

# The Footprint of Data Across Healthcare Organizations

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## CHAPTER OBJECTIVES

1. Examine the drivers affecting the current healthcare landscape.
2. Explain how healthcare technology has advanced during the past decade to create infinite databases.
3. Determine how healthcare data are being used to meet policy, regulatory, and consumer demands.

## CORE COMPETENCIES

- Knowledge of the healthcare environment and current trends
- Information technology knowledge and future trends
- Management and use of evidence-based healthcare data
- Knowledge of healthcare care policy, regulations, and consumer demands

## INTRODUCTION

The healthcare industry is constantly experiencing change. How the industry responds will be determined by numerous influences. The influences include data and platforms, digital therapeutics, healthcare reform, consumer-centric products, care communities, and a shift from healthcare to health and wellness (DeloitteHealth, 2019; Siwicki, 2019). As with other industries, healthcare organizations must be

business savvy, risk averse, and persist in the use of meaningful evidence-based data to achieve quality, safety, and sustainable value-based outcomes. This chapter will focus on the drivers affecting the current and future healthcare landscape and how technology will continue to generate databases that are essential for sustainability, policy development, and meeting regulatory requirements and consumer demands.

The chapters that follow will include information necessary to accelerate knowledge, improve decision-making, and enable healthcare professionals, students, and educators to use data to achieve quality, safety, and value-based outcomes. Specifically, Chapter 2 focuses on a new age of imperatives that will impact quality, safety, and value-based outcomes within the context of new rules, leadership skills, and a competitive healthcare market. Chapter 3 concentrates on different quality improvement tools, methods, and selecting the right tool for interprofessional projects. Tools that are pivotal to planning data collection and analysis will be explored. Chapter 4 provides information on the value of data to inform administrative and clinical decisions to achieve peak performance, anchor strategic initiatives, and improve operational thinking. Chapter 5 is an overview to understand how data science accelerates discovery, improves decisions, and creates a data-driven economy for healthcare success. Chapter 6 discusses the advantage of collecting, managing, and analyzing big data and how the 5Vs (volume, velocity, veracity, variety, and value) are central to mapping and designing interprofessional strategies to promote organization-wide improvement. Chapter 7 provides information on how data influences and guides the development, implementation, and interpretation of policy and regulations by interprofessional teams. Chapter 8 is a discussion of the importance of innovation, data diffusion, and dissemination necessary for interprofessional teams who participate in data improvement processes. Chapter 9 presents information needed by interprofessional teams when developing a business case for change and practice innovation. Chapter 10 is an introduction on how consumer demands and data are driving change by consumers and leveraging interprofessional team power. Chapter 11 provides an introduction to data mining tools and techniques beneficial to interprofessional teams. Chapter 12 discusses how interprofessional teams use evidence to guide quality and safety initiatives. Chapter 13 focuses on how interprofessional teams extract and use data effectively. Chapter 14 provides a futuristic perspective of data and charting a course for care in the 21st and beyond.

Each of the chapters is central to understanding how data frames quality, safety, innovation, and sustainability in interprofessional practice as consumers become more engaged in their care. Adding value to each chapter are case exemplars for application authored by experts from practice, management, and education.

### **CURRENT AND FUTURE HEALTHCARE INFLUENCES AND DRIVERS**

On a daily basis, leaders in healthcare organizations are confronted with the rising costs of care, shortfalls of quality and efficiency of care, and how interprofessional

teams can collaboratively use evidence-based data to achieve improved results, satisfy patients, and create data rich infrastructures. Healthcare of the future will be driven by innumerable data connectivity and consumer engagement. Archetypes that create strategic initiatives and improved business models will be commonplace in order to develop a “culture of health, reduce disparities, and improve well-being of the U.S. population in the 21st century” (DeloitteHealth, 2019; National Academy of Medicine, 2019, para. 2).

Data and platforms are the cornerstone of a health ecosystem that generates decision-making insights fundamental to invest in new and improved healthcare technology (DeloitteHealth, 2019). With the increasing cost burden generated by chronic health conditions and an aging demographic, the use of data is a beneficial investment in the digital health technology market. This investment will offer individuals across the care continuum expanded opportunities to manage well-being. Favorable reimbursement policy development and efficacy research are possible as digital technology expands.

Digital therapeutics has increasingly become a debated and discussed topic in order to establish a comprehensive network of options for disorders and diseases. According to the Digital Therapeutics Alliance, “digital therapeutics deliver evidence-based therapeutic interventions to patients that are driven by high-quality software programs to prevent, manage, or treat a broad spectrum of physical, mental, and behavioral conditions” (Digital Therapeutics Alliance, 2019, p.1). Digital therapeutics produces a broader product from others available in the digital health landscape (Comstock, 2018). The benefits in this field are infinite for all stakeholders as it evolves.

