CHAPTER

Looking Ahead: The Road to Broad Adoption

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30.1 Where we are now

In the previous edition of this book, seven years ago, the subtitle of the book, and of this last chapter, was "The Road Ahead." After decades of work, the field had reached a stage in which progress toward adoption was occurring very slowly and haphazardly and was in need of stimulation through a set of concerted efforts that the book took pains to outline. Happily, many of those efforts, such as progress in standards and interoperability and new architectures for integrating computer-based clinical decision support (CDS) with host systems, organizational efforts to build implementation skills and teams, tools for knowledge management, and evaluation studies demonstrating value of CDS, actually occurred, and have greatly accelerated the pace of CDS research, development, and implementation – although readers will surely recognize that this journey is far from complete.

It is actually quite amazing that during the same short period of time since our previous edition, a number of other factors that were just beginning to take shape are also growing into major forces stimulating interest in and need for CDS. These have included the *rise of new or expanded capabilities* such as those listed in Table 30.1.

In addition to new capabilities, we have seen the rise of *new demands, stimuli, and incentives* for CDS brought about by the factors such as those shown in Table 30.2.

All of these new and rising capabilities and demands have been discussed in various chapters of this book, as we have sought to provide a grounding for the reader in the technical, standards, organizational, and policy aspects underlying and driving or impeding CDS adoption. The new foci have actually resulted in seven additional chapters on topics not discussed at all in the previous edition – more than 25% of the book. This is testimony to the fact that we are no longer in a stagnant period in which change is slow, but a period in which many forces are pushing us rapidly toward broad adoption. Hence the new subtitle.

At the same time, the scope of CDS has become much more complex. What we mean by "CDS" has greatly expanded, to include new methods and approaches to aiding the process of care, and new ways of integrating them into the care process, including wellness and disease prevention settings, and expanded data sets on

Table 30.1 New and expanding capabilities for CDS over the past decade

New or Growing Capabilities	Description and Examples	CDS Implications and Opportunities
"Precision medicine"	Translation to practice of the results of "-omics" research and development of targeted therapies	Approaching N of 1, need for vast scale-up of available knowledge and new CDS methods, new organizing framework for delivering
Consumer/ patient engagement	Health, wellness, fitness activities, use of biosensors, monitors, and tracking devices; PHRs and patient portals; mHealth, social networking, consumer activism; media ads with dire warnings, with tagline, "Ask your doctor if 'X' is right for you"	Need for patient-centered CDS tools, shared provider-patient tools, provider information resources and tools for responding to patient queries; new approaches to responding to patient personal sensor/monitor alerts
"Big data"	Expansion and growth of comprehensive aggregate databases upon which population-based analytics and population health management initiatives can be based; new sources from genomics data; personal health data, improved NLP extraction from records; feature extraction from medical images	Methods of analytics and predictive modeling; population management; methods of selecting patients maximally similar to a given patient, for immediate "patients like mine" analysis
An "app" culture	Rise of ubiquitous and mobile communication and information access in many industry sectors; health care slower because of difficulties and resistance to interfacing with EHRs but yielding; growth of mHealth (see above)	New ways of organizing, visualizing, summarizing, and interacting with data, and providing the opportunity to incorporate CDS in creative ways
Interoperability and standards	Gradual adoption and incorporation of knowledge representations, data models, SOA interfaces for health data exchange and messaging	Ability to deliver apps with CDS capability that integrate better with clinical systems, can function across venues of care, can facilitate workflow and care coordination

which to base them, and new and more comprehensive realms in which to apply them. Thus, although many factors are now converging to bolster the demand for broad adoption, the direction this will take is far from clear. More than likely, we will see progress at different rates along a number of somewhat uncoordinated directions concurrently, based on each of the above trends, as well as continued traditional efforts, until a more unifying framework comes into being that will enable these disparate approaches to be combined, scaled, and applied more effectively.

