



Date: May 6, 2011

From: Clinical Decision Support Consortium

To: Agency for Healthcare Research and Quality

Re: Recommendations for the ONC Health Information Technology Policy Committee

Introduction

Along with the U.S. Federal Government's intense push for adoption and meaningful use of electronic health records (EHRs) by all eligible health care providers will come an equally intense push to identify and develop real-time, point-of-care, clinical decision support (CDS). This CDS is necessary if we are to achieve both Meaningful Use¹ targets as well as transformational improvements in patient safety, quality, and efficiency of care.

On March 1, 2008, the Agency for Healthcare Research and Quality (AHRQ) funded two research teams to develop CDS demonstration projects: the Guidelines Into Decision Support (GLIDES) project headed by Richard Shiffman, MD, based at Yale University in New Haven, Connecticut, and the Clinical Decision Support Consortium headed by Blackford Middleton, MD, MPH, MSc, based at the Brigham and Women's Hospital in Boston, Massachusetts. The goal of these projects is the "development, implementation and evaluation of demonstration projects that advance understanding of how best to incorporate CDS into the delivery of health care...with the overall goal to explore how the translation of clinical knowledge into CDS can be routinized in practice and taken to scale in order to improve the quality of health care delivery in the U.S."².

As part of the contracts with AHRQ, one of the key deliverables is a set of recommendations for health IT policy committees regarding features and functions that all Office of National Coordinator for Health Information Technology (ONC)-certified systems should possess in order to allow health care organizations to begin to realize the full potential of their health IT investments. The recommendations below are structured around specific features and functions that all EHR systems should provide rather than the types of clinical interventions that should be supported. Furthermore, this year's recommendations: 1) include input from last year's meeting with the GLIDES team, led by Richard Shiffman; and 2) do not include any recommendations regarding the clinical knowledge management features and functions that will be critical for any organization that is using these advanced CDS features that are outlined.

Specific Recommendations for the ONC Health Information Technology Policy Committee

The recommendations for CDS certification criteria are divided into four sets based on the features and functions that are currently available in commercial EHR systems and at Partners Healthcare. A fifth set of overarching CDS recommendations is also included. Specifically, we recommend the following:

Recommendation 1: Data used to invoke CDS interventions. The first set of recommended capabilities concerns data items or events that can be used to “trigger,” or invoke, a CDS intervention. These triggers are defined as “events that cause a decision-support rule to be invoked”. Triggers are critical to providing event-driven, action-oriented, real-time, point-of-care CDS and represent the initiating condition for a many different types of CDS interventions. Recommended triggers include: 1) order entered; 2) laboratory result stored; 3) outpatient encounter opened; 4) user request; 5) time; 6) admission; 7) problem entered; 8) enter allergies; and 9) enter weight. All of these data items need to be captured and stored in a structured or coded data field, meaning that both the syntax, or format, of the data conforms to a predefined (and, if available, standards-based) structure and that the semantics, or meaning, of the data are based on a predefined standard; otherwise they are not usable by the CDS systems that rely on such coded data.

Recommendation 2: Coded input data elements. Nearly all decision-support rules require patient-specific, coded data to make their inferences. The second set of recommendations consists of the types of data that should be available for use by the CDS intervention logic to make inferences regarding suggested clinical actions or alerts. All of the following input data elements should be “required” by the ONC EHR certification recommendations, and they should be accessible or available for use by the CDS functionality of the systems:

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|---|--------------------------|
| 1. Laboratory result or observation | 8. Family history |
| 2. Medication list | 9. Allergy list |
| 3. Hospital unit the patient is on at the time the CDS is triggered | 10. Weight |
| 4. Diagnosis or problem | 11. Surgical history |
| 5. Age | 12. Reason for admission |
| 6. Non-drug orders | 13. Prior visit types |
| 7. Gender | 14. Race |

Recommendation 3: Actions the CDS modules can take when CDS logic is satisfied. Triggers and input data elements represent the input arm of decision support. Interventions, by contrast, are outputs of CDS. The best decision-support systems tailor their interventions based on the severity of the clinical situation and the user’s workflow³; therefore, offering a broad range of interventions is important. The third set of recommendations consists of “interventions,” or the possible actions a decision support

module can take. The capacity to automatically route these actions to the appropriate person, based on logic included with the CDS intervention, should be supported. Examples include such actions as sending a message to a clinician, showing a guideline, or simply logging that an event took place. These interventions are: 1) notify; 2) log; 3) provide default values or pick lists; 4) show guidelines; 5) collect free text; 6) get approval; and 7) show data entry template.

