitly for healthcare analytics, The Data Warehouse Institute (TDWI) has developed a [Business Intelligence Maturity Model](#) that separates six levels of BI maturity:

- Level 1 and Level 2: Nonexistent
- Level 3: Preliminary
- Level 4: Repeatable
- Level 5: Managed
- Level 6: Optimized

According to TDWI, its Business Intelligence Maturity Model "shows the stages that most organizations follow when evolving their BI infrastructure from a low-value, cost-center operation, to a high-value, strategic function that drives market share," adding that its purpose is to provide "the big picture of a BI program, where it needs to go and how to get there." The TDWI and [HIMSS Analytics](#) maturity models are excellent tools to gauge an organization's BI and analytics capabilities in relation to other organizations' capabilities, and to help identify which steps should be taken to progress to the next level. In addition to these (and other large-scale) capability and maturity models, I like to employ a quick analytics system check to ensure that there aren't any analytical needs that are not being met. This quick system check goes over the key requirements that must be evaluated for an organization to progress along the analytics continuum and to ensure that analytics development and deployment efforts align with organizational decision makers' requirements.

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These are the five main points of the quick analytics system check:

Clearly define and communicate business goals and objectives. Analytics can help align and synchronize quality and performance improvement efforts throughout a healthcare organization. In order to achieve alignment, there must be clearly articulated quality, performance, safety and other clinical operations goals. Their associated targets and timelines must be stated, and a definite methodology (such as Lean, [Six Sigma](#) or others) needs to be in place to translate analytics into high-impact improvement activities.

Understand the needs of stakeholders. Stakeholders are the individuals who use or benefit from analytics in healthcare organizations. Stakeholders can include patients, who may benefit from the use of analytics to distill medical information in a patient portal. More often this list includes healthcare executives, clinicians and [quality improvement teams](#) that require analytics for generating insight from the volume of business and clinical healthcare data that continues to accumulate at an accelerating pace. The roles of stakeholders, in terms of their contributions to achieving the goals of the organization, must be well-defined so that their information needs can be met in an accurate and timely manner.

Make sure appropriate human and technical resources are available. To address the needs of the above stakeholders, healthcare organizations require analytics teams. Healthcare organizations must ensure that the data scientists, statisticians, [informaticists](#), programmers and report builders are deployed on the right projects and are working on activities that help move the organization closer to achieving its performance and quality goals.

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Check that necessary technology is available. Of course, an analytics team must be well-equipped with the proper tools (such as statistical, simulation, BI, data profiling and data mining software), and the necessary hardware (capable of supporting computationally and database-intensive applications) must be available to run these tools.

Use analytics to drive decision making. Finally, to be a truly analytical organization, it is important that key decision makers, including executives, quality improvement teams and other leaders, use the analytics that are available. It is futile for analytics professionals to be building tools, reports and models that nobody uses. Because the needs of a healthcare organization **are constantly changing**, analytics teams must refresh their analytics tools, reports and predictive models so they don't grow stale. Teams should also be aware of any decisions that are made without supporting evidence, or evidence that no longer seems to be associated with any pressing questions. Corrective action may be required in these cases.

This quick system check will help provide an excellent starting point when an organization is gaps in its ability to develop and utilize analytics. To further assess your organization's analytics maturity, I recommend that you further investigate the HIMSS Analytics and TDWI maturity models. For additional information and tips on how to ensure that improvement projects are getting maximum leverage from analytics and are achieving the desired results, my book [Healthcare Analytics for Quality and Performance Improvement](#) contains strategy guides that help move an organization towards higher analytics capabilities and maturity levels.

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▶ **Benefits, challenges of healthcare embedded analytics**

Trevor Strome, Informatics and Process Improvement Lead – Winnipeg Regional Health Authority Emergency Program

Most healthcare organizations possess some degree of business intelligence or analytics capability, but until clinicians can use embedded analytics at the point of care, the full potential of real-time information at the fingertips of doctors and patients will be difficult to realize.

It would be challenging, not to mention highly inefficient, to operate a modern healthcare organization without even basic [business intelligence](#) (BI) functionality for decision support. In typical organizations, this capability likely consists of data from source systems being stored in an enterprise data warehouse or other storage repository. Analytics, BI and reporting are provided by one or more special-purpose tools.

This configuration of BI and analytics may be suitable for most business management decision-making requirements, as well as research; however, this arrangement offers little, if any, benefit by way of analytics to healthcare providers working on the front line. Clinicians must assimilate large quantities of information, including test results, best evidence, and their own clinical judgment during the course of treating patients. Unfortunately, [the information systems](#) that are currently available to most clinicians do not

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assist them very well with this task, and poorly designed systems may only obfuscate the process.

