Commentary: Clinical Informatics

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The true impact of comparative effectiveness research (CER) will be measured one decision at a time and one life at a time. A great number of these decisions will be made in traditional clinical settings where clinicians and their patients must decide what to do and then act on their decisions. Their decisions and subsequent actions will be the product of individual and mutual understanding of choices and consequence. Some decisions—and we often do not know which ones—may literally be matters of life and death. The gravity of such decisions warrants timely and informed deliberation. But time constraints rarely afford such luxury. In primary care settings, important decisions must be made within the brief minutes of a typical office visit. Outside the clinic, decisions are often made using telephones or other messaging technologies. Ephemeral decisions are often different. They may be made with less supporting information, and neither their context nor their substance may be incorporated into an electronic health record. In some situations, potential evidence may be lost and individuals may be subject to increased medical risk. Clinical informatics researchers and practitioners seek ultimately to realize maximally efficient and effective 2-way communication between people facing medical decisions and the knowledge resources designed to ensure that good decisions are made. Clinical informatics professionals aspire to see that every care encounter contributes to society's greater understanding of biology, public health, and the care of the individual. To ensure that knowledge is translated into actionable plans that in turn are monitored and adjusted, clinical informatics professionals aspire to see that every decision—great or small—is informed by all knowledge and evidence necessary to produce an optimal result. Endeavoring to ensure that every clinician and patient recognize and act on important problems promptly, clinical informatics professionals seek to transform the very purpose of information technologies from the management of transactions to the effective use of current knowledge.

Those seeking more informed and effective clinical decision systems face many challenges over how data can be collected efficiently in the course of care, by how data are represented so that they can be compared, by what means such data should be stored and made available for later use, and by the extent to which many clinical information systems are grounded more in complexities of administrative transactions needed for reimbursement than in the nuances of clinical care delivery. Each of the four articles in this clinical informatics section informs the CER debate in complementary ways.

Hamilton Lopez and colleagues examine the peer-reviewed biomedical literature and identify important themes. They describe the emphasis placed on the historical context of various efforts, the maturation of these efforts through the evaluation of pilot platforms, and the critical role of natural language processing and other methods for translating text into semantically linked computable data. Standardization-one of two cross-cutting themes identified—is essential for ensuring the meaning of an individual encounter or initiative is not lost when analyzed with data from other sources. Governance and access constitute a second cross-cutting theme. The privacy of the individual can be maintained only if systems conform to expected social norms. Without explicit declarations of how personal health information will be used or how such information

will be made anonymous, public distrust will doom ambitious expectations. Without strong governance, the long-term sustainability of vital infrastructure becomes less certain.

Building on the historical context identified through the literature review, Wilcox and colleagues examine five recent initiatives that leverage society's rapidly changing preference from paper and workstations to mobile devices. Their Washington Heights Initiative Community-based Comparative Effectiveness Research project demonstrates how mobile devices can be used to collect primary data across multiple settings, combined with data from other sources, and made available for CER. In one of four other initiatives reviewed—Colorado's SAFTINet initiative—data collection depends on the care context and the extent to which data can be captured as part of the clinical encounter. Paper, electronic health records, kiosks, or tablet computers are all potential means for collecting data as use of these technologies become more widespread. Briefly contrasting their use of mobile devices in clinical research with the use of mobile devices in clinical care, the authors raise some challenges and opportunities ahead, as mobile computing devices become a dominant medium for many forms of communication.

Kahn and colleagues describe how their SAFTINet initiative informed the development of one of many robust data models needed for CER. Such models are part of the standardization efforts described in the Hamilton Lopez literature review and are essential to meaningful data aggregation and interpretation. The Kahn article serves as an excellent primer describing how answering specific questions can help navigate through numerous design trade-offs. Implicitly, they suggest that data representation (and, indeed, overall system design) is ultimately driven by questions of purpose: what is the system designed to do?

Sittig and colleagues compare and contrast 6 relatively new large-scale clinical informatics technology platforms used to support CER. Each initiative is the inheritor of a different institutional technology legacy, each system was designed to satisfy slightly different needs, and each design team made different data modeling and design decisions driven both by legacy and by intent. Each of the systems described raises cross-cutting aspects of the conceptual model for clinical informatics infrastructure. Intended use, available data sources, culture, workflow, regulatory pressures, evaluation methods, technology platforms, and policies are among the many factors that must be taken into consideration when applying clinical informatics to CER.

These four clinical informatics infrastructure articles validate one another and, when read together, raise additional issues. To address the gaps identified in literature reviews the relative absence in the academic medical literature of clinical and administrative technologies used by health plans, data analytics companies, and other private sector concerns must be added. These systems dominate the landscape of health care delivery and financing today and will greatly influence the course of policy, health care financing, and widespread application of CER. More structured and open discussion between the private sector and the academics may be required both to create the evidentiary base required for CER and to realize routine application of CER findings. To integrate mobile technology platforms and other emerging technologies into CER efforts, one must understand how these technologies are part of a more pervasive global infrastructure that is changing work and life. To realize an intended purpose, data must be represented in ways that assure integration and analysis without loss of context or meaning. To develop and sustain a CER clinical informatics infrastructure, current technology efforts must be nurtured, while means of combining people, policy, process and technology are evaluated.

Collectively, these articles demonstrate a degree of progress that would have been almost inconceivable only a decade ago. Reports of such progress provide both the evidentiary base and the optimistic spirit essential to face the many challenges ahead.