Recommendation 4: Action items that the CDS system should offer to clinicians. The final set of recommendations concerns the actionable items stemming from a CDS intervention. Such items are usually offered alongside or following a system notification and represent the actions a user of the clinical information system can take based on the CDS intervention. For example, a rule that was triggered because a physician entered an order for a drug the patient is allergic to might allow the clinician to cancel the new order, choose a safer alternative drug, or override the alert and keep the order as written but provide an explanation. These actionable items are:

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|---------------------------------|----------------------------------|
| 1. Write order | 7. Edit existing order |
| 2. Defer warning | 8. Set allergies |
| 3. Override rule and keep order | 9. Write letter |
| 4. Cancel existing order | 10. Write note |
| 5. Cancel current order | 11. Edit problem list |
| 6. Edit current order | 12. Enter weight, height, or age |

Overarching CDS recommendations: In addition to these basic CDS-related features and functions, the teams also developed several overarching recommendations that we believe all ONC EHR-certified systems must possess if health care organizations are to fully achieve the improvements in health care quality and safety that are possible.

The following additional recommendations are based on the findings from site visits conducted at each CDSC site. No specific frequency data were collected to inform them; therefore, estimates of either the frequency of occurrence or current commercial availability of these features are not available.

- Provide a general purpose capability for creating logical rules within the EHR system. The capability should support triggering, allow for access to coded data, allow a variety of intervention types, and especially support offering actionable choices to users. It should not limit end users to specific types of CDS.
- The CDS rule engine should support basic mathematical and logical actions, including:
 - FIRST: Earliest time a data element was stored in the patient's record.
 - LAST: Most recent time a data element was stored in the patient's record.

- MAX: The maximum value of a specific data type stored in the patient's record.
 - MIN: The minimum value of a specific data type stored in the patient's record.
 - ADD: The sum of a set of numerical values.
 - MEAN: The mean of a set of numerical values.
 - SUB: The difference between two numerical values.
 - GREATER: Compares two numerical values and returns True/False
 - LESS: Compares two numerical values returns True/False.
 - EQUAL: Compares two numerical values returns True/False.
 - MULT: Multiplies two numerical values.
 - DIV: Divides two numerical values.
 - COUNT: Counts the number of occurrences of a particular item.
 - LOG: The exponent required to produce a given number (supporting any base).
 - EXP: Raises a specified value to a given exponent.
 - ROOT: Takes the square root of a given value.
 - Boolean operators: AND, OR, NOT, XOR.
- Code data according to ONC-approved interoperability standards using standard terminologies and make all the coded data available to decision-support rules.
 - Generate a full, complete, and standard, structured Continuity of Care Document (CCD) and make the CCD available through a programmatic interface. This CCD could then act as an input to CDS services. If this type of capability existed, health care organizations with the time, expertise, financial, and human resources could develop most of the common, simple CDS interventions they needed. Alternatively, new health IT vendors that specialize in developing CDS content could gain access to the data required to develop robust CDS interventions. In addition, standard developers and vendors need to be prepared to begin developing new clinical data interchange formats, or perhaps extending the current CCD specifications to include additional data that is often required for more robust and complex CDS interventions. For example, the CCD as currently configured, only requires recent laboratory test results instead of all results, and it doesn't have e.g. structured history or physical exam findings.
 - Allow selective filtering or tailoring of rules (i.e., to turn off some rules) to apply to particular contexts, such as specific practices, physicians, specialties, clinical situations (e.g., bone-marrow

transplant patients, terminally ill or comfort measures only, pregnant women), patient types (e.g., day surgery, outpatients), time of day, and locations within a practice or hospital setting.