Initial efforts to aid clinical decision making consisted of tools that would enable clinicians to find the best evidence online during the course of treatment. The reason more analytics are [not available at the point of care](#) is because it can be challenging to integrate analytics into a clinical environment, such as an electronic medical record (EMR). Therefore, clinicians may require workarounds such as a push to mobile devices or some tool other than the primary clinical system in use.

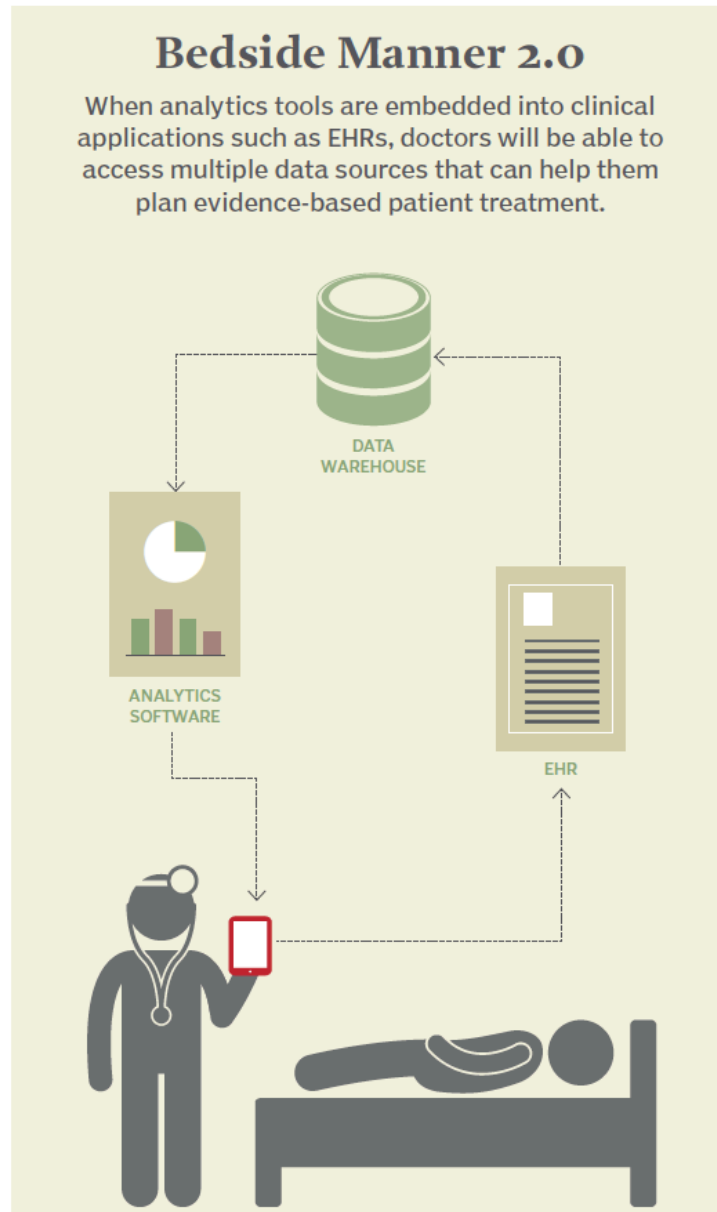
Although this hybrid approach may be sufficient for some clinical uses such as alerts, this strategy likely cannot support most real-time [clinical decision-making](#) needs. The technology is advancing, however, to the point where it is becoming feasible to embed more real-time analytics in the clinical systems, such as EMRs, that clinicians are already using at the point of care.

Embedded analytics integrates workflow at point of care

There are many potential benefits for healthcare providers in bringing the power of analytics to the point of care.

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- **Synthesis:** Embedded analytics will enable the rapid integration of multiple sources and large volumes of data. For example, such tools will quickly determine the relevant and best outcomes and different courses of treatment for patients with similar conditions. Embedded analytics can also inform clinicians in real time on how their performance stands given the decisions, clinical outcomes, and quality [performance of their peers](#).
- **Workflow:** Analytics embedded within clinical applications are better integrated into existing workflows so there is no need to look at other information sources that disrupt the process of clinical decision making and caring for patients.
- **Context:** When embedded inside clinical applications, [analytics-generated insight](#) can be presented alongside and in context of patient data.

