In this digital age, hospitals and health systems are gathering greater volumes of data year over year, but most are unable to harness that data to create meaningful and lasting improvements.

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Many healthcare executives say their IT departments—typically the gatekeepers of data—are understaffed and overworked, resulting in long queues to access data and deliver them in an actionable format. A full 45 percent of healthcare organizations face budgetary constraints for big data projects, according to a 2015 survey by IDG Enterprise.¹

Indeed, 90 percent of so-called data lakes (massive data storage sites) will be useless through 2018 because they are overwhelmed with information assets captured for uncertain uses, according to a 2014 report by the research firm Gartner Group.²

There Might be a Better Way

Some hospitals and health systems are turning to so-called small data to gain valuable insights into employee practices and patient care. "Small data" means what it sounds like: one or several data sources accessible on a local or department level. Small data might be a single-source application or several types of data cross-referenced for a specific purpose.

"Small data is data you have easy access to," explains Travis Frosch, senior director, analytics services for GE Healthcare, a champion of small data. "It doesn’t require an army of resources or investment. It is data you already have access to and is low-hanging fruit."

¹ IDG Enterprise Big Data and Analytics Survey 2015.

Big Data Challenges by the Numbers

45% of healthcare organizations face budgetary constraints for big data projects

40% have limited availability of skilled employees to analyze data

33% of enterprise organizations have challenges with development time

26% are worried that they have limited availability to demonstrate ROI from big data investments

Source: IDG Enterprise Big Data and Analytics Survey 2015
Applying Big Data Concepts to Small Data

The key concepts of big data apply to small data, says Frosch, including the four V's—volume (the amount of data needed to deliver value), variety (data sources that solve the problem), velocity (how often the data are validated or refreshed) and value (whether the correct problem is matched with the appropriate data source).

“The small data side is much easier [to manage than big data] but still uses these principles,” Frosch says. Key questions to ask when embarking on the use of small data are “What data source will I use?” and “What time frame do the data need to span?”

If given the authority, proactive individuals in organizations can go very, very small with data. One person can use one source of data without extra IT resources to test whether this data can solve a problem encountered in daily practice.

“Once you start to get data moving, you might get to a different root cause” than originally expected, says Frosch. “Small data allows individuals to understand more fully what they are seeing and whether a test of change might make a difference.”

Seizing the most visible opportunities can garner early results, he adds. A targeted test using small data can produce a proof of concept in a six-week time frame, rather than months or years in the future, and can get the ball rolling on bigger tests or on implementing something on a wider scale. “Quick wins can totally change the mindset within an organization.”

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Travis Frosch, senior director, analytics services, GE Healthcare

Apply the Four V’s of Big Data to Small Data

- **Volume**: What is the amount of data needed to produce value
- **Variety**: What are the required data sources for the solution/problem
- **Velocity**: How often does the data or analytic need to be refreshed
- **Value**: Have you identified the correct problem or pain point to solve
Radiology practices seek to produce high-quality diagnostic images for accurate diagnosis while keeping patient exposure to radiation at a minimum. One way to gauge quality assurance of imaging and patient exposure is to track rejected and repeated image acquisition rates.

A “reject” is an X-ray or other radiology image (e.g., a mammogram) that is not usable due to failure of some quality check. Common reasons include improper patient positioning or clipping of the target anatomy, sub-optimal acquisition parameters, patient motion, and image artifacts among others. A “repeat” means the same image must be retaken because the initial image is not usable.

By identifying high repeat/reject rates among technologists, radiology departments can actively target training and education efforts to improve technologist skills and therefore patient care, quality, and safety.

A radiology team at the University of Washington (UW) Medical Center in Seattle is testing a data analytics system that allows it to remotely pull data from X-ray machines around the hospital (and from mobile X-ray units) to conduct analysis of technologist repeat/reject rates.

“We were already doing this work, but we were doing it manually and it was very time-consuming,” says Kalpana Kanal, PhD, director of the diagnostic physics section at the UW Department of Radiology.