Nationally, healthcare reform continues to remain an agenda item as prices escalate, mandates for quality and safety outcomes increase, and prevention services expand (Centers for Medicare and Medicaid Services [CMS], 2011a, 2011b). While the Patient Protection and Affordable Care Act of 2010 remains law, parts have been restructured with actions that create positive and negative outcomes (Office of Legislative Council, 2010). Regardless of the changes, meaningful use, collection, and analysis of data remain central to healthcare organizations survival. Understanding the value of data, selecting various digital platforms and devices, and analysis of information will continue to be markers for success as future reforms occur and inter-professional teams collectively engage in improvement activities.

The growth of consumer engagement in healthcare continues to expand and consumer-centric products are continuously being introduced into the market. In 2016, 46% of U.S. consumers were active users of digital health devices (Adams et al., 2016). The demand will continue as healthcare consumers become more knowledgeable about the benefits of preventive health and digital products that are unique to their behavior, lifestyle, genetics, and the environment. While healthcare products are marketed daily, developers must consider that each consumer is structurally, emotionally, and chemically different (Babalola, 2017). Consider for example the healthcare consumer who has the option to trial and purchase a phone application to measure pulse rates during walking. Based upon market demand, the product margin is predictable based on volume. Unlike the phone application, cardiac bypass

surgery does not offer a trial period before the procedure is performed (Babalola, 2017; Mwachofi & Al-Assaf, 2011). This presents developers of new products with many challenges. Future research and development departments will require large quantities of data collection and analysis as new consumer-centric health products are marketed in order to personalize services.

The U.S. population continues to age at a rapid rate. As Americans age, the number of continuing care communities (CCCs) continue to grow contributing to a demographic who are active, use digital technologies to manage health status for a productive and meaningful life, and seek care communities for continuum of care options (Szlauderbach, 2020). As the popularity of CCCs increase, multiple markets will be tasked to develop new technologies that promote preventive health dedicated to health and well-being. Metrics will guide data collection and analysis that focus on outcomes important to individuals, families, and care providers (Rowe et al., 2016).

The shift from health to health and wellness will continue to be a significant influence in contemporary society as life expectancy and demands for new technologies and wellness-focused commodities increase (Alder et al., 2016). Influencing the shift is data coupled with personalized health coaching in order to create a pathway that optimizes individual healthy outcomes. As data from genetic testing are collected and analyzed, research opportunities that focus on prevention and care for illnesses will transpire (Mann, 2019).

## HEALTHCARE TECHNOLOGY ADVANCEMENTS DURING THE PAST DECADE

In the past decade, the healthcare industry has experienced an information revolution similar to the industrial revolution. The information revolution is credited with a variety of technology advancements in an era where the electronic medical record was adopted. As healthcare organizations leverage technology to improve outcomes, the technology advances of the past decade provide roadmaps for developing a future landscape for transforming quality, while ensuring safe and affordable care. As outcome-driven markets increase, digital health markets will continue to soar. In 2018, the digital health market represented a funding investment increase by 230% with predictions to continuing rising (Zweig et al., 2018).

Change in healthcare is constant and how data are obtained and disseminated impacts daily operations. Quantum leaps in efficiency and effectiveness have and will continue to occur with the diffusion of technology and availability of electronic networks that provide instant access across all points of care (Geibert, 2017). Technology has evolved with a shift from power to value as evidenced by greater throughput and efficiency in emergency departments and clinics with the use of protocol automation.

The previous example is only one of the many advances where value, both human and financial, is attributed to technology advances during the past decade. The following technological advances are further examples that will transform healthcare and the importance of data, as individuals remain the centrality of care delivery beyond the 21st century.

Telemedicine has gained much popularity since its introduction, offering opportunities to treat chronic diseases without traditional visits to providers and expanded accessibility to care in remote areas. One of the most documented uses of telepresence is in mental health. Patients receive prevention, treatment, and reduced stigma associated with office visits using this technology (Newman, 2017).

Patient-centric devices that are wearable have continuously entered the market. Patients are able to transmit cardiac, weight, pulse, and oxygen level information without visiting a provider's office. Future advancements will offer opportunities where biochips will aid in the treatment and management of chronic disorders such as diabetes, cardiac disease, and dosing requirements required from many chronic conditions (Shah, 2015).

