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making technology talk

how interoperability can improve care, drive efficiency, and reduce waste

The abundance of proprietary protocols and interfaces that restrict or prohibit healthcare data exchange take a huge toll on productivity. Health systems and providers should demand better interoperability.

AT A GLANCE

Health systems and providers that search out more interoperable technology can help move the industry toward greater productivity using a multistep approach.

- > Assemble a team of champions to address the interoperability issue.
- > Describe the desired state of interoperability for the organization.
- > Assess the current state of interoperability in the organization.
- > Identify the gaps between the current state and the desired state.
- > Develop a road map for addressing the gaps.
- > Achieve an immediate win by selecting a quickly attainable goal.
- > Maintain focus and communicate successes.

Many industries have harnessed the power of technology to improve outcomes and reduce costs, but despite continued technological advances, health care overall has experienced negative productivity over the past decade. Some organizations are doing better than others. To determine where their organizations might fit into this scenario, healthcare leaders should consider three questions:

- > Does the technology within our health system help clinicians excel in their jobs and achieve the best possible outcomes for patients?
- > Does technology function seamlessly in the background, allowing streamlined operations and freeing care teams to return to the patient bedside?
- > Have we optimized the return on our technology investments?

Chances are that most health system leaders' answers are closer to "not exactly" than a resounding "yes."

Unfortunately, the vast majority of medical devices, electronic health records (EHRs), and other IT systems lack interoperability—i.e., the ability to seamlessly share and use information across multiple technologies. Perhaps more precisely, they lack a common, built-in system that can exchange information across vendors, settings, and device types. Various systems and equipment typically are purchased from different manufacturers, and each comes with its own proprietary interface technology.

As a result, hospitals must spend time and money—both scarce resources—setting up each technology in a different way, instead of being able to rely on a consistent means of connectivity. Moreover, hospitals often must invest in

separate “middleware” systems to pull together all these disparate pieces of technology to feed data from bedside devices to EHRs, data warehouses, and other applications that aid in clinical decision making, research, and analytics. Many bedside devices, especially older ones, don’t even connect; they require manual reading and data entry. The nation’s largest health systems employ thousands of people dedicated to dealing with what one system dubs “non- interoperability.” The exhibit below depicts the current state of data flow.

Rethinking the Interoperability Challenge

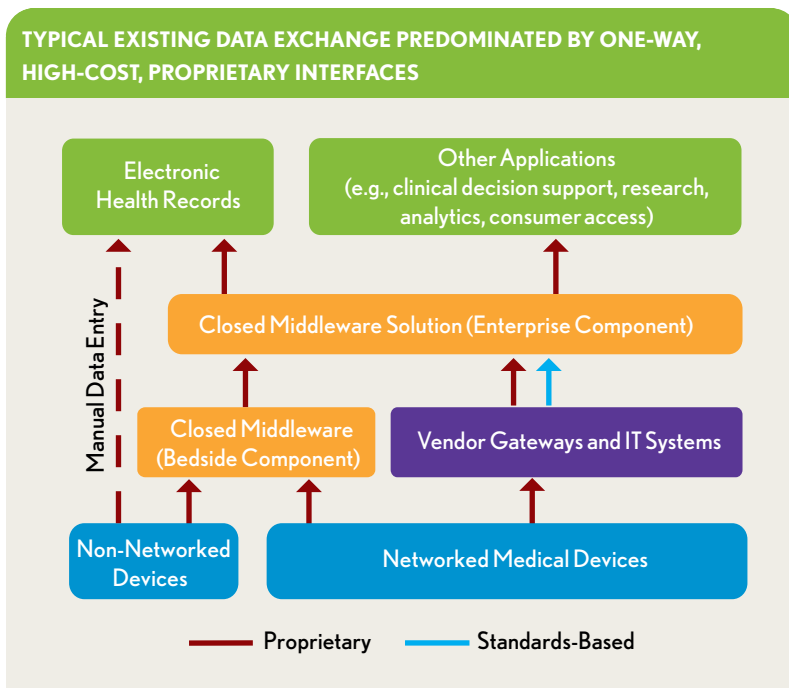
The current lack of interoperability can compromise patient safety, undermine care quality and outcomes, contribute to clinician fatigue, and waste billions of dollars annually. It also hinders progress toward achieving goals for population health management and precision medicine. Worse yet, it impedes innovation, which may be the biggest missed opportunity for health care. People with ideas for doing things differently—both in terms of care processes and technologies used—face significant obstacles accessing data, validating solutions, integrating into highly configured environments, and scaling