Manual data collection consisted of an individual walking to 13 different X-ray machines around the hospital and retrieving individual data files, which required 237 mouse clicks. That person would then compile the data into a spreadsheet and analyze the data for trends to identify individual technologists for targeted training. The entire retrieval/analysis process took six hours and forty-five minutes on average. Further, the manual process was susceptible to data loss due to system upgrades between data collections. The process was not only completely personnel-driven, but was conducted at longer intervals—perhaps once a month or once a quarter—because of its time-consuming nature.

Kanal and her team are testing the repeat/reject analytics solution, a new software from GE Healthcare that remotely pulls repeat/reject data from the X-ray machines and compiles it into an easy-to-view analytics dashboard for use by managers and QA technologists—essentially eliminating hundreds of mouse clicks and over six hours and forty-five minutes of manual work. The automation is more reliable than manual data retrieval and allows for more frequent data retrieval. Additionally, the software tool displays a .jpg file of the rejected image for further analysis to determine why it was faulty.

“Sometimes, the further training that needs to be done requires being able to see the image itself,” explains David Zamora, medical physicist at UW Radiology.

Since installing the beta system eight months ago, Kanal and Zamora say they have learned several lessons:

1. Automation saves measurable time and resources.
2. The data allows readily available feedback for technologists to aid in continuous improvement.

The quality of data is higher from the automated system than was gathered manually because fewer opportunities are present for data loss or corruption.

The project exemplifies the power of small data—a specific data source (X-ray repeat/rejects) for a specific purpose (technologist training)—to drive improvement. It also shows the value of moving from manually exported data to automatically exported data. Kanal’s section is composed of five medical physicists, who are responsible for seven inpatient and outpatient sites in the Seattle area. Given the scope of practice, she says, “the more automation, the better.”

“We were already doing this work, but we were doing it manually and it was very time-consuming,” says Kanal.
The national epidemic of opioid abuse (and other controlled substance abuse) and overdose is impacting the anesthesiology profession. Anesthesiology residency is considered one of the most dangerous jobs in the United States because of the high risk of substance abuse. Anesthesiology residents have an annual mortality rate of 15.7 deaths per 100,000 residents, which ranks just below farmers, fishers and police officers as one of the most dangerous jobs. In contrast, among all healthcare workers, the annual mortality rate is just 0.7 deaths per 100,000 workers, according to the Mayo Clinic and the American Board of Anesthesiology.1

"It’s a significant job-related mortality [rate]," says Dr. Robert Craft, chair of the anesthesiology department at the University of Tennessee Medical Center.

Given the broad concern for diversion of opioids for personal use or street sale in anesthesiology departments, Craft is seeking to develop innovative safeguards as a preventive measure. The most addictive and highly desirable drugs are those used routinely by anesthesiology teams, namely controlled substance opioids such as morphine and Dilaudid. “This [issue] is very important to us,” he says. “These drugs carry a high street value and they are very potent.”

Craft is planning to test a GE Healthcare analytics software program that would allow him to cross-reference several data sources to identify possible abuse for further testing, such as urine drug testing.

“The specific thing I went looking for was to be able to see controlled substance utilization by case type to better screen for diversion,” Craft says.

Valuable data sources for this purpose include surgical procedure type and provider. Additionally, cross-referencing the post-anesthesia care unit patient pain scores with patient opioid doses recorded is valuable as small data. If a patient is experiencing a high level of pain and his or her medical record shows a high amount of pain medication has been administered, the scenario could be a red flag for provider diversion, he says.

Craft also recently gained approval to purchase a refractometer for the pharmacy department. The refractometer will allow pharmacists to test leftover vials of opioids and other pain medications used by the anesthesiology team in procedures. A common tactic in opioid diversion is to dilute the remaining opened vial of pain medication with saline prior to returning it to the pharmacy following a procedure. The original product is diverted for use or sale.