Traditional software of the past decade is incapable of providing seamless data to consumers and providers. Cloud-based technologies offer new advances for rapid capture and transmission of electronic medical records (Shah, 2015). This advancement does however raise red flags related to patient privacy and data security. Healthcare organizations are therefore confronted with the question, "is the data value greater than financial gains"? (Newman, 2017). The answer remains a significant challenge nationally and globally in healthcare organizations and information technology circles.

Maximizing technology and use of data management systems during the past decade has offered multiple opportunities in healthcare. The value of big and small data remains a valuable source of information when analyzed and integrated into strategic and financial planning. Big data that are generated from multiple sources offer a snapshot of what is occurring without answering why. The data are used to describe, interpret, and predict (Henley, 2014). Small data on the other hand provides material to answer a specific question or address a problem. Small data can support big data by generating new knowledge and has potential for change in care, operational efficiency, and satisfaction (McCartney, 2015). Future healthcare demands will require shifts from big and small data to meaningful specialty-specific analytics. The prominence of specialty-specific analytics will intensify as healthcare organizations access, share, and analyze evidence that will include population health management and efficient treatment pathways (Das, 2018).

These are only a few of the many advances in the past decade that will benefit the healthcare industry. Future developments remain promising and offer opportunities for entrepreneurs to capture segments of healthcare technology markets.

## **MEETING HEALTHCARE POLICY, REGULATIONS, AND CONSUMER DEMANDS**

Meeting policy, regulations, and consumer demands require continuous actions by any healthcare organization due to the volumes of data generated daily. The best-case scenario of how data influences each of these demands is characteristic of the activities related to each demand.

Policy in healthcare establishes a general plan of action to guide desired outcomes and make decisions. For example, policies guide how data are collected, analyzed,

and used to improve healthcare quality, safety, and efficiency. Policy changes occur often due to provisions within healthcare reforms, federal and state requirements, the Centers of Medicare and Medicaid provisions, the Joint Commission Standards, and other accrediting requirements. Therefore, communication of health policies to employees and use of technologies that regularly update them based on evidence are foundational to success, consistent practice, and avoidance of deficiencies and penalties (Leahy, 2019).

The exponential number of federal regulations that affect the healthcare industry requires significant resources in order to meet the demands. According to the American Hospital Association (AHA) (2017), there are 629 regulatory requirements mandated by four agencies that promulgate the requirements. The agencies include the Centers for Medicare and Medicaid, the Office of Civil Rights, the Office of Inspector General, and the Office of the National Coordinator for Health Information Technology. While regulatory frameworks are necessary for ensuring basic standards compliance, it is estimated that \$39 billion per year is dedicated to comply with the administrative aspects of compliance. While the requirements are steeped in a foundation aimed at ensuring patients receive quality and safe care, the results evidence less time spent in patient care and spiraling healthcare costs (AHA, 2017; Singh, 2018).

How the healthcare industry continues to respond to the regulatory challenges is unclear. However, there is current evidence that the challenges have resulted in fines for data breaches, increased information technology infrastructure costs, lowering of reimbursements, and fraudulent claims to identify a few (Singh, 2018). One thing remains constant, regulatory demands will continue. Capturing meaningful data and thorough analysis remains a key ingredient for the vitality of healthcare organizations and dealing with human lives.

Healthcare organizations depend on patients in order to generate revenues. Understanding patient needs and demands is requisite to remain competitive and maintain loyalty. Using data from a variety of sources such as satisfaction scores, type and frequency of services used, and health data create a data-centric culture where patient-centrality becomes central to strategic decisions and actions (Betts & Korenda, 2018). More patients are reviewing quality ratings and prices when making decisions regarding care and providers. Engaging patients to become active consumers of health and well-being can result in improved outcomes, improve the patient experience, lower healthcare costs, and ultimately meet patient demands.

## SUMMARY

- The healthcare industry is constantly changing based on internal and external influences. Change will be driven by data connectivity and consumer engagement.
- Healthcare is experiencing an information revolution similar to the industrial revolution.

