Reusuable Knowledge for Best Clinical Practices: Why We Have Difficulty Sharing And What We Can Do

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Abstract and Objective
A central challenge in clinical decision support is the difficulty in creating shareable repositories of best practice knowledge. A host of proprietary systems makes it difficult to have a widely accepted representation format. Different uses of knowledge and contextualized, workflow-specific adaptations cause the knowledge that is already in such site-specific formats to be not readily usable by others. New or updated knowledge is continually being generated. Where should such knowledge reside, what format should it reside in, and how should it be reviewed and disseminated? What are roles of knowledge providers? How does the “last mile” of adaptation to settings and proprietary formats get accomplished? This panel seeks to identify promising approaches to managing the lifecycle of knowledge generation and refinement. The aims are to facilitate the transition of new knowledge to formal representation, and the delivery of best practice knowledge in executable form to different settings, where it can be adapted to improve care processes and outcomes.

Learning objectives: (1) Recognize the new and emerging methodologies for knowledge representation and knowledge management. (2) Explain the life cycle of knowledge generation/refinement/deployment/value delivery. (3) Recognize the challenges in adaptation and widespread use.

Keywords
Knowledge representation, reusable knowledge, clinical decision support, knowledge management, clinical quality improvement

Panel description
The panel gathers experts in knowledge representation, clinical decision support, knowledge dissemination/publishing, and outcome-focused implementation of decision support. It will explore the challenges involved in developing large-scale, robust mechanisms for the processes of knowledge generation, refinement, and deployment in operational systems.

The volume and complexity of clinical knowledge needed for practice of health care, and the rate of generation of new and updated knowledge, make it essential to develop robust mechanisms to make such knowledge available and useful at the point of care. We are seeing increasing recognition of the need for proactive decision support to achieve quality, safety, and efficacy goals. There is increasing feasibility of doing this with widespread use of electronic health record (EHR) systems, and a globally intensifying focus on healthcare performance improvement.

Yet there is considerable difficulty in creating shareable repositories of best practice knowledge. There is no widely accepted representation format, and knowledge is deployed in EHR systems in a many different representations and using a variety of different data models and coding systems. Even if that were not the case, the knowledge must be contextualized and adapted to different settings, business practices, and workflows, in order to be useful. Such localization issues include how rules are triggered, how the logic may be qualified or constrained (such as by modifying timing or thresholds for action), and to whom the recommendations or actions should be delivered. These adaptations take great effort by organizations, and at the same time, they cause the knowledge that is already in such setting-specific form to be not readily usable by others.

Can there be a robust representation for best-practice knowledge that can be easily converted to deliverable formats? Can the process of adaptation be facilitated? Where should shared knowledge reside, how should it be reviewed and disseminated? What are roles of knowledge providers?

Some efforts in use of the semantic web and ontologies are relevant for formal representation. Work spearheaded by the US Office of the National Coordinator for Health IT (ONC), and involving many stakeholders, is evolving a model for interoperable sharing of best-practice knowledge in the form of CDS intervention artifacts and services. Knowledge publishers and work on mechanisms for adaptation to settings and workflows are addressing the question of facilitating deployment. A multi-stakeholder CDS Collaborative for Performance Improvement is helping providers, EHR vendors and others document, improve and share strategies for using CDS interventions to address improvement imperatives.

This panel will briefly discuss these approaches to managing the lifecycle of knowledge generation and refinement. A set of challenge statements/questions will be posed as a basis for further discussion by the audience and panel.

Panel Objectives and topics
The goals of the panel are to raise awareness of the value and necessity of sharing best practice knowledge and implementation approaches as well as the impediments to doing so, and to discuss new and emerging strategies for addressing the challenges. The panel will address the following:
• Lifecycle of knowledge generation, refinement, and deployment
• Advances in knowledge representation
• Interoperable approaches to knowledge sharing
• Knowledge repositories, responsibilities, and roles of knowledge “publishers”
• How to adapt knowledge to setting-specific workflows, business practices, and electronic health record system constraints, formats, data models, and platforms
• Strategies and tools for documenting, improving and sharing target-focused CDS implementation approaches
• Impediments to sharing of successes, and strategies to overcome them.

Strategies to engage the audience in discussion

We will have short presentations describing the dimensions of the above topics. To ensure participation by the audience, each panelist will contribute three provocative one-sentence debatable statements or challenge questions related to his or her point of view on the feasibility of sharing reusable best-practice knowledge and implementation strategies (e.g., "There is a single form that can be used as a basis for distributing best-practice decision rules", or “Because of the variety of care settings, there is no practical way to facilitate the process of knowledge adaptation to these settings”). We will ask the audience to vote on whether they agree with the statements before discussion. These questions, especially those eliciting divided opinion, can then be used as foci for further discussion, although discussion will not be limited to those topics.