Challenges of embedded analytics

Although there are definite tangible benefits of embedded analytics within clinical applications, there are technical and other challenges that are preventing the widespread use of embedded analytics in health IT. A few of these challenges include:

- **Integration:** Making a seamless analytics transition is a major technical challenge. The usability of analytics at the point of care will be impacted greatly by how well [analytics is integrated](#) with the user interfaces clinicians are used to seeing. Point-of-care analytics needs

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to be patient-context sensitive, and must provide the necessary insight clearly yet unobtrusively to the patient visit.

- **Relevancy:** Embedded analytics must anticipate the questions clinicians will need to have answered. In doing so, the information must be targeted and specific to the needs of the patient and care delivery. This cannot be random insight generated by a machine-learning algorithm.
- **Clinical competency:** A very real barrier is the perception that embedded analytics will diminish providers' clinical autonomy and have them engaged in "cookbook medicine" -- or worse, that their clinical judgment will be second-guessed by computers and perhaps even overruled.

Expanding analytics in electronic records

Clinical system vendors are making great strides to ensure [electronic health record systems](#) are user-friendly and intuitive. The next steps are for vendors to expand the use of analytics within the clinical systems, and not just as an add-on decision-support (or reporting) package. In future articles I will be profiling examples of where, in my opinion, embedded analytics is done right.

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A healthcare data analyst faces more sophisticated information needs

Trevor Strome, Informatics and Process Improvement Lead – Winnipeg Regional Health Authority Emergency Program

It can be argued that as the number of potential healthcare data items that can be analyzed in modern clinical systems continues to grow, analysts have less understanding of the data compared to when databases were much smaller and used for specific purposes.

As health IT becomes more sophisticated, [having more data](#) is indeed a good thing. But it's simply a fact of life that a healthcare data analyst cannot have as intimate knowledge as he or she once had of data systems. Indeed, I often have to scratch my head and look up the exact definition of a data item if I haven't used it in a while or if I need to explain to somebody exactly what the source data represents.

When new data becomes available in healthcare information -- or any other type of -- system, or when embarking on a [new analytics development effort](#), it is important to fight the urge to dive right in without first obtaining a clear understanding of the data and how it relates to the business.

Below is a high-level summary of what is critical to know about data before exploring new data or developing analytical [tools such as dashboards](#), reports, alert agents and any sort of reporting. Future articles will cover these in more detail.

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- **What the data represents.** Much healthcare data is generated on the front lines during the provision of care by clinicians and other staff. It is important for analysts to know the processes and workflows from which the data is taken, what the data is measuring and who is responsible for entering the data. If possible, outcome data should be attached to process data to help determine how efficient, effective and [safe clinical workflows are](#).
- **Where and how the data is stored.** Fundamental to using data is for the data analyst to know where the data is located. Is the data being stored in an enterprise data warehouse, a data mart aligned with a clinical system or a standalone database? Along with knowing [where the data is stored](#), understand the quality of the data. For example, are there missing values that might bias analysis, or are there invalid entries that need to be cleaned/addressed?
- **The data type.** Most database management systems require data to be stored as certain types (such as integer, character, and date/time). Regardless of how data might be physically stored in a database, what kind of data do the values represent in "real life"? Are there any data conversions that need to be done [before the data becomes useful](#) for the intended purpose? For example, numbers stored in character fields may need to be cleaned and cast to a numeric type such as *float* or *integer* to undergo appropriate operations.
- **What logically can be done with the data.** Given the type of data and how it is stored, what kind of database and mathematical operations can be performed on the data in meaningful ways? While you can do counts for any data type, even basic operations, such as addition, and statistics, such as mean, would not be valid on categorical and ordinal types of data, even if the values appear numeric.

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- **How to turn data into useful information.** Raw data in and of itself is rarely useful. Even in this age of big data, an organization's executive, management and other decision-makers can make more effective decisions if the [data can be compiled, analyzed](#) and used to generate insight into an organization's operations. It can also highlight what the best way forward is if the data results range from specific, well-defined performance indicators on a dashboard to simulation and [predictive analytics](#).

It can be argued that, as big data is garnering attention from an infrastructure and technology perspective, focus must always be maintained on how all that [data relates to the business](#) and what is relevant to decision-makers. In my experience, when a healthcare data analyst begins with a new data set, it's best to spend time on the floor (or in the office) where the work occurs that generates the data, and where analytics' resultant insight is being used to guide decisions. This hands-on exposure helps relate data to actual situations and conditions that simply reviewing existing documentation and meta-data would never be able to elucidate.