- Data and platforms, digital therapeutics, health reform, consumer-centric products, care communities, and a shift from health and wellness are influencing the healthcare industry.
- Healthcare organizations must use meaningful evidence-based data to achieve, quality, safety, and sustainable outcomes.
- Interprofessional practice teams use evidence-based data to improve results, satisfy patient demands, and create data rich infrastructures.
- Comprehensive strategy and new business models are requisite in order to develop a culture of health, reduce disparities, and improve health.
- Data and data platforms generate decision-making insights fundamental to improving technology.
- Digital therapeutics delivery evidence-based interventions necessary to prevent and manage physical, mental, and behavioral conditions.
- Healthcare reform remains an ongoing agenda item in order to meet the challenges demands confronting healthcare.
- Consumer engagement is driving digital product introduction that are unique to one's behavior, lifestyle, genetics, and the environment.
- Data coupled with health coaching create pathways for optimal health.
- Technology has shifted from power to value that generates new efficiencies and value in healthcare.
- Cloud-based technologies offer rapid advances to capture and transmit electronic medical records.
- Big data offers a snapshot of what is occurring without answering why; whereas, small data provides information to answer a specific question or address a problem.
- Health policy establishes a plan of action to guide desired outcomes and make decisions.
- Federal regulations are affecting the healthcare industry by requiring significant resources for compliance.
- Meeting consumer and patient demands will continue to be an essential activity for the ongoing development of technology and survival of a healthcare organization.

## REFLECTION QUESTIONS

1. Select an internal influence affecting healthcare delivery in an organization. What data should be collected to assist in managing the identified influence in order to achieve quality, safety, and sustainable outcomes?
2. Access a business model to use when introducing a new digital product in a healthcare organization. What steps will you take to introduce the product based on the business model selected?
3. Why is it essential to identify and synthesize data before introducing a new idea or product in healthcare?



- Review the list of federal regulations required for compliance by health-care organizations. Which of the regulations do you recommend for elimination and why?

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# CASE EXEMPLARS FOR APPLICATION

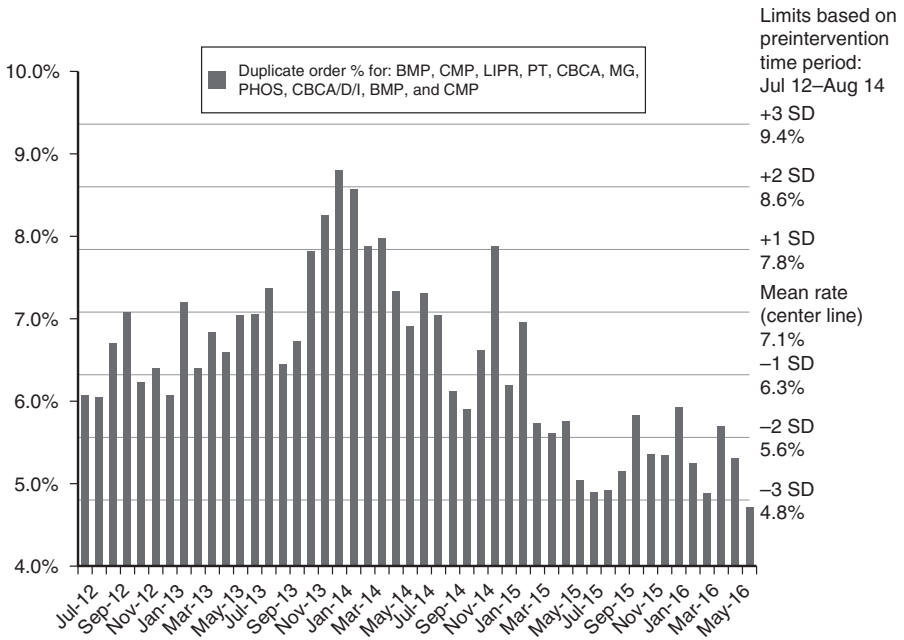
## A Lean Lab

Alison M. Scarry

A change in the process to order lab tests led to a significant increase in duplicate orders at our 186-bed community hospital, prompting immediate action. The efforts to address duplicate orders reduced the duplications by 50% and represented a significant cost savings. The laboratory processes over 100,000 tests for 15,000 patients each month with daily volume reaching as high as 4,000 tests in inpatient, observation, surgical, and emergency settings. Given the size and volume of our lab service, it is not uncommon to have duplicate tests ordered as a subset of unnecessary lab tests (Salisbury et al., 2011) and overuse of diagnostic tests are in fact identified as medical errors (Levick et al., 2013).

Payment for lab services are most often bundled into the overall payment for a given inpatient, surgical encounter, emergency room visit, or observation stay. Additionally, our service is a stand-alone outpatient and central processing facility for physician office labs (POLs), which is mostly fee for service (FFS). This provides high-quality lab services and incredible economies of scale for our community. The balance of services means that overuse for inpatients, for example, consumes the capacity for providing outpatient FFS lab work.