Combined with the GE Healthcare software capabilities, the use of the refractometer will help reinforce the new measures to staff. “We believe increased testing is a deterrent,” Craft says.

Specific, actionable small data are expected to help Craft and his colleagues tamp down on abuse and reach providers who are going down a dangerous path.

Craft says, “There is a lot of opportunity by having the data to improve efficiency and effectiveness.” He anticipates that the analytics software will help alleviate the issue of data availability “in short-circle time—in the [midst of] battle, as it were.”


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University of Tennessee Medical Center: Using Analytics Software to Identify Signs of Illegal Substance Abuse

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Dr. Robert Craft, chair of the anesthesiology department, University of Tennessee Medical Center
Sharp HealthCare: Gamification of Revenue Cycle Analytics

Sharp HealthCare, a regional health system in San Diego, is using small data to raise productivity in its bill collections department.

Gerilynn Sevenikar, vice president of revenue cycle for Sharp HealthCare, says she came up with the idea of tapping small data to improve employee engagement in and adherence to standard procedures while improving the capture rate of payments owed to the health system. The concept is known as “Gamification.”

“If you think of the revenue cycle like a game, you can identify the hurdles you need to go [over], from unbilled to billed to paid, to reach success,” Sevenikar says.

She is collaborating with GE Healthcare on creating such a game using data gathered from Sharp HealthCare’s revenue cycle process. The revenue cycle process includes moving owed payments from unbilled to billed and to self-pay collections if necessary, where the remaining balance is transferred to the patient. Her team members are required to make a call to the patient within five days of the balance being transferred to his or her responsibility, to request payment or set up a payment plan.

Gamification would translate the revenue cycle workflows into a real-time display of how far, and how many, of each of the prescribed hurdles each employee “clears.” Team members receive bonus points for moving through each revenue cycle hurdle, with the most points awarded for securing final payment. The “games” are driven by an analytics engine and feature a leaderboard to display the teams and progress, allow each team member to select their own avatar (alternate online identity), and goals are updated throughout the day. The data in the displays is updated every 15 minutes, with each individual gamer’s points increasing or decreasing toward a goal determined by Sharp HealthCare’s management team or supervisors. The entire organization’s productivity over the last 15 minutes is displayed, the top few gamers are showcased, and the race is on. Rewards are still being determined and are expected to be in the form of monetary compensation or awards through a recognition program.

Sevenikar involved her staff of 10 teams in developing the concept and designing the game. Team members came up with the idea of creating their own avatars for the game. “[The avatars] made it more engaging, less threatening, more along the millennial [generation] thought process,” Sevenikar says.

About 60 percent of Sharp HealthCare’s revenue cycle workforce is under age 35. But the older workers also are keen on the idea, Sevenikar says.

The pilot will start with about 35 people, and the program will eventually expand to about 300 staff.

The main area of measurement to gauge the success of the game is worker productivity and successful outcomes. Currently leaders are unable to easily monitor real-time productivity and compliance with standard workflows. It can be unclear if the difference between daily account productivity is due to drift from standard workflows, someone working fewer cases but with those that are high quality, or if we have a performance issue.

Sevenikar surmises, “With a gamified display of real-time outcomes, we will see a move toward ‘rewarded’ standard workflows and shared productivity expectations.”

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Gerilynn Sevenikar, vice president of revenue cycle, Sharp HealthCare
Five Keys to Unleash the Power of Healthcare Data for Real-world Results

Conclusion

Hospitals and health systems bogged down by big data streams can make progress by being focused, innovative, and practical. Leveraging small data for specific purposes can produce big wins that move the organization along in effecting change.

Using small data is cheaper, potentially more valuable, and can have a greater impact on the organization than big data by spurring momentum bottom-up rather than top-down.
Additional Resources

Find more information such as case studies and thought leadership on Applied Intelligence, GE Healthcare's comprehensive portfolio of analytics solutions, here.