The Five Rights of Clinical Decision Support: CDS Tools Helpful for Meeting Meaningful Use

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A 75-year-old man sits uncomfortably on an examination table as his physician informs him that he needs to get a colonoscopy. The patient, an ex-cop, barks at the physician, "Why after all these years do I need to get a colonoscopy?" The physician coolly responds, "With a paper record, I never realized that you had a family history of colon cancer, and now that your health information is being recorded in an electronic health record (EHR) system, I am being alerted that it is time for you to have a colonoscopy." The man relents and has the procedure. A small walnut-shaped tumor is discovered in his colon, which turns out to be cancerous. The man undergoes successful chemotherapy treatment and has just celebrated another birthday. This is a best case scenario of what can happen in a world with clinical decision support.

With the advent of the "meaningful use" EHR Incentive Program, healthcare organizations, along with healthcare providers, are required to integrate clinical decision support (CDS) into their federally certified EHR systems. To provide a foundation for understanding how to develop a systematic CDS program, one should note the five "rights" of clinical decision support, an approach for improving care processes and outcomes that was first articulated by Jerome Osheroff, MD, in 2007. The framework, and guidance for implementing it, was discussed in Dr. Osheroff's 2009 book "Improving Medication Use and Outcome with CDS: A Step-by-Step Guide," and was further developed in the 2012 book "Improving Outcomes with CDS: An Implementer's Guide (second edition)," written by Dr. Osheroff and co-authors. In this article CDS and the CDS Five Rights are discussed in relationship to meaningful use, with the most common forms outlined, and evidence provided showing where CDS has been most effective in improving quality of care.

Clinical Support Meets Meaningful Use

CDS has been defined as a "process for enhancing health-related decisions and actions with pertinent, organized clinical knowledge and patient information to improve healthcare and healthcare delivery."[1] To understand the relationship between CDS and meaningful use, it is important to comprehend, in an unconventional way, why the concept of meaningful use has come into existence. Few, if any, remember the era when the concept of standardized time zones did not exist. In that era, a person could start a journey in one town at 8 a.m. and arrive in a town two miles away at 7:50 a.m., and arrive in another four miles away at 7:55 a.m. Time was relative to location. With the creation of the concept of a time zone, time became more absolute.

Fast forward to the Pre-HITECH Meaningful Use Era, where if you asked a physician what they wanted in an electronic health record, they might respond by saying, "I would like a system that allows me to create SOAP notes." Or "How about a system that keeps track of patients' demographics and a list of medications they are currently taking." Further confounding the matter was electronic health record systems developers' insistence that their systems were just what the doctor ordered, in terms of their patient documentation needs. Meaningful use is a much-needed attempt to standardize the functionality of an electronic health record system so that, according to former ONC coordinator Farzad Mostashari, MD, the electronic record becomes less of an "electronic filing cabinet, and more of an indispensable tool by which to deliver better healthcare."[2]

Under the rules for stage 2 meaningful use, both hospitals and eligible professionals must "implement five clinical decision support interventions" directly linked to four or more clinical quality measures published by the Centers for Medicare and Medicaid Services. If relevant clinical quality indicators are not applicable, a hospital or provider must implement support measures that monitor high priority health conditions such as cancer, diabetes, hypertension, and stroke. Returning to the example above, an entity wishing to adhere to this meaningful use standard can develop a clinical decision support intervention that will alert physicians when a particular patient is a candidate for colorectal screening. This type of intervention would correspond directly with the clinical quality measure NQF-0034 Colorectal Cancer Screening, which measures the percentage of adults 50 to 75 years of age who had appropriate screening for colorectal cancer. In the above example, having a

colonoscopy performed would qualify as an appropriate screening measure, with the ultimate goal of having a high percentage of the practice's patients—who are at risk for colon cancer—screened for this disease. Additionally, to demonstrate meaningful use, hospitals and eligible professionals must implement drug-drug and drug-allergy interaction checks to comply with the clinical decision support standard.

CDS Research Shows Care Improved by Tools

Over the past two decades there have been a number of studies investigating the role clinical decision support has played in improving the quality of healthcare in the United States. In the last five years, the Agency for Healthcare Research and Quality has sponsored literature reviews examining the results of these studies. One review looked at the impact CDS had on process outcomes, clinical outcomes (morbidity, mortality, length of stay, health-related quality of life), and economic outcomes.[10] This literature review revealed that there is evidence showing that CDS has the greatest impact on process outcomes such as the ordering of preventive, clinical, and treatment services, along with the enhancement of user's knowledge pertaining to a medical condition. This led the authors of Improving Outcomes with Clinical Decision Support: An Implementer's Guide to conclude that "strong evidence now shows that CDS is effective in improving process measures across diverse academic and nonacademic settings using both commercially and locally developed systems."[11]