implementations across varied settings. As a result, innovators often steer clear of the health-care market because navigating it is simply too difficult, which has the perverse effect of reinforcing entrenched, proprietary interests.

By contrast, the seamless exchange of information would improve care, increase operational efficiency, and lower costs. It would facilitate care coordination, enable informatics, reduce clinician workload, and increase the return on existing technologies. To realize these benefits, healthcare organizations must rethink how the disparate pieces are connected not only within one hospital, but also among every entity involved in a patient’s care, including physicians’ offices, home health agencies, and other post-acute care facilities.

Rather than continuing to be constrained by the high-cost, proprietary status quo, health systems and providers should demand and adopt a platform that is standards-based, addresses one-to-many communication, allows two-way data exchange in real time, and enables plug-and-play integration of devices and systems. Let’s explore these attributes.

The use of *standards-based* interfaces will reduce costs by decreasing the number of interfaces that must be built and maintained. In January 2016, the Senate Health, Education, Labor, and Pensions (HELP) Committee released draft legislation calling for such standards.^a Several private-sector entities, including standards development organizations, continue to develop new protocols, and improve upon existing ones, for data exchange. Those responsible for purchasing and implementing technology should reward vendors that adhere to standard, as opposed to proprietary, approaches. Policymakers and regulators can provide the push toward standards-based solutions while the market creates the pull.



a. Daly, R., “Senate Offers Latest Interoperability Plan,” HFMA Healthcare Business News, Jan. 21, 2016.

One-to-many communication refers to the need for one device or system to communicate with multiple other devices and systems, sometimes at the same time. For example, data elements that are critically important to the safety of care and patient outcomes, such as patient allergies, are manually entered and reentered even on the same inpatient or outpatient visit. Ideally, the data would be entered once and automatically shared with various systems, making it available to any care team and avoiding potential mistakes from delayed data entry. This capability, combined with real-time, two-way communication, would improve workflow by automating tasks as appropriate and ensuring that needed information is readily available—all with appropriate levels of privacy and security.

Two-way data exchange is the backbone of a *learning health system*, characterized by the Institute of Medicine as a health system “designed to generate and apply the best evidence for the collaborative healthcare choices of each patient and provider; to drive the process of discovery as a natural outgrowth of patient care; and to ensure innovation, quality, safety, and value in health care.”^b Patient care technologies need to be able to send and receive data in a manner that enables feedback loops and automation. When connections are one-way, information doesn’t always reach the destination where it is needed and often places the onus on individuals to detect problems. In some cars, for example, sensors are able to communicate with brakes and automatically intervene to prevent crashes. The lack of such information exchange in health care frustrates efforts to apply advanced informatics and improve clinical workflow and care delivery through automation.

Plug-and-play means that when two independent pieces are connected, they self-configure and can talk to each other without (or with minimal) human intervention. For example, an ATM card can be used in any ATM around the globe. A platform with these attributes would give a health

system or provider greater control over the data it needs to deliver safe, efficient, and effective care. A hypothetical platform is shown in the exhibit on page 3.

A key feature of the platform is that it makes it possible to scale interoperability. It provides a blueprint for how the various technologies used in patient care can plug into a health system’s operations. The platform uses adaptors and standards-based interfaces to connect data producers with data consumers. If a vendor can certify that its product works with the platform, the product will be interoperable with any other system already connected to the platform. This interoperability is analogous to how the electrical system in your home works—you can plug a phone charger into any socket in any room and it will work.

The blueprint is the foundation for standardization and innovation. Vendors can compete on capabilities and features, not on access to data, and provide more useful products because they can use all data that work with the platform. The use of standards-based interfaces also levels the playing field and reduces barriers to entry for those trying to innovate in health care.