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Clinical decision-making hinges on reliable analytics backups

Trevor Strome, Informatics and Process Improvement Lead – Winnipeg Regional Health Authority Emergency Program

Data analytics is a field long associated with data, dashboards, business insight and predictions in many market sectors. Healthcare is coming around to analytics, too, as many organizations are beginning to see its value on both the clinical and business sides.

Backups, however, aren't often seen as a critical part of [analytics systems](#). They should be.

It is the responsibility of those who manage and govern data to confirm that system or data backups are being administered.

Many, if not most, organizations would be crippled if their analytics capability (and with it their ability for informed decision-making) was to "go dark" for any extended period of time because it would take away information needed to make informed decisions. Despite this, professionals working in the [field of healthcare analytics](#) take backups for granted. Many will continue to have this attitude until they're hit with a worst-case scenario and important data and decision-making capability is lost.

Because of the critical role analytics has within healthcare organizations (HCOs), [backups for related systems](#) and data should be in the forefront of

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analytics professionals' minds, and a central component of an analytics strategy. This is because a well-formed backup strategy ensures that HCOs are not simply backing up their data; they are also backing up their capacity for operational and clinical insight, and ultimately, their ability to do business.

Data governance, stewardship and backups

Analytics professionals often hold data quality, governance and/or stewardship positions within their healthcare organizations. Their responsibilities extend beyond day-to-day use and analysis of data. They are responsible for ensuring that sufficient and effective measures are being taken to confirm that an HCO's analytics capability can be restored quickly and completely following a catastrophic loss of systems or data.

In the event of a catastrophic downtime resulting from the loss of a system or data storage device, system recovery does not simply consist of restoring services. All data and related content must be restored as well. A fully protected HCO means that backup policies and procedures must encompass more than just what is considered "data." A complete restoration of system capabilities requires [comprehensive backup](#) and restoration procedures that include the major components of analytics: data, content and context.

Data -- Data is the raw material of analytics. Without data, there can be no insight and no evidence for decision-making. Setting up and managing the systems and processes for backing up enormous volumes of data typically found in HCOs is most often the responsibility of dedicated technical

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specialists. Yet regardless of who is responsible for the technical aspects of [data backups](#), it is the responsibility of those who manage and govern the data to confirm that system or data backups are being administered, and to check the validity of the backups.

I have seen situations where, due to some technical glitch or system setting, data was not being backed up when it was assumed to be. This can be catastrophic if found out after a loss of data. It is also essential to validate that backed up data can be restored, and did not somehow become corrupted during the backup or restoration process. Although these checks can seem like a nuisance to perform, they are a lot more convenient than learning the hard way that data is unrecoverable.

Content -- Although data is usually thought of first when discussing backups, an organization cannot neglect to back up analytics content. This consists of the myriad reports, dashboards and supplemental programming code that make insight via analytics possible. Many thousands of hours go into [developing analytics tools](#) and content within an HCO, so losing this work would mean both a loss in capability and a major loss in time and effort and, therefore, money. The backup and recovery plans of HCOs should encompass the full backup of systems such as business intelligence platforms, including both the application itself, and associated content such as reports, agents and dashboards.

What may constitute a bigger risk for loss are the volumes of programming code, such as [R](#), [SAS](#), [Python](#) and others, that sit on individual analysts' workstations or on second-tier development and test servers that may not be regularly backed up. Responsibility for backing up this code usually

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defaults to individual analysts. To address this risk, policies and infrastructure should be in place to ensure that all such content be placed on servers that are secure, protected and regularly backed up. This content should not solely reside on workstations or laptops. This is a prudent step to protect both the intellectual property itself, and financial investment in the development of the content.

Context -- In addition to the data and analytics content, there is likely a plethora of supporting documentation, such as business processes and data dictionaries, that provides context for the data and code used to drive analytics. This context is vital to analytics because without this knowledge and documentation, it can be challenging to reconstruct what specific data points represent in [a clinical workflow](#) or business process, or to understand the logic behind business rules. Even though it is important for business continuity, contextual information is perhaps at a greater risk for loss than content because it is often documented or created by business analysts during early stages in a project, and may not end up in a storage location that is regularly backed up.

Without a tested and implemented backup plan, HCOs run the risk of losing the backbone of their ability to make timely and intelligent decisions. The points above illustrate that to ensure full analytical capability is restored in the event of a disaster or major technical issue, regular backups must consist not only of an organization's data, but the analytics content (reports, [dashboards](#) and other analytical tools) and context (such as business process documentation). Finally, backup processes should be validated to ensure that all backed up content can be completely restored should that unfortunate circumstance become necessary.