Types of Clinical Decision Support

Although alerts are one of the most common forms of CDS, it must be noted there are many interventions that make up the current CDS toolkit. In the book "Improving Outcomes with Clinical Decision Support: An Implementer's Guide" the authors state that CDS interventions fall into one of four categories: data entry, data review, assessment and understanding, and triggered by user task.[3] For example, one of the more innovative interventions—smart forms—falls in the category of data entry, and "integrate(s) decision support into the normal tasks of seeing a patient and documenting a note."[4]

Another more widely used data entry tool is the order set. An order set is a "collection of pre-formed orders"[5] used "to manage a disease state or a specific procedure"[6] like a hip replacement. Order sets are a key tool in the CDS arsenal because they are thought to reduce medical errors, develop a safer healthcare environment, improve outcomes, and enhance workflow. Other interventions in the data entry category include parameter guidance, and immediate alerts.

In the "data review" category, an intervention known as the Virtual ICU is used to monitor patients in intensive care units across multiple facilities. This intervention allows remote nurses and intensivists to observe patients in real time, check vital signs, and work closely with bedside providers. Furthermore, Virtual ICU technology can make sure that doctors and nurses follow endorsed guidelines by prompting them when a "lifesaving therapy" needs to be incorporated into the patient's care plan.[7]

A third category, "assessment and understanding," is concerned with satisfying the information needs of physicians and patients as they formulate, debate, and discuss treatment options and care plans. One innovative tool in this category is the Health Level Seven (HL7) Infobutton.[8] An infobutton can be used in an electronic health record and can appear next to a condition listed in a patient's problem list, or medication in the medication list. To learn more about the condition, the physician clicks on the button and is immediately linked to an information source presenting detailed, evidence-based knowledge regarding the disease and its treatment. The same functionality applies to medications and their contraindications with other substances.

The final category, "triggered by user task," raises awareness about events that occur outside of routine patient-specific workflows.[9] These types of interventions range from an alert in an EHR, text message, or electronic mail notification regarding an abnormal test result, a prompt regarding the need for an influenza or pneumonia vaccination, or a reminder that the patient is due for a preventive test like a colonoscopy examination.

The Five "Rights" of Clinical Decision Support

With a firm understanding of clinical decision support, its various forms, and its relationship to meaningful use, the focus can turn to the five "rights" of CDS. These five rights can be used as a framework when planning to implement CDS interventions within a facility or practice, or when creating an extensive CDS program.

The five rights include:

- the right **information**,
- to the right **person**,
- in the right intervention **format**,
- through the right **channel**,
- at the right time in **workflow**.

The Right Information

The information presented to the end-user—or in some cases, the patient—should be evidence-based, derived from a set of recognized guidelines, or based on a national performance measure. In the case of the 75-year-old colonoscopy patient, an alert is generated informing the physician that the patient needs to be screened for colon cancer. The alert is based on the performance measure NQF-0034, which is a national measure developed by the National Committee for Quality Assurance. Furthermore, this performance measure is based on a set of guidelines developed by the American Cancer Society that stipulates who, from the general population, should be screened for colon cancer on a regular basis.

The intervention, in this instance an alert, should contain only enough information for the end user to act on. If the end user is given too much information, this may induce cognitive overload and cause them to disregard the alert. In the current example, the physician is alerted to the fact that the patient has a family history of colon cancer and they are within the threshold—patients age 50-75—of who should be screened for colon cancer. In instances where the physician would like to read the performance measure or the guidelines on which the alert is based, the channel (EHR) used to deliver the alert should make this information available via a URL or portable document format file. As a result of the alert, the physician advises the patient to have a colonoscopy performed.

Some experts recommend that healthcare organizations and practitioners who find themselves in the early stages of CDS intervention development refrain from basing interventions solely on expert opinion.12 In some cases expert opinion can be contentious. Because it may not be universally agreed upon as best practice, it may negatively influence whether an end user complies with the recommended actions forming the basis of the CDS intervention.

The Right Person

As healthcare becomes more of a team approach, it is important to make sure that the right information gets to the right person that can then take action. The right person can be a nurse, physician, physical therapist, or in some cases, a significant other. In the example above, the right person is the physician who receives the alert and advises the patient to get a colonoscopy. However, it is important to note that CDS interventions can sometimes change care team roles. For example, if the patient is resistant to advice from their physician, the information, in the form of an alert, may be best conveyed by a significant other or sibling who can use persuasion to help gain patient compliance. The important takeaway is to present information only to individuals who can take action. A common example in the health informatics literature is one where a nurse receives an order to adjust medication dosing for a patient. This type of information is problematic because the nurse has no way of knowing whether the medication dosing has already been adjusted.