Driving Interoperability With the Power of Procurement

Creating and implementing a standards-based system is no small task, and impossible for any single system. The procurement process is an effective lever for this magnitude of change. Health systems and providers—as the organizations buying, implementing, and using technologies to care for patients—can and must transform the technical underpinnings of the healthcare industry. Purchasers can reward vendors and developers that work together to adhere to the blueprint, thereby instilling confidence that solutions will work as expected, safely, and securely.

The unified voice of health systems and providers making consistent requests of vendors would benefit purchasers and sellers alike. The need to

b. *The Learning Healthcare System*, IOM Roundtable on Evidence-Based Medicine, March 30, 2007.

FEATURE STORY

create and support customized solutions often is a financial burden on vendors as well. A centralized approach to establishing requirements can overcome the inability of a single health system or provider to compel change on its own. Requirements should be specified in requests for proposals (RFPs) and upheld in contracting language.

For the vendor community, a centralized approach also provides a focal point for engaging customers in solving shared technical challenges. It also makes enlisting the help of other industries easier. Breaking legacy thinking is one of the hardest, yet most critical, aspects to revamping data flow in health care. Learning from those industries that have conquered similar challenges is invaluable.

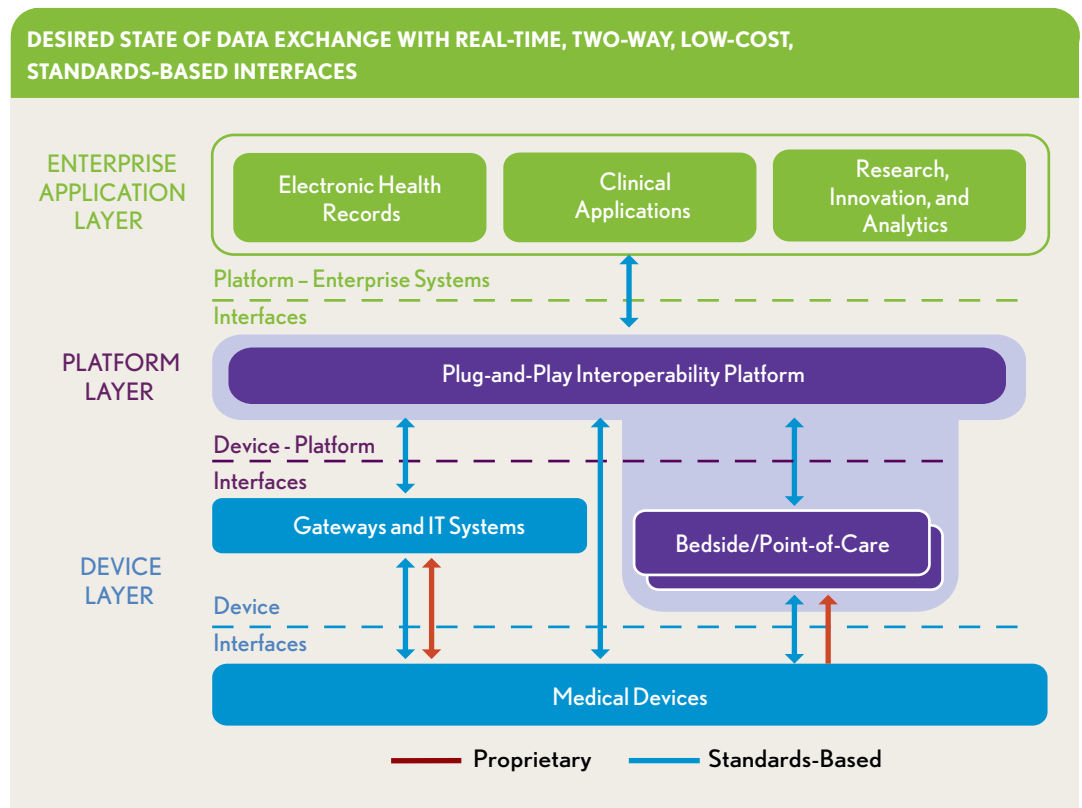
A Playbook for Change

Concurrent proprietary advances are common in the natural evolution of technology. Only after users have adopted disparate solutions do markets tend toward consensus and standardize

on important operational parameters. The difficulty with regard to healthcare technology is that advances have been so rapid, and solutions have been so complex, that the “natural” evolution toward standardization is a decidedly uphill battle. If progress is to be made any time soon, it will require significant *pull* from users, to use marketing terminology, rather than waiting for a push from suppliers.