Table 30.2 New demands, stimuli, and incentives for CDS over the past decade

Demands, Stimuli, Incentives	Description and Examples	CDS Implications and Opportunities
EHR adoption	In many nations, as top-down national programs either incentive-driven or required. HITECH Act of 2009 in US, almost complete adoption in general practice in UK, use of open systems and mobile technology in lower-income countries as examples	Enabling platform for CDS
Meaningful Use	Official term for stages of requirement for use of features of EHRs in US over a several year period; comparable requirements in other nations	Requirements for CPOE, health information exchange, and other capabilities that need CDS, as well as specific requirements for CDS use
Value-Driven Health Care	New health care reimbursement models emphasizing pay-for-value rather than fee-for-service as the basis, creating incentives for focusing on wellness, disease prevention, and better health care efficiencies	Need for CDS focusing on prevention, screening, patient self-management of disease, optimizing hospitalization and discharge
New care delivery models	Patient-Centered Medical Home, Accountable Care Organizations, and other models for managing patients over their lifetime, coordinating care, emphasizing wellness.	Need for CDS focusing on goals such as above, as well as care coordination and workflow process optimization.
Quality monitoring and reporting	Demands for measurement of various quality indicators, and periodic reporting of them, as part of Meaningful Use and other certification and regulation mechanisms in US, with similar programs elsewhere	Quality reporting itself as a method to provide CDS; also drives need for proactive CDS to achieve quality targets

My own prediction is that this will take another decade, given the great amount of change that is now underway and the transformation of our health system itself, which, in the US at least, although inevitable, is still in its early stages.

As I did in the previous edition, I use this chapter to venture into uncharted territory, by discussing how the various forces may evolve, and some of the requirements that will need to be met to achieve true broad adoption of CDS. I will go so far as to pose a possible unifying framework for that evolution. My hope is that this will stimulate discussion and action, and that the suggestions contained herein will be helpful to readers engaged in this field in accomplishing the goal of broad dissemination and wide use of high-quality CDS.

30.2 Impediments still with us

Over the past five decades, the pursuit of CDS has mostly been stimulated by three main kinds of interests, as we reviewed in Section I: (a) the intellectual and technical challenge of understanding and improving the cognitive processes and information base of the human; (b) the moral and ethical imperative to address important issues in patient safety, health care quality, and access to health care; and (c) business and policy reasons relating to allocation of limited resources and control of costs of an increasingly expensive health care system.

Until recently, the efforts to stimulate adoption of CDS based on academic/intellectual interest in innovation per se, and based on goals of error prevention and quality improvement, tended to be carried out largely in academic settings and were ad hoc, as we discussed in Section II.

Business reasons for implementing CDS have also been somewhat opportunistic and locally driven, although frequently tied to changes in health care financing and reimbursement models, efforts to shift care from hospitals to office or home, introduction of managed care, and approaches to curbing overutilization by requiring preapproval/prior authorizations for high-cost procedures, referrals, or medications. CDS had been introduced in those situations as a means of coping with and addressing government or payer regulations and restrictions, as a defensive measure by health care organizations and providers to ward off such intrusions, and as a means of achieving efficiencies. As a result, business-oriented uses of CDS tended also to be implemented in an institution-specific fashion.

Because such responses by institutions have largely been either local and opportunistic, academically driven, or reactive and defensive, and not as a result of top-down policy and a coordinated set of standards, it is not surprising that CDS – in the most prevalent forms of logic rules, order sets, and documentation templates – has been implemented in a manner that is highly dependent on local needs, constraints, and preferences. As a consequence of the individualized nature of the implementations, with setting-specific adaptations and customizations, and the proprietary incompatible platforms in which they have been done, there has been considerable difficulty and little perceived benefit to sharing of CDS knowledge and experience.