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Section 3: Population Health Management

Population health management, or the collective treatment of a group of patients, is an area that has matured along with the use of technology in healthcare. Though technology has come a long way, there are still hurdles, including those involving the exchange of health information among care facilities, that are causing hospitals to achieve treatment advances at different rates. This section contains information on why participating in an accountable care organization is one way for healthcare providers to commit to improving their population's health and why that commitment has proven elusive for some.

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Home health monitoring could be part of your cable bill

Reda Chouffani, Co-founder – Biz Technology Solutions

Today, consumers can order their Internet, television and telephone services from one provider. They can also receive discounts for adding a security system and monitoring service to their monthly subscription. There are signs that other services, including some related to healthcare, will soon be available to tack on to household cable bills.

Internet service providers and cable companies are always searching for new ways to increase the number of services available as part of their packages. Since they possess an existing client base, it's simple for them to stimulate new revenue by bundling new services with their core offerings. An upcoming rollout of home health monitoring services by a large telecommunications provider could go a long way in determining whether other healthcare services could be included as part of future cable bundles.

AT&T is preparing to offer its remote security monitoring service to U.S. households, called AT&T Digital Life. The company recently announced it would be performing a trial of Digital Life that will allow family members and non-medical caregivers to observe elderly or disabled patients that are living independently via remote patient monitoring systems.

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The home health monitoring service can be offered to senior citizens and others to track and capture information that can be shared with their providers or caregivers.

"This newest service from Digital Life will help caregivers stay connected with how their loved one goes about their daily activities," Kevin Petersen, president of Digital Life Inc. at AT&T said in an [announcement of the trial](#).

Home health monitoring systems and similarly functioning mobile apps consist of real-time wireless vital sign-capturing devices. There are also devices that can be connected to a hub that collects patient data and publishes it to a secure server or cloud.

These tools will play a critical role in helping the population address chronic disease management. From remote [biometric technology](#) and consumer technology such as tablets and old-fashioned patient education, care providers have a collection of ways through which they can convince patients to become involved in their own care. Engaging patients will not only improve care, it can reduce the occurrence of hospital readmissions.

Development of these initiatives and services will also hinge on how successful physicians are in motivating patients to use these devices and technologies. Their long-term effectiveness will be determined by the quality of data captured, and whether it can be shared with different healthcare systems and primary care providers. AT&T isn't the only cable provider exploring the [possibilities of home health](#) monitoring. Verizon has been active in this arena with its [SureResponse](#) mobile emergency response system.

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Home monitoring services can be of great convenience to patients. Patients with certain [chronic conditions](#) are more likely to evaluate these services. If they find them to be worth the effort or if they are recommended and supported by their provider, the patients can opt to have their local service provider perform the installation. Because security is an area many will ask their service providers about, companies such as AT&T and Verizon will need to ensure all safeguards are taken to protect their client's private health information.

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■ Growth of ACO model stunted by slow technology adoption

Reda Chouffani, Co-founder – Biz Technology Solutions

While more than 300 accountable care organizations exist since the Affordable Care Act launched the innovative fee-for-health payment model, there are significant hurdles blocking their continued success and expansion, according to a recent [eHealth Initiative webinar](#).

ACO models offer a unique approach to solving some of the complex healthcare issues in the U.S. Their focus on improving patient outcomes while shifting the payment model into a [pay-for-performance](#) instead of a fee-for-service system holds the promise of a better healthcare system. Healthcare professionals participating in an ACO know its foundation must be built on collaboration.

Member providers from different disciplines should be allowed to work together when taking care of patients. This would allow the formation of ACO-wide care teams. Each could oversee the health of a subset of a population of [patients with similar conditions](#), such as diabetes or congestive heart failure.

In order to accomplish this collaborative goal, many technology requirements must be met. Unfortunately, many ACOs continue to be

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plagued with significant IT and workflow challenges that present a serious threat to their sustainability and mission.

Health information exchange

Lack of widespread HIE adoption is a barrier to open data sharing for ACOs. The inability to gain access to patient health records shared between providers using [different EHR systems](#) that hold the health record poses a significant problem for ACO participants. It gives providers limited visibility of patients' current health information, making it difficult for them to know how to treat them.

Patient engagement tools

ACOs aim to get patients more involved in their own care. Encouraging patient engagement creates greater accountability and could motivate patients to significantly improve their health. Most patient engagement tools [involve modern technology](#) and haven't been tested enough for providers to trust in their efficacy. For that reason, many ACOs choose a more traditional route and rely on telephone and in-person communication to ensure patients stay in touch and follow up with any questions they might have.