The following seven steps provide a methodical approach healthcare providers can take to encourage technology suppliers toward standardized information sharing.

Assemble a team. An effort as expansive and complex as improving the interoperability of a health system requires a champion (or team of champions). Start by assembling a team of cross-functional individuals, including caregivers, clinical informaticists, IT professionals, clinical engineers, operations leaders, financial managers, and a patient advocate. This team should have CEO sponsorship to ensure



organizational alignment and assistance in overcoming barriers.

Describe the desired state. A major objective of the team is to set a vision for the future. This vision should reflect organizational priorities and not be limited by the constraints of how things work today. The people, process, and technology framework can be a helpful organizing principle.

The vision should contemplate improving patient outcomes and treatment experiences. It might, for example, imagine a quieter care environment that leverages built-in technology for identifying and monitoring patients. The vision could set a goal for HCAHPS scores and address the necessary inputs.

The vision should account for care teams' biggest pain points and reimagine workflow to create a better user experience with seamless technology that supports care. One large health system armed 800 of its frontline nurses with 3-by-5 index cards and asked them over the course of two days to write down what they needed to improve their care delivery. The top needs identified through this exercise were cleaning up the EHR terminology; making the nurses mobile without nuisance alarms and notifications; and, most important, getting the nurses back to the bedside with the support of seamless technology in the background that would help them provide the care their patients deserve and desire.

The vision also should consider how technology can drive efficiency and support care outcomes. For example, documentation tasks such as recording and transcribing patient information detract from time spent directly with patients. The burdens of manual documentation generally result in less frequent documentation, which leaves real-time vital sign data lacking and limits the use of clinical decision support tools, such as the Modified Early Warning System (MEWS), to monitor and respond to changes in patients' conditions. Technology also can help reduce waste and manage throughput, which, in turn, helps care teams.

TECHNICAL EFFORTS PRIORITIZED AND ORGANIZED BY CLINICAL CARE CONTEXT

| | |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pre-Acute Care | Home care, continuing care |
| Acute Care | Emergency medicine, critical care, pathology and laboratory, pharmacy, imaging, surgery, anesthesiology, cardiovascular surgery, transplant |
| Ambulatory Care | Primary care, obstetrics and gynecology, cardiology, behavioral medicine, cancer, internal medicine, dermatology, endocrinology, gastroenterology |
| Continuing Care | Case management/chronic disease management, physical and occupational therapy, palliative care/hospice, long-term and post acute care, rehabilitation |
| Health and Wellness | Diet and nutrition, fitness and exercise |

Assess the current state. To be able to make any improvements in interoperability, the team must understand the current state of interoperability across the health system. Interoperability, like security, is not a specific state but rather a continuum, ranging from complete inability to exchange even a single data point to the fluid exchange of information. It is therefore difficult to measure. The Center for Medical Interoperability has developed a maturity model to help evaluate an organization's level of interoperability—basic, intermediate, or advanced—in five key dimensions:

- > *Infrastructure.* How connected, secure, and resilient is the health system's infrastructure?
- > *Contextual/dynamic.* Do information exchanges enable safety and optimal decisions?
- > *Conversational complexity.* Is information exchange orchestrated to meet the organization's needs?
- > *Terminology/semantic.* Do the places that send and receive the organization's data speak the same language?
- > *Syntactic.* Is the information the health system needs to exchange formatted to meet those needs?

It is important to make coordinated progress along each dimension to increase the degree of interoperability from basic to advanced levels.

Current-state assessment also should include analyses of costs and contracts. Health systems and providers need to know the total cost of installing and maintaining the thousands of interfaces and systems supporting data exchange. They also would benefit from understanding how contracts for each device and IT system, including EHRs, affect their level of interoperability.