30.3 Need for new mechanisms

Motivations have become more coordinated and integrated into policy over the past decade or less, stimulated by factors such as we have listed in Table 30.2, such as national initiatives for EHR adoption in developed nations (NHS, 2006, Pipersburgh, 2011), and as an example of a further specific driver in the US, the requirements for Meaningful Use of such systems (Murphy, 2010). However, the present opportunistic and diverse modes of implementation, and the impediments of them, are still with us. If we are to greatly expand our capabilities, as we need to, just incrementally trying to do more the way we have been will not be the way to do it. It simply won't scale as the complexity and extent of CDS demand increase.

Technical advances that we have reviewed in previous chapters, including computer technologies and systems architectures, in Chapter 29, and development of some of the important standards needed for data and knowledge representation and communication, in several chapters of Section IV, as well as increased understanding of organizational strategies to encourage CDS use, as discussed from several perspectives in Section V, are beginning to make the process easier. Yet adoption of EHRs has largely been through legacy systems, some of which are 10–20 years old, each with proprietary environments, data models, and CDS capabilities. In the US, although well-intentioned, the HITECH Act of 2009 and the incentives for rapid increase in EHR adoption throughout the nation, have in fact greatly expanded the uptake of legacy systems, as some of the older, dominant EHR vendors have grabbed significant shares of the market. Thus, despite progress in EHR adoption, perversely we are still saddled with a high degree of dependence on proprietary systems and incompatibilities.

The burden of knowledge management, well beyond the scope of all but the largest institutions, and even then exceedingly complex and costly, is particularly troublesome, as discussed in Chapter 28. This all but demands multi-stakeholder participation in a more robust, scalable approach that can share and coordinate the tool developments needed, and establish an ongoing process of making high quality computable knowledge resources broadly available.

Eric Topol's, 2013 book *The Creative Destruction of Medicine* (Topol, 2013) is apt in its characterization of how significant the forces are that are leading to major transformation of our health care system, which are now gathering momentum. Many of the forces he identifies overlap with the factors we list in Table 30.1. Topol's focus is on describing the forces, and not on how the transformation will come about. In fact, there is very little written about that, but it is clear that at least part of what will be needed is a significant rethinking of the health IT infrastructure required to support it, to achieve truly patient-centered care, a focus on lifetime health and wellness, and coordination of care processes across venues of care.

Yet, we do not have the IT infrastructure and framework to support these goals. The changes will need to rely on much greater integration of data for a patient, the ability to aggregate and harness the power of big data, with more powerful analytics for population management, much more availability of point-of-care knowledge for CDS, much greater interoperability and ability to create workflows and processes across venues of care, and much better tracking of care processes and outcomes, and quality assessment.

Table 30.3 lists ten desiderata for IT capabilities for the health care system of the future that is beginning to take shape.

The infrastructure, tools, and resources identified above are both daunting to individual efforts and require concerted action that has not yet become organized to

Table 30.3 Health IT infrastructure desiderata for future health care systems

Feature	Description	Importance
1. Ontology of health/health care process	A framework for describing the entire spectrum of care processes, activities and settings.	Context of health and health care activity is important to be able to target appropriate knowledge and advice, such as CDS interventions.
2. Ontologies of problems/diseases, actions	Characterization of problems/diseases and their attributes, and diagnostic, treatment, and other actions (e.g. by clinical ontologies such as SNOMED-CT and ICD-11).	Ability to characterize a given patient's health/disease status and current care processes.
3. A universally adopted robust clinical information model	Data model with rich enough sets of attributes to encompass nuances (e.g. as represented in work on Clinical Element Model, OpenEHR archetypes, and other projects).	Need for consistency and richness of access to clinical data for decision support, and for quality measurement.
4. Longitudinal individual lifetime care record	A method for effectively integrating data on individual patients over their lifetime, and across venues of care, whether done explicitly by harvesting data from various primary sources, or virtually on demand. Ideally, this would be a primary source record (e.g. health record bank) from which all EHRs create views, but evolution to this needs a compelling business model not yet sufficiently defined.	Continuity of care and lifetime wellness goals and CDS to support these require a care record that is more comprehensive than individual institutional records. Can avoid some of the redundancy of HIE that require user to reconcile CCD documents, etc., if we have a single source record that is continually updated with audit trails of all transactions.
5. Big data resources	Methods for obtaining data from different sources, including genomics, personal data and biosensors, harvesting from records by NLP, imaging features, etc. Methods of normalizing data, aggregating data across patient populations, data mining, and predictive modeling.	More refined population management capabilities, predictive analytics, and immediate access to data on similar patients during care can provide important new types of CDS.
6. Privacy and role-based access	Methods for assuring privacy of individual data and managing role-based access, needs to be bolstered by regulations and enforcement mechanisms.	Necessary in order to obtain confidence of the public and necessary protections for the benefits of lifetime records and big data to be achieved.