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Health IT costs

In the webinar, the eHealth Initiative shared the results of a survey co-performed with Premier Inc. One statistic conveyed that "cost and return on investment are crippling concerns" for ACO participation, with 14% of respondents showing concerns in these areas in 2013, a percentage that rose to more than 90% of ACOs in 2014.

Employee training, technology platforms and services have shown little change in pricing despite an increase in ACO technology vendors. Lack of adoption of state or [federal HIEs](#) forced many ACOs to seek private HIE formations. This forces members to chip in and fund system upgrades to meet the data exchange requirements. These upgrades come at a price and have yet to see a significant ROI.

Interoperability

The meaningful use program and EHR certification requirements support the [goal of interoperability](#). Unfortunately, many ACOs are coping with significant gaps in this area. Typically, several large systems within ACO IT environments are unable to interface and exchange health information with each other.

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Data analytics challenges

Data analytics holds many of the insights needed to quantify how the ACO model serves healthcare. This can only be possible if the analytics platform can gain access to comprehensive population health information. Many ACOs are limited to what information may be accessible to them. Claims information and clinical data seem to be the only data sets that are easily accessible, leaving registry information, patient's reported data, remote monitoring and other sensory data inaccessible and isolated.

ACOs have the blueprint to make a significant impact on healthcare, but most of them are in the process of dealing with complex [health IT challenges](#). This has left ACO leadership looking for effective strategies to execute their business plans. Technology is one thing that will continue to serve a key role in helping ACOs accomplish their objectives. As more ACOs begin to form and grow, they will have to lean on each other by sharing lessons and best practices to help ensure the sustainability of the ACO model.

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■ Karen DeSalvo, M.D., discusses health data analytics, much more

Don Fluckinger, News Director

In the mind of Karen DeSalvo, M.D., the value of health IT and EHR systems became [painfully obvious in the aftermath](#) of Hurricane Katrina in 2005, which destroyed many paper patient records and made treating patients extraordinarily difficult. The power of data analytics [was made just as clear to DeSalvo in 2012](#) after Hurricane Isaac, when she was serving as New Orleans Health Commissioner. Her agency combined its own databases with CMS's and a power utility's. Together, they directed emergency responders to bring electricity online for the most medically vulnerable populations first.

We introduce readers to DeSalvo, now National Coordinator for Health Information Technology, in SearchHealthIT's first one-on-one, just days after [ONC proposed a rule offering new flexibility](#) for eligible hospitals and eligible physicians in attesting for meaningful use. This interview took place hours before DeSalvo announced [an ONC reorganization](#) streamlining 17 offices and sub-offices into 10. Here is the first installment of excerpts.

On how her still-new job's going:

Karen DeSalvo: It's been four and a half months. It's been great. I say [four and a half months to point out] it's still pretty new in some ways, getting to know a lot of our important stakeholders and partners and working to meet

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with every single person at ONC so I can have a chance to understand the depth and breadth of the work the agency's involved in. It's been a lot of fun getting a chance to know who's in the space and what great work we're doing.

On how her experiences inform policymaking:

DeSalvo: I was in public health for three years. When I was there, one of my jobs was to build a hospital. I was the lead for that project, and it included an IT purchase -- so just before I came here I was involved with selecting an IT system for the hospital, a small, 80-bed facility, on the purchasing side. I'd implemented this system [as CEO of Tulane] Community Health Centers but it was obviously less complicated than buying a hospital-based system. And of course I've used [EHRs], because I still practice medicine. I've seen it from a lot of angles, and this is just a different view, of the true policymaking arm of ONC in partnership with CMS.

Before [I was in] public health, as we were rebuilding the healthcare system in New Orleans and setting a policy framework, IT was one of the four pillars necessary to build a system that would [serve patients' needs](#), and that of the providers. It's always been a part of the world we were building, from a policy standpoint or on the front lines. So although I'm not a techie person, I do come with a lot of technical exposure in my background and I'm delighted to have the chance to lend that perspective to the work we're doing for ONC.