Given “Duplicate Lab Orders” are defined as the same patient, test, and start date for nine of the most common labs, over four and a half years or 54 months between January 2012 and June 2016 charted in Figure 1.1 (Scarry et al., 2017), the following patterns emerged. The overall average rate of duplicate orders over the 54 months is 6.5%, indicated by the straight gray horizontal line in the middle of Figure 1.1. The duplicate rate was between 6.5% to 7.5% for 22 months (January 2012 to October 2013), then rose sharply in November 2013 for six months through April 2014, above 7.5% and more than one standard deviation from the mean indicated by the top horizontal dotted line. This was among 10 straight months above the mean rate of 6.5%, from November 2013 to August 2014 including two straight months (January and February 2014) more than 8.5% and two standard deviations above the mean indicated by the top horizontal line.



**FIGURE 1.1** Duplicate lab orders: same patient and same test start date.

Source: Data from Scarry, A., Eamranond, P., Joshi, M., Haque, I., Geary, S., & Collins, B. (2017). A system-wide movement to improve patient care and reduce unnecessary laboratory testing. *Medical Lab Observer*, Mar 21, 2017.

All of these anomalies are beyond the signals of statistical significance and system change. In fact, the hospital had changed the lab ordering process in November 2013 moving from a laboratory information system (LIS) to a hospital information system (HIS). The LIS had clinical decision support (CDS) built in that alerted providers of duplicate orders. Despite the possibly perceived nuisance of such alerts, the absence certainly presented in significant terms. During this time, over 500 complaints were made through the hospital incident reporting system about this patient safety issue mainly by phlebotomists worried they were being asked to needlessly draw blood from a patient. Instead, they questioned the order and escalated to lab managers who researched and likely cancelled the order, then made the formal complaint with details. That process was more time intensive and therefore more costly than performing the test but it was much better for the patient and drove systemic improvement.

In short time, a multidisciplinary team was formed between the laboratory utilization committee and medical administration. Within months, systemic, cultural, and significant results were achieved (Scarry et al., 2017). By September 2014 the duplicate order rate was below the mean rate 6.5% for the first time in a year and a half. For the last 16 months in Figure 1.1 (March 2015 to June 2016) the duplicate percent has been below the mean rate. Including four consecutive months below 5.5%

or one standard deviation (June-September 2015) indicated by the bottom horizontal dotted line. Both are significant trends and indication of major system change. Duplicate results are now a more predictable 4% to 5% versus 6.5% to 9.5% and we continue to improve and model these efforts for MRI, CT scans, and other ancillary services.

## REFLECTION QUESTIONS

1. Examine the care you deliver for gaps or redundancies. What steps could you take to ensure the gaps in care were filled or to eliminate the redundant practice?
2. As you consider the data required to address the issues identified in number 1, what first step could you take to bring awareness to your colleagues?

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# Higher Education Outcomes

Heather R. Hall

The well-documented need for faculty and administration to collaborate requires processes to collect, analyze and use data to inform programs, curriculum development, and evaluation (Kezar et al., 2007). The need for increased clinical placement settings, faculty, student enrollment and outcomes presents increased challenges for nursing programs. These challenges provide the need for additional administrative requirements and faculty collaborations to ensure successful higher education outcomes.

A committee of graduate track coordinators and administrators of a nursing program was appointed to review the competencies for specialty tracks, clinical placement processes, policies and procedures. The committee continuously used data to enhance the student documentation used for clinical placement. These processes included management of clinical affiliations, documentation requirements, clinical paperwork, faculty certifications, and licensure to ensure completion of program learning outcomes. The administrators serving on the committee reviewed the policies and procedures recommended by the committee and made sure the appropriate committees within the college were included in the discussion and implementation. The faculty and administrators collaborated to ensure compliance with updated specialty competencies, criteria for nurse practitioner programs, and standards for accreditation for Master of Science in Nursing, Doctor of Nursing Practice and Post-Graduate APRN Certificate programs (Commission on Collegiate Nursing Education Accreditation, 2020; The National Organization of Nurse Practitioner Faculties, 2020).

The implementation of the committee's recommended changes improved the specialty track curricula, clinical placement processes, and student outcomes. In addition, positive feedback has been received from students, faculty, and administrators. The committee meets on a regular basis to discuss current challenges that may be improved by processes developed and recommended by the committee. The curriculum and operations within the graduate specialty tracks and clinical placement processes are more efficient. Student satisfaction has increased upon graduation from all programs. The faculty and administrators have identified the committee outcomes as successful and has led to greater efficiency in the use of data and resources.

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