Our Learning Health Care System Journey

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The policy drivers behind meaningful use are improving quality, enhancing safety, and increasing efficiency in our health care system. In my view, health care in the United States lacks “systemness”—instead relying on disconnected hospitals, clinician offices, labs, pharmacies, and long-term care facilities. How will meaningful use achieve its policy goals and bring us to a future state of coordinated care, a focus on wellness, and broad dissemination of best practices?

The three stages of meaningful use are:

- **Stage 1**: Move clinicians from paper to structured data capture in certified electronic health records (EHRs)
- **Stage 2**: Share data among providers, patients, and payers via health care information exchange
- **Stage 3**: Create a learning health care system that enables new knowledge to be disseminated rapidly

For everyone, this is a journey and an incremental learning experience. At Beth Israel Deaconess Medical Center, here’s how we’ve approached it.

We changed our medical staff bylaws to require the use of a certified electronic record by December 2010 as a condition of practice. A few clinicians retired or resigned, but we achieved 100 percent adoption in all our owned and affiliated practices.

We have enthusiastically supported “private” health care information exchange efforts to link together all our internal stakeholders in community hospitals, clinician offices, and academic health centers for bidirectional sharing. At the same time, we've been very involved with “public” health care information exchange efforts to share data among competing organizations, with public health entities, and with quality registries. Using the New England Healthcare Exchange Network, we transmit a summary of every encounter to a statewide quality data center that computes all of our meaningful use quality measures, physician quality reporting system measures, and pioneer accountable care organization metrics for government entities. Today, we have 2.2 million patient records and over 200 million data elements.

Data alone do not make a learning health care system. Data must be transformed into information, knowledge, and wisdom. How are we doing that?

1. Controlled vocabularies: We’ve mapped the 200 million data elements to LOINC® (Logical Observation Identifiers Names and Codes) codes for labs, SNOMED-CT® (Systemized Nomenclature of Medicine–Clinical Terms) for problems/diagnoses/procedures, and...
RxNorm for medications. We’ve created a standards-based query tool that enables any authorized user to explore population data via 20,000 structured medical terms. We use the concept hierarchies curated by the National Library of Medicine so that users can query from the most general to the most specific concepts, such as all cardiovascular medicines, all anti-hypertensives, all ace inhibitors, or just lisinopril.

2. Enable analytics: Our quality data center includes its own business intelligence applications, but we also embrace the open-source PopHealth software for automated computation of quality measures in support of meaningful use. PopHealth examines the clinical summaries exported from all certified EHRs and calculates numerators and denominators without requiring the creation of a registry or repository.

3. Support distributed queries: In addition to sending data to centralized repositories, we support federated queries in which questions are sent to many organizations, which respond with answers. We’ve done this across the Harvard-affiliated hospitals as part of the Clinical and Translational Science Awards program. We also support the Office of National Coordinator Query Health project to enable nationwide broadcast queries such as pharmacovigilance from the Food and Drug Administration (FDA). For example, the FDA could send a standards-based electronic query to hospitals asking for the number of patients on Vioxx from 1999-2004 and incidence of ischemic heart disease/stroke before, during, and after the availability of Vioxx in the marketplace.

The year 2015 will bring us to Stage 3 of meaningful use, with incentives to implement these three strategies nationwide. At that point, we will free the data from the silos where they live today and enable the information technology foundation for a learning health care system.

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Note: Authored commentaries in this IOM series draw on the experience and expertise of field leaders to highlight health and health care innovations they feel have the potential, if engaged at scale, to foster transformative progress toward the continuously improving learning health system envisioned by the IOM. Statements are personal, and are not those of the IOM or the National Academies.

In his discussion of three stages of meaningful use, John Halamka describes the experience of implementing the information exchange and analysis steps that can marshal clinical data to generate new knowledge and insights at Beth Israel Deaconess Medical Center. His discussion touches on several issues and lessons central to delivery of care that is effective, efficient, and continuously improving, including the importance of:

- Full staff involvement in the effort for meaningful use of electronic health records.
- Adoption of term and vocabulary standards that enable practical data exchange and use.
- Infrastructure that facilitates queries, both broad and targeted, with structured search terms.
- The capability to support analytics of centralized clinical data, as well as federated broadcast queries.

Information on the IOM’s Learning Health System work may be found at www.iom.edu/learninghealthsystem.