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Takeaways from proposed rule relaxing certified EHR technology [CEHRT] rules:

The patient voice is a powerful one, and there's research to show that patient-reported outcomes are great substitutes and additives to the quantitative objective measures we might traditionally think of. Karen DeSalvo, M.D., national coordinator for health information technology

DeSalvo: Meaningful use is a program designed to offset the costs of adopting certified electronic health records, help advance healthcare and eventually help advance outcomes. There was some evidence that suggested the market wasn't ready for full upgrades and this may disproportionately impact smaller, rural critical access providers through no fault of their own. We thought it would make sense to put out this [proposal] that would consider whether there could be some flexibility for those providers.

We still want people to progress to better technology that is more inclusive of, for example, the patient voice and allows for transitions of care. But we felt like [a proposal] speaking to some flexibility right now would make some sense.

Where the idea to give providers flexibility on using 2011 and 2014 CEHRT to attest for meaningful use came from:

DeSalvo: ONC is constantly surveilling the environment. Not only ONC but also CMS, HIMSS [and others] so there's a constant level of information

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gathering and sharing about the market. We were hearing from major stakeholders that there were some challenges. It looks like the certification process was going well, but there may very well have been some vendors who weren't quite ready. We were hearing that [at federal advisory committee meetings], in public comments and in other ways.

Did CCHIT leaving the ONC EHR certification program complicate the meaningful use rollout?

DeSalvo: CCHIT was incredibly professional about letting us know they were moving out of the space, changing their business model and [partnering] with HIMSS. They had a queue of where they were in their certification; they were working already to do appropriate handoffs that would not allow for any skipped beats, so we felt pretty certain it would not have an impact. They were thoughtful about their transition, so I have to say it really was not a major factor and there is plenty of opportunity for EHR certification in the marketplace.

On the potential for "partial credit" for meaningful use payments for providers who meet most, but not all, of a particular stage's criteria:

DeSalvo: We are absolutely taking ideas like that into consideration, moving forward, especially with [meaningful use stage 3](#) in particular. But there are constraints with the way the law is written. We're in this heavy listening phase [with advisory committee hearings] to get broad feedback. We're getting letters and other input from folks as we start to move into the quiet phase of stage 3 development. We certainly appreciate those kinds of ideas.

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How "big data" can change patient outcomes through health IT:

DeSalvo: There's great promise in what we can do with information, whether that's to improve systems around quality and safety or whether it's to advance science and/or cure and treatment for individuals with genomics at the bedside all the way to population-level advancements. There's an array of opportunities for use of the data. At the end of the day, it's the patient's data ... and we have to get ahead of the privacy and security challenges that are going to arise as big data gets more common.

[\[The recent White House report on big data\]](#) speaks to some of these challenges. There's a list of things we have to consider. We have the opportunity to collect all kinds of data on all of us. The patient voice is a powerful one, and there's research to show that patient-reported outcomes are great substitutes and additives to the quantitative objective measures we might traditionally think of. It's really important [to] remember it's about them. Their voice matters and it contributes to the trajectory of their health in a way that retrospective and even current data can't. Creating space for that, finding standardized ways to capture that [patient perspective] is another challenge, but I don't want us to lose sight of it and just analyze what we have at hand.

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■ Part two: Q&A with National Coordinator for Health IT Karen DeSalvo

Don Fluckinger, News Director

On the difficulties public health agencies face implementing IT:

Karen DeSalvo: The thing about public health is that it saved our life today, and we didn't know it, and that's when it's doing its work. It's one of the quiet, behind-the-scenes infrastructure parts of our country that generally works extraordinarily well. Whether it's protecting food, biosurveillance or public preparedness, it's easily [overlooked]. Coming with that has been a long-standing problem that it's been underfunded at the local and sometimes the state level. When there are shortfalls in funding, things have to go. Over time, particularly in local public health, there's not been the chance to build up IT capacity to [keep pace with health IT](#) in general.

To the credit of the public health world -- professional societies, professional organizations, the CDC [the Centers for Disease Control and Prevention] and others -- they've been really leaning forward to see that public health is modernizing rapidly to be a part of this promise of health IT. It's something they're working on from workforce development to interfaces to understanding privacy and security opportunities and challenges that differ from the healthcare system, how deep data needs to be shared for contact tracing, etc. They've been really great partners, ready to build. But

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we have to be thoughtful and step-wise, just as they are, to build up their capacity.

How public health will eventually use clinical data physicians collect in EHR systems:

DeSalvo: [Working] in public health, what became so crystal clear was the power and opportunity from data being [collected in EHRs](#) in the clinical environment. When appropriately used, it can really help to support public health, and that's been part of the meaningful use program. It's important that public health [has] more timely data; it's one of the ways the adoption of EHRs is going to really transform public health in this country.