Panel organizer and participants

Panel organizer: Robert A. Greenes, MD, PhD, is Ira A. Fulton Chair and Professor in the Department of Biomedical Informatics, Arizona State University, Phoenix, Arizona, USA, since 2007, and Professor of Biomedical Informatics, College of Medicine, Mayo Clinic. For 27 years, he directed the Decision Systems Group at Harvard Medical School, Brigham and Women’s Hospital, which carried out work in knowledge discovery, knowledge management, decision support, natural language processing, interoperable and composable software architectures, and education. He is author/editor of a widely-used book on CDS [1] and led one of the early consortia aimed at sharing executable knowledge, the Morningside Initiative [2]. He is a member of the Institute of Medicine and 2008 recipient of the Morris F. Collen Award of the American College of Medical Informatics.

Dr. Greenes will talk about the ONC’s Health eDecisions strategic framework [3] and the work of the ONC-funded SHARPc project 2B, which has been developing approaches to setting-specific adaptations of knowledge [4], as well as other national-scale initiatives [5]. The goal is to provide a common framework for representing best-practice knowledge in close-to-executable form, and a strategy for both adapting this to host delivery formats and also localization requirements. A product of the effort will be a tool that facilitates knowledge authoring/editing and exchange between knowledge creators/publishers and integrators.

Panel participant: Mor Peleg, PhD, is Associate Professor at the Department of Information Systems at the University of Haifa, Israel, which she headed during 2009-2012. Prof. Peleg has been one of the key developers of the GLIF3 guideline modeling language while a postdoctoral fellow at Stanford University. Her research targets guideline modeling languages, semantic knowledge and data integration, and process learning. In 2005 she received the AMIA New Investigator Award. She was the program chair of an AI in Medicine conference and has repeatedly co-organized the ProHealth and Knowledge Representation in Healthcare workshops. She is the coordinator of the FP7 European large scale integrated project MobiGuide.

Prof. Peleg will discuss different types of knowledge that could be more readily shared and suitable representation formats that facilitate sharing. She will draw from her experience in sharing a diabetic foot guideline with two different hospitals and EHR systems in Israel [6] and from her experience in adapting an international guideline on thyroid nodule diagnosis and management to European and American settings [7]. She will argue that locking guideline knowledge into workflow-like structures hinders their sharing. In contrast, sharing declarative clinical concept definitions and representing clinical actions in modular action-tuples, could ease sharing.

Panel participant: Alan Rector, MD, PhD, is Professor of Medical Informatics in the School of Computer Science, University of Manchester, Manchester, UK. His research targets practical clinical systems for patient care, knowledge representation and management, and user interface design. He led many projects in semantic web ontologies including development of the Protégé-OWL Ontology Development Environment (with Stanford University) and the EC funded GALEN programme on large reference ontologies for clinical medicine. He is a member the Strategic Advisory Board for the US National Center for BioOntologies and co-chairs the technical group advising WHO on infrastructure for the eleventh revision of ICD. He has been a member of the W3C Semantic Web Best Practices Working Group and HL7, CEN and ISO working groups on healthcare terminology. In 2003 he was awarded the first British Computer Society Award for Life-time Achievement in Health Informatics.

Prof. Rector will discuss the interaction of terminologies and “ontologies” with medical knowledge representations and EHRs and issues of quality for EHRs [8,9]. He will argue for clear distinctions and interfaces between the domain model and information model and between the definitions and necessary truths in the ontology and the broader knowledge bases using the ontology. He will discuss how different uses of terminology lead to different modes for “binding” of the terminology to information and decision support structures and the need for extended query languages and hybrid systems to allow different sorts of information to be captured accurately in appropriate representations but to be used together for integrated health records and decision support [10].

Panel participant: Jerome A. Osheroff, MD, is Principal of TMIT Consulting, LLC, Cherry Hill, NJ, USA, founded in 2011 to help care delivery organizations, government agencies, HIT vendors and others to develop and implement pathways to better healthcare outcomes. For the prior decade, he was Chief Clinical Informatics Officer for Thomson Reuters Healthcare. Dr. Osheroff has been a leader in helping provider organizations and others successfully apply CDS. He is lead author of the internationally utilized HIMSS CDS Guidebook Series [11], which includes the HIMSS bestselling book and 2005 HIT Book of the Year, “Improving Outcomes with Clinical Decision Support: An Implementer’s Guide,” and a second edition of this book published in early 2012 – another best seller and 2012 HIMSS Book of the Year. He is also lead author for the ONC-commissioned Roadmap for National Action on CDS [12], and founded and directs the CDS Collaborative for Performance Improvement that is executing on key Roadmap recommendations [13]. He led a US Agency for Healthcare Research and Policy project to develop a structured approach encoding clinical guideline recommendations for use in clinical decision support [14]. Dr. Osheroff serves on the...
internal medicine faculty and clinical staff of the University of Pennsylvania Health System.

Dr. Osheroff will discuss the role of the knowledge publisher. He will then provide an overview of the “CDS 5 Rights” framework for improving outcomes with CDS [15]. He will provide examples of how participants in the CDS Collaborative for Performance Improvement are using CDS configuration templates based on this framework to document, improve and share target-focused CDS strategies. He will argue that strategies for systematically sharing and distilling best CDS implementation practices must accompany better approaches to sharing CDS interventions themselves, in order to realize CDS’ full potential for improving care deliver and outcomes. He will also invite additional international participation in the CDS/PI Collaborative.

References


Statement of the panel organizer

All participants agree to take part in the panel.