7. Methods of organizing available knowledge and CDS	Methods to encapsulate CDS, e.g. as SOA services, and tag them by descriptors such as in the ontologies of (1) and (2) above.	Will provide a framework for knowledge management, update, and selection for CDS based on precise context and setting. Also will enable identification of gaps, discrepancies, and conflicting knowledge, and focus on priorities for addressing them.
8. Reusable methods/apps	Methods/paradigms for visualization, summarization, trend analysis, analytics, and other decision aids, in interoperable form.	Availability will stimulate an app industry and begin to foster more receptivity of health systems and EHR vendors to incorporate them. This will further enable the ability to meet the needs of lifetime care and coordination across venues, as will be needed by future health systems.
9. Sharable repositories of best-available knowledge, in unambiguous form, amenable for use in CDS	Ideally, each item is systematically annotated in terms of how it was developed, source or EBM review, consensus, or peer review process to derive it, responsible party or sponsor, date of creation and last update, standards and conventions used, and situations (context and setting such as from capabilities (1) and (2) above) to which it applies.	Rediscovery or individual compilation of such repositories is beyond the scope of even the largest enterprise. A communal process, possibly public-private, possibly commercial, is needed to achieve the scale and continual update required.
10. An organizational framework	Orchestration of the infrastructure capabilities by a multi-stakeholder entity.	The above capabilities need to be overseen by one or more entities that can set priorities, identify and allocate resources, and manage the process. This could be at national level, possibly as some sort of public-private partnership, and linking with international efforts, consortia, and other stakeholders.

any significant degree. Addressing the inertia, in my opinion, requires in particular the last item in the list, an organizational framework (one or more entities) that can bring a coordinated, communal approach, in order to overcome barriers, align motivations, determine priorities, obtain support, and establish the mechanisms that will be needed.

Some of what is described is beginning to occur, for example, through national efforts in countries with single-payer systems, international standards organizations and collaborations, voluntary consortia, and public-private workgroups focusing on specific challenges of standards and interoperability. Noteworthy among the latter are the Standards and Interoperability (S&I) Framework initiatives (S&I, 2013) established as public-private activities engendered by efforts of the US Office of the National Coordinator for Health IT (ONC), and the work of the National Library of Medicine (NLM), which launched the Value Set Authority Center (VSAC) (NLM, 2013), which "provides downloadable access to all official versions of vocabulary value sets contained in the 2014 Clinical Quality Measures. The value sets provide lists of the numerical values and individual names from standard vocabularies used to define the clinical concepts (e.g. diabetes, clinical visit) used in the quality measures." The intent is for this site and other related sites to be repositories of computable resources, such as quality measure definitions and decision rules.

As encouraging as these steps are, I believe that we need to organize more aggressively. My opinion is that this should take the form of a public-private partnership aimed at orchestrating and organizing national-level resources, engaging stakeholders, establishing a governance mechanism, determining priorities, securing funding, and proceeding to build out the needed resources.

30.4 Organization of process

To summarize the preceding, I believe that for the deployment of CDS to progress at other than the glacial speed that has occurred to date, the communities of interest – the stakeholders invested in delivering safe, high-quality, cost-effective care – need to proactively organize themselves to provide a guiding role in the evolution of CDS capabilities and tools, processes, and knowledge resources that they require.