In the modern age of infectious disease and the contagions that reach the headlines like [Middle East Respiratory Syndrome coronavirus] MERS, the better connected clinical environment EHRs [are] to the public health system [the better they will] support biosurveillance. Early recognition of the potential spread of disease can allow [public health to get ahead](#) of it very quickly and do their work much more efficiently and effectively. That is an exciting promise and potential that is already underway. There are many other ways they're out trying to protect, but having them connected to the clinical environment in such a way that they can get real-time data will really advance and support their role in keeping us well.

On the promise of [health data analytics](#) for public health:

DeSalvo: I don't want to speak for the CDC, but I know CDC is thinking about how they support workforce development: the training of epidemiologists and public health fellows, considering how that training may be leveraged to

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provide a better infrastructure of public health informaticists. Public health professional societies are thinking through how to have their resources in local health departments and how they share services.

The analytics piece is one of the many places where public health can bring so much to bear as we work on how to manage big data increasingly [accumulated by HIEs](#) and other organizations. They have skills at understanding patterns of care and disease. Because of their training in epidemiology, they are certain they are appropriately using data and not finding significance where [it isn't].

They bring the perspective of prevention and social determinants to the analytics to help us think of more than healthcare as an improver of health but the whole environment where people live, learn, work and play. I get excited about the fact that in the world of health IT there's a meaningful and important space where public health and medicine can work together in concrete ways. We need to do that more and more to improve life expectancy and quality of life.

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Clinical decision support tools still underused by clinicians

Joseph Kim, Physician technologist and President – Qsynthesis

The concept of clinical decision support has been around for many years, but the active adoption of it continues to vary among physicians. There are some physicians who feel [clinical decision support](#) can be too narrow and prescriptive. They use the term "cookbook medicine" to imply that healthcare providers who stringently follow algorithms and clinical pathways are not using their brainpower to apply the art of medicine when they care for patients. Instead, they are following rigid recipes based on established guidelines, many of which are outdated.

A wide variety of clinical decision support tools, both of the simple and advanced variety, have been integrated into [EHR systems](#). Physicians and hospitals -- already struggling with [alert fatigue](#) -- are getting bombarded with clinical messages and pushed to continue to use more sophisticated clinical decision support tools.

The expectation is for clinicians to use clinical decision support at the point of care when they are actively treating patients. Some advanced clinical decision support tools are seamlessly integrated [into an EHR](#) and become a natural extension of the clinical workflow without hindering productivity. Other clinical decision support tools are intrusive and distracting, and they end up becoming useless because clinicians choose to ignore them.

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Most physicians did not use EHRs when they were medical students. They did not learn how to apply clinical decision support tools at the point of care when they were going through their clinical training. The American Medical Association is hoping to change this through their "[Accelerating Change in Medical Education](#)" initiative, which consists of 11 medical schools piloting innovative approaches to educate medical students. Several of these projects incorporate the use of EHRs, virtual patients, and the application of clinical decision support as medical students treat real and virtual patients and document their progress on EHRs.

As medical students learn to naturally [use EHRs](#) and clinical decision support tools when they treat patients, they will be more efficient at using the technology once they enter the workforce as practicing physicians. They will also have the ability to offer valuable feedback to shape and improve EHRs and clinical decision support.

There are so many ways technology can be used to improve patient safety and the delivery of care, but growing patient workloads has left many physicians struggling to efficiently utilize EHRs during clinical encounters. Physicians who rely on medical scribes to enter information into EHRs don't see the visual cues and alerts generated when data is entered or selected in [check boxes or drop-down lists](#). There are hospitals still trying to establish consensus around prioritizing clinical alerts and messages so that physicians are not overwhelmed by them.

Clinical decision support tools are designed to [improve patient safety](#) and encourage physicians to remain concordant with established guidelines. However, physicians often deviate from recommendations because of

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unique patient factors or other circumstances that justify alternative treatment options. For instance, when a patient develops advanced cancer and chooses non-aggressive medical care and symptom management instead of chemotherapy and radiation therapy, the treating physician and team of clinicians may need to deviate from standard treatments in order to respect the patient's wishes.

However, the treating physician may choose a radically different approach to manage symptoms for a certain this patient. Should disruptive alerts and messages pop up on the screen every time the physician is trying to prescribe a treatment that goes [against clinical guidelines](#)?

The practice of medicine is both an art and a science. As clinical decision support becomes an integrated part of clinical medicine, physicians will need to learn how to modify their workflows so clinical decision support moves from being an annoyance that disrupts it to an instrumental tool that helps them deliver better care.

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