- Allow the system to randomize presentation of CDS interventions at the patient, provider, and practice level to allow any organization to test the effectiveness of the CDS interventions within their own environment.
- Support common types of commercially-available CDS (drug-drug interaction checking, drug-allergy checking, reminders, order sets, and templates) out of the box, support various commercial content types, and make it as easy as possible to incorporate this knowledge along with updates within the EHR. The EHR system should allow appropriately trained personnel at the local site to customize any and all CDS logic and/or content.
- Log the results (including date, time, location, name of provider, and patient) of all inferences and rule firings and user responses/override reasons and provide the ability to view and analyze these logs.
- Support the Health Level 7 (HL7) InfoButton standard in all systems for at least problems, medications, and laboratory tests.
- Provide the ability to export the clinical knowledge used in all of the CDS interventions in a human-readable form so that any interested person can easily review the clinical logic used in all CDS interventions.
- Provide a user interface in EHRs that allows template design for data collection with integrated prompting and flexible display of relevant information. Radio button and checkboxes should be supported as well as free text comments about why decision support may have been ignored. Audit of these functions should be straightforward.
- Provide a “certified” mail-like feature that records who, when, and where a specific CDS intervention was received and what action was taken, if any.

Finally, we recommend that the Meaningful Use Stage 2 and 3 criteria be expanded to include additional forms of CDS. For example, we strongly recommend that the use of order sets, medication dosing support, workflow support, clinical documentation templates, and access to information resources be included in future definitions of Meaningful Use. In addition to these real-time, point-of-care type CDS interventions, we also encourage the use of retrospective, population-based reports that can help ancillary staff initiate contact with patients in need of additional healthcare services. We would also like to see a significant increase in the quantity of CDS required. Specifically, we think that the number of rules be increased significantly to 25 in 2013 and 100 in 2015. We also recommend that each healthcare organization use something like the Leapfrog Computer Physician Order Entry (CPOE) Evaluation Tool⁴, (or ONC should create their own form of a similar test) to verify that their CDS was functioning as designed. We also believe that all organizations should report their overall usage rates of their CDS interventions. To simply require that an organization have a set number of rules active, without any

indication of whether they were used and what the clinician's responses to these rules were, seems short-sighted.

Summary

The ONC Health Information Technology Policy Committee along with the U.S. Federal Government must continue their push for increased adoption of EHRs by all health care providers. These EHRs must include the real-time, point-of-care CDS that is necessary for completing transformational improvements in patient safety, quality, and efficiency of care.

Our recommendations addressed features and functions that all ONC-certified systems should possess in order to allow health care organizations to begin to realize the full potential of their health IT investments. If all commercially-available EHR systems had the features and functions described in these recommendations, the project teams believe that many more health care organizations could begin to develop and implement the basic CDS features that are necessary to radically transform both the quality and safety of the current health care system.

List of Acronyms

AHRQ	Agency for Healthcare Research and Quality
CCD	Continuity of Care Document
CCHIT	Certification Commission for Health Information Technology
CDS	Clinical decision support
CDSC	Clinical Decision Support Consortium
CPOE	Computer Physician Order Entry
EHR	Electronic health record
GLIDES	Guidelines Into Decision Support
HL7	Health Level 7
IT	Information technology
ONC	Office of the National Coordinator

References

¹ <http://healthit.hhs.gov/portal/server.pt?open=512&objID=2996&mode=2>

² AHRQ Clinical Decision Support Services -- Request for proposals; (Accessed 3.8.09) available at: www.ahrq.gov/fund/contarchive/rfp0710045.htm

³ Bates DW, Kuperman GJ, Wang S, et al. Ten commandments for effective clinical decision support: making the practice of evidence-based medicine a reality. J Am Med Inform Assoc 2003 Nov-Dec;10(6):523-30.

⁴ <http://www.leapfroggroup.org/media/file/NewCPOEEvaluationToolResultsReport.pdf>

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