Identify gaps. After the current state has been assessed, the team can identify gaps between the desired and current states. It will be important to clearly define gaps and measures to evaluate progress being made in filling those gaps. As needs will likely overwhelm available resources, it will be essential to prioritize and gain executive and organizational alignment around each remedial measure.

Develop an implementation plan. Having identified interoperability gaps, the team can create a plan for addressing them. This plan should detail priorities and suggest a phased approach that emphasizes clinical impact and allows for measurable levels of attainment.

The technical activities outlined in the road map could be framed through a clinical perspective. The clinical area may be divided according to five care contexts as shown in the exhibit on page 4.

Technical activities also should take into account the most appropriate sequence for integrating devices and systems. One consideration is

balancing criticality of data with ease of integration. Vital signs, for example, are deemed vital for a reason, and it would make sense that vital sign data be readily available. The first phase of integration could focus on noninvasive vital signs (e.g., temperature, blood pressure, pulse, respiration rate, and oxygen saturation). The second phase could address critical care vital signs (e.g., monitors in the intensive care unit, operating room, or emergency department), and infusion pump, ventilator, and EKG data. A third phase could integrate bed alarm management, call bell management, defibrillation data, and anesthesia data.

Another consideration is prevalence and extent of use of point-of-care devices. The exhibit on page 5 presents a sample tabulation of device occurrence across acute care domains. Such a survey can help an organization prioritize its interoperability improvement efforts.

The key consideration when phasing improvements is making sure those improvements suit an organization’s needs, including what’s important to clinicians. Opportunities abound for interoperability to positively affect safe clinical outcomes and patient satisfaction while also reducing costs and improving operating efficiencies. Describing a path forward—both a starting point and a gradual evolution across the clinical and technical domains of the health system—is the foundation for an organized effort to drive progress.

| SAMPLE PREVALENCE TABULATION OF POINT-OF-CARE DEVICES USED IN ACUTE CARE SETTINGS | | |
|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| High Device Occurrence | Medium Device Occurrence | Low Device Occurrence |
| Pulse oximeter Thermometer Vital signs monitor Infusion pump Peak flow monitor Blood pressure monitor | Glucose analyzer Dialysis machine Electrocardiogram Arterial line Blood gas analyzer Defibrillator Fetal monitor Pulmonary function analyzer Ultrasound Blood coagulation analyzer Ventilator | Entropy monitor Mammography unit Anesthesia machine X-ray MRI CT Heart-lung machine ECMO machine EEG |

Achieve immediate wins. Early success will help the team gain support for the implementation plan. Under the infrastructure dimension of interoperability, there is potential for a quick win in improving the wireless environment, which in an increasingly mobility-centric world is an essential preliminary step toward connected, interoperable, and trusted health care.

A reasonable starting point for evaluating wireless health is a Wi-Fi traffic assessment. Detailed findings can inform remediation recommendations to ensure a high level of wireless assurance.

Maintain focus and communicate successes. Maintaining the enthusiasm and buy-in to execute long-term strategic initiatives is not easy. It is important to keep the established team engaged and celebrate milestones achieved. Communicating successes related to improved care, increased efficiency, and reduced waste will be important to sustaining momentum.

A Call to Action

Achieving interoperability requires effort on both the business and technical side of operations. One tactical step that health systems and providers can take immediately, and in parallel with enacting long-term strategies, is to audit existing contracts. Any contractual language that impedes optimal patient care should be catalogued.

Examples of such language are gag clauses, provisions that inhibit data sharing or make it prohibitively expensive, and limitations on engaging other vendors and third parties. To remedy contractual terms that are counter to the best interests of patients, these terms must first be identified and understood.

We can no longer accept the status quo of U.S. health care. We must require the same level of interoperability that we enjoy in other aspects of life. It's time for the healthcare ecosystem to come together and drive change. Patients deserve better outcomes and care experiences, healthcare professionals deserve technology that helps them excel in their jobs, and our nation deserves a sustainable health system to care for generations to come. ■

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