The Right Intervention Format

As previously discussed, CDS may be implemented in various formats—alerts, order sets, protocols, patient monitoring systems, and infobuttons. Consequently, it becomes important for implementers to identify the issues and problems they are trying to solve and choose the best format to resolve the problem at hand. Furthermore, when developing a CDS program, implementers should create an inventory of current systems to determine which CDS tools are available, which tools need to be developed in-house, and which tools need to be purchased through a vendor. In the opening example, a practice wishes to

identify patients at risk for major illnesses, and get them to adopt preventive measures. The simplest solution is an alert that non-intrusively informs the physician of a patient's predisposition to an illness—in this case colon cancer.

The Right Channel

In healthcare, CDS interventions can be delivered through an EHR, PHR, computerized physician order entry, an app running on a smartphone, and—if necessary—in paper form via flow-sheets, forms, and labels. In the example above, if the physician is the right person, then the EHR may be the best platform for delivering the alert. However, if a significant other is the right person, then the right platform may be a text messaging app running on a smartphone. The alert would inform the individual of the patient's need to have a colonoscopy performed.

The Right Time in Workflow

A common problem in health information management is the desire to overlay new technology onto current clinical processes. One negative outcome of this practice is that information may be delivered to a clinician at the wrong time, or it may not be available when it is needed. A common example of this problem occurs when a physician is treating a patient who is taking aspirin. The physician temporarily loses track of this fact and begins the process of prescribing Coumadin for the patient. After entering in all the pertinent information for the prescription, the physician attempts to send the script to the pharmacy. An alert appears on the screen informing the physician that the patient is already taking aspirin and prescribing Coumadin could generate an adverse outcome.

This is an example of where information is presented at the wrong time in the clinical workflow process. It would be more advantageous for the physician to be alerted when they began typing the word Coumadin at the very start of the prescription process, not after the prescription had been entered. This highlights a very fundamental fact in the CDS implementation process, that to successfully create an intervention, the clinical processes involved must be thoroughly understood and documented so that the right information is delivered to the right person at the right time.

Closing the loop in the example from above, workflow analysis performed on the clinical process of a physical examination may reveal that a passive alert found in the patient's electronic health record informing the physician of the patient's need for colon cancer screening may be the best intervention to employ. An alert appearing when the physician opens the patient's health record, and requires the physician to actively acknowledge that they have seen the alert—which requires them to click on an alert window—may not be the best intervention. This could disrupt the physician's current workflow and consequently may not be processed at all.

Passive alerts can appear in a prominent place on the health record—a decision based on the results of the workflow analysis—and can be processed once the physician completes the physical examination. An alternative method would be when the physician closes the patient record they are given a prompt informing them that they have five patient alerts that need to be processed.

CDS Goals and Objectives

In the early stages of developing a CDS intervention, an organization would be advised to choose a goal to focus their efforts. The goal can be an organizational priority (patient satisfaction, safety, or prevention) or it can be a national priority, such as meaningful use or the CMS quality initiatives. Whatever goal is chosen, a direct link needs to be made between the goal and its potential impact on illness, death, and clinical outcomes. Once the goal is determined, a set of objectives can be defined that when achieved will provide evidence that the goal has been successfully realized.

For example, a goal could be a reduction in major illnesses in the practice's patient census. An objective to reach this goal could be a 90 percent screening rate for patients at risk of developing colon cancer. In addition, for each objective that is defined, a baseline rate needs to be identified to determine how successful the practice has been in meeting the objective. By defining a set of goals and objectives for the development of a CDS intervention, a practice can make use of the five rights to determine the what (information), who (recipient), how (intervention), where (format), and when (workflow) for a proposed intervention.

HIM Professionals' Role in CDS When developing a CDS intervention for an organization or practice, one of the most important tasks to be performed by an HIM professional is workflow analysis on the related clinical processes. A workflow analysis will examine the process and determine where the process can be modified and what information is needed at each step within the process. Also, the analysis would determine which intervention(s) are candidates for enhancing the process, making it safer and more efficient while providing a higher level of quality care.

Another area where an HIM professional can be involved is the implementation and use of vocabularies and classification systems used to code family histories, problem lists, symptoms, diagnoses, and medication lists. If patient information is not properly coded, CDS interventions such as alerts and reminders will not be activated if a patient meets a specific criterion.

For example, a patient who is coded as having a family history of colon cancer, whose age falls in the range of 50-75 years old, will automatically activate an alert informing their physician that they are a candidate for a colon cancer screening. If the information regarding the patient's family is entered as a note or unstructured data, then the alert will not be activated, and the patient may not be deemed as having a greater chance of succumbing to colon cancer.

Through the use of the five rights of CDS, workflow analysis, and clinical vocabularies and coding systems, HIM professionals can play a major role in the development of a CDS intervention and in turn help improve patient care.

For more information on the CDS Five Rights, visit https://sites.google.com/site/cdsforpiimperativespublic/cds.

Notes

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