Accelerating progress thus depends on organization and guidance by an oversight body (OrgBod) that is in a position to influence how health care is organized and delivered, and how it is paid for.

Key responsibilities of the OrgBod would be:

- To determine priorities for communal efforts to facilitate CDS adoption
- To establish and oversee permanent entities to carry out the formalization of infrastructure, resources, and tools to support the three life cycles
- To oversee the implementation of end-to-end processes to facilitate adoption of CDS for the selected priorities and their subsequent refinement and iteration in expanded or additional areas

The OrgBod should include representatives of the health care professions, health services research, economics, and policy experts, payers, and the public. A reasonable way to accomplish this would be for the OrgBod to be composed of high-visibility, respected, and knowledgeable individuals representing these stakeholder categories. As noted earlier, such an OrgBod would most naturally function at a national level, so as to be responsive to the overall needs of the country and to be able to garner the necessary support to carry out the work, but there may be related efforts that could occur on regional levels, or also internationally. Ideally such efforts should dovetail with and leverage the work of national OrgBods.

The strategy to be carried out by the OrgBod is an iterative one, as depicted in Figure 30.1, consisting of identifying high priority foci, establishing and refining necessary infrastructure, and using this infrastructure to develop and deploy CDS in the areas of high priority. The infrastructure involves providing resources

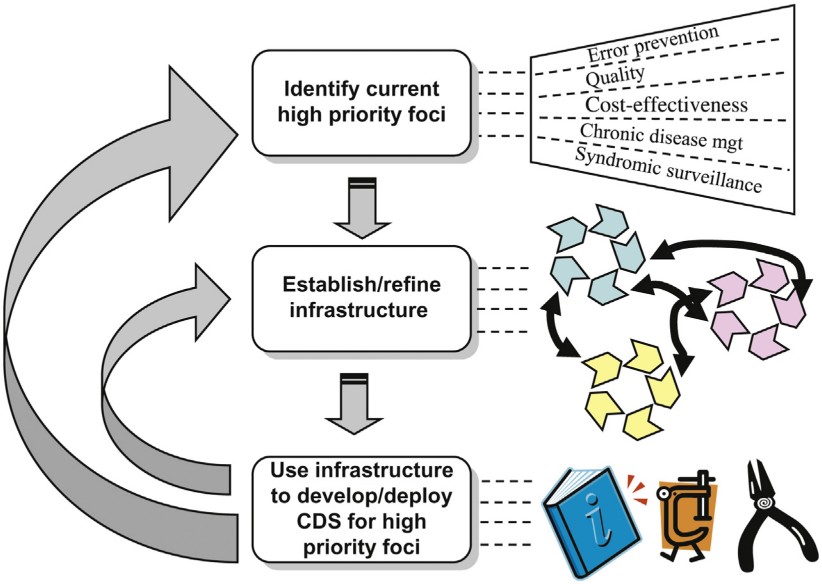

FIGURE 30.1

Priorities for CDS are likely to fall into specific categories, such as the five areas listed as examples (top right). The three interrelated life cycle processes involved in generation of knowledge, knowledge management, and incorporation into functional CDS require infrastructure for supporting them (middle right; these are the three interlocking life cycle processes discussed in Chapter 1). The result of applying these life cycle processes to the priority areas will be knowledge bases and authoring and implementation tools (lower right), which are tried out in selected test beds. The whole process iterates as we learn more about how to create infrastructure to support it, and as priorities change.

for and supporting the three inter-related lifecycle processes described in Chapter 1 for knowledge generation, knowledge management, and CDS methodology refinement.

The permanent entities responsible for carrying out the communal development of infrastructure, resources, and tools to formalize the three lifecycle processes would report to the OrgBod. The OrgBod would be responsible for ensuring that their composition is appropriate, that their functions are transparent and of high quality, that access to their products and services are broadly accessible, and that they are adequately funded. It would also oversee their interrelationship and coordination.

