Curriculum Development Centers Program

Awardee of The Office of the National Coordinator for Health Information Technology

Decision Support for Quality Improvement

Unit 6d: Tips for Successful Clinical Decision Support Systems

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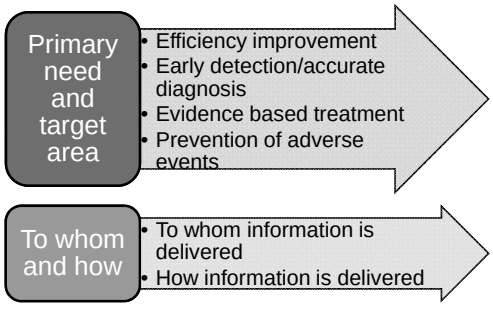
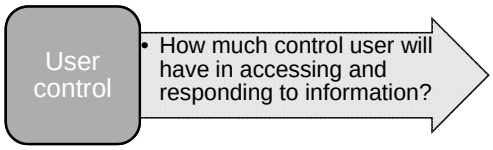
Objectives

- Investigate strategies for successful design and implementation of decision support systems.

Early Considerations



Early Considerations

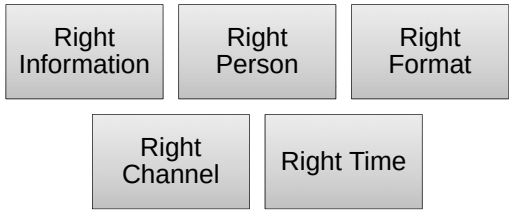


Automatic:
Example: calendar alarm that is automatically presented to remind user that a scheduled meeting is about to begin

On Demand:
Example: user can access the online thesaurus as needed

Component 12/Unit 6

5 Rights of CDSS



Component 12/Unit 6

CDS Design

- More effective than manual decision support processes
- CDS interventions most likely to be used:
  - Fit into clinicians' workflow
  - Presented automatically
- If recommends actions for users to take: more effective than if merely provides assessments
- If provides information at a time and place of decision-making: more likely to have an impact.

Component 12/Unit 6

CDS Implementation

Workflow integration

- Includes structure or work system features and processes that support care
- Step 1: Engage clinicians in design and implementation
- Step 2: Analyze workflow and how CDS will fit into that workflow
- Step 3: Determine need for process improvement
- Step 4: Configure to meet users' needs

Component 12/Unit 6

CDS Implementation

Data Entry and Output

- Most CDS are integrated into the EHR and pull patient information from that record
- Some CDS are independent of the EHR and the user may have to enter patient information twice
- A consideration: who enters the data and who receives the CDS advice?

Component 12/Unit 6

CDS Implementation

Standards and Transferability

- EHRs with CDS capability may not be ready for use "off the shelf"
- Effective CDS implementation requires some degree of local customization
- In the absence of standards for information exchange of CDS, users will need to select the rules and alerts that are most applicable to their site

Component 12/Unit 6

CDS Implementation

Knowledge Maintenance

- It is difficult to maintain the accuracy of the medical record (e.g., failure to update medications or allergies)
- If information used to trigger the CDS is not accurate, the alerts will not be accurate
- Knowledge imbedded in the CDS may be out-dated (e.g. clinical practice guidelines may change and the CDS will need to be updated to reflect the current standard).

Component 12/Unit 6

Clinical Decision Support (CDS) Inpatient Case Study

A semi-rural community hospital has bought a commercial inpatient computerized order entry system. The hospital admits patients from its emergency department (ED) and from ambulatory clinics and wants to measure safe and timely admission and transition of patients from the ED to the inpatient unit. The hospital sees many cases of chest pain in the ED, identified as an area in which it can improve management. There is a standard protocol for working up, diagnosing, and treating patients with chest pain. The inpatient physician group would like to assure rapid initiation of the protocol once the diagnosis of chest pain is made in the ED.

Component 12/Unit 6

Inpatient CDS Case Study Two Contingencies

Patient may come to the ED with clear diagnosis of a major event (heart attack) that requires immediate transfer to the cardiac intensive care unit (CICU). The cardiac care team has protocols for different cardiac diagnoses that depend on rapid evaluation and diagnosis in the ED, timely communication to the cardiac care team and coordination of diagnostic testing/interventions and patient transfer to the CICU.

A patient may deteriorate acutely after arrival to the ED. Deterioration may be preceded by changes in vital signs and measures (e.g., heart rate, respiratory rate, blood pressure, oxygen saturation levels, electrocardiogram) that are tracked and recorded by patient monitors with alarms for abnormal values.

Component 12/Unit 6

Inpatient CDS Case Study Considerations for Clinicians and IT

- What is CPOE? What are its functions in patient safety?
- What is the role of CDS in CPOE?