For the process of refinement of the overall strategy through iterative cycles of end-to-end implementation, one mechanism the OrgBod could adopt would be to initiate and/or fund projects by institutions or consortia that would serve as appropriate test beds. It would probably be best for these projects to be of limited duration. If they are successful, they will provide feedback for improvement of the permanent infrastructure, resources, and tools available to all. However, it may be necessary to provide additional funds aimed specifically at technology transfer, in order to get successful projects to the point where they are self-sustaining at their local or consortial sites, and for refining the process of adoption of the approach at other sites. Ultimately the goal will be for further replication and adoption of established approaches to be supported through the commercial marketplace. This might also need to be stimulated through a series of small grants to business.

An early call to action was voiced in a June 2006 white paper produced on contract from the US ONC to the American Medical Informatics Association (Osheroff et al., 2006), which outlined a proposed *Roadmap for National Action on Clinical Decision Support for the US*. In that white paper, a number of steps were proposed to create an environment conducive to the general goal we address. In the intervening years, what I observe is that the needs have increased, recognition of them has grown, incentives such as Meaningful Use have been adopted, and standards and interoperability initiatives have been promoted. We have seen specific initiatives spring up, including activities in the HL7 CDS Working Group (HL7_CDS, 2013), an initiative known as OpenClinical (OpenClinical, 2013) to track and collate diverse activities going on related to CDS, collaborative projects such as the Morningside Initiative/SHARPC 2B project (Greenes et al., 2010), the CDS Consortium (Middleton, 2009), the Socratic Grid (SocGrid, 2013), and OpenCDS (OpenCDS, 2013) (see Chapter 29 for discussion of these two latter projects), that have sprung up under various sponsorships. We have seen the establishment under ONC sponsorship of the S&I Framework Initiatives (S&I, 2013) and the NLM Value Set Authority Center (NLM, 2013), as noted earlier, and most recently the Health eDecisions Initiative (Health_eDecisions, 2013) under the S&I Framework program.

Despite the value of these individual efforts, no overarching effort has been established to align the various activities and create a sustainable framework for moving the whole effort forward and to create the necessary national-level infrastructure for managing shared knowledge, updating it, and facilitating its incorporation and adaptation for use in local settings.

I don't immediately see any entity stepping forward to organize such an effort, but perhaps this will arise when the needs become more urgent, as health care transformation begins to take hold, and we are in the throes of the disruptive process.

30.5 A possible paradigm for future CDS

In this penultimate section, I would like to switch gears. As I review the range of topics and the huge amount of new activity occurring in many realms that bear on CDS, I am struck by the lack of scalability of our current approaches, and would like to suggest a new framework for thinking about it.

Specifically I suggest a framework based on context and situational awareness. Think of the myriad rules we now have. Think of every node on a computer-interpretable guideline. Think of an order set, a documentation template, a piece of knowledge retrieved by an infobutton manager or a predictive model. Ideally, each of these has either an explicit or implicit set of "eligibility criteria" for when they are relevant to consider. These include characteristics of the patient, and the setting and activities of a user, for which the CDS intervention is appropriate.

The targeting of particular CDS resources could be made highly explicit if we were able to continually have access to data about the user – e.g. patient, nurse, doctor, pharmacist; what he or she is doing – such as, for a provider, checking or entering an order, communicating with a patient by phone, going on rounds; and details about the patient – e.g. demographics, problem list, medications, and trajectory of current findings. I call for ontologies of these attributes as the first two key components of shared knowledge infrastructure in Table 30.3. Attributes of context and setting could in fact be the basis for a semantic framework for organizing CDS knowledge components. We could have ontologies describing axes of context and setting, such as those mentioned above, and relevant CDS artifacts could be indexed and organized by these descriptors.

A side benefit of this is that we could identify situations where there are no knowledge resources, which could help to focus attention on those that are important. In situations where there are multiple alternative approaches, we could develop methods to use them in combination or as alternative "opinions." We could harness "big data" for situations where no resources exist, or to add to those resources the experience of patients maximally similar to the current patient in this precise situation, e.g. in terms of which medication was more likely to result in a favorable effect.

What strikes me here is the similarity of this kind of organizing framework to a technology we are already very familiar with – the GPS navigator. GPS is able to monitor where we are in the physical world, and can be set for different modes (e.g. walking vs. driving or sailing), and can be used in a passive mode, giving us awareness of our immediate surroundings, information about resources that are available (e.g. restaurants, service stations, and ATMs), and what lies ahead in the direction we are going (e.g. next exits, traffic jams, accidents, and weather conditions). In a directive mode, we can give it a destination, and it develops a plan and helps to keep us on course or to get back on course.

If we had a contextual and situational awareness monitoring capability, why couldn't we create something analogous to GPS in the nonphysical world of health and health care management? I call this a PGS – Personal Guidance System. We know how to build GPS navigators to be very user-friendly, and they are widely adopted and used. Why not build something like this for health care? Thus, I believe that the PGS and the semantic modeling of context and situation applying to health and health care can become a highly effective, scalable framework for organizing and delivering CDS.

We can easily obtain context and situation on a continual basis, if an individual opts into it and if we set up our systems to allow it. The user profile, job role and specialty, if you are a provider, roles and restrictions, the applications you are using, the physical location, your immediate prior history, and the patient you are interacting with, or whose record you are viewing and his/her problems and data could be readily used to define context and situation. New technologies such as the somewhat geeky Google Glass® which is soon to be released have the intriguing potential of being able to continually track what we are doing and where we are and connect us to the knowledge resources related to that context and situation.

We could thus set about refining these contexts and situations, organizing our knowledge artifacts, and identifying where resources exist, where conflicts may occur, and where gaps exist, as a basis for further development of knowledge resources. We can fill in gaps with big data analytics. In my own laboratory, we are beginning to explore the idea of a PGS framework for organizing available knowledge and integrating it with human activities.

30.6 Looking ahead: epilogue as prologue

We are poised at a point where the need to accelerate efforts for CDS adoption is great, but where ill-conceived or inadequately founded efforts could contribute more to chaos than to benefit. We are already overwhelmed by knowledge, so just having many varieties of it deployed in the form of CDS is no guarantee that patient safety, quality, cost-effectiveness, or other objectives will be achieved. In fact, sorting through and reconciling conflicting knowledge may be particularly frustrating.

As we seek to accomplish approaches to sharing the results of knowledge generation and knowledge management required for the preceding, we also need to continue an active process of experimentation to learn how to best deploy CDS for maximum benefit and acceptability by users. Thus we need to lower the barriers for this process. By considering CDS as an external capability, we are also shifting the paradigm from a built-in functionality of a clinical system to an added value that can be incorporated into clinical applications in a variety of ways. This opens up the process not only to initiative and experimentation but also to business opportunities, by creating niches for content, software, and services that would otherwise not be there.

Thus there are many reasons for moving in the general direction outlined. The road up to this point has been a bumpy one that has been largely unpaved, so it is desirable to shift onto a paved road that will allow our speed to accelerate. Do we know enough to do the paving? Do we have a roadmap of where we want to go and just need to build the roads? Or do we need to do more mapping and planning, more infrastructure development, before we commit to the roadmap?

Organizing our collective effort appears to be the only feasible path for enabling us to cope with the many opportunities and challenges, particularly in the context of a health care system that is itself undergoing transformation. Such an initiative needs to be bold, but also somewhat cautious and iterative, and requires thoughtful and deliberative effort to organize it and build initial infrastructure. It will require a concerted focus on the problem and a collective willingness to move ahead. It is encouraging to see efforts to do this mounting in various nations, both in standards efforts, national health care infrastructure development, EHR adoption, and professional and public calls to action.

So, as in our first edition, I do hope that this Epilogue will indeed be a Prologue and that we are able to build the road to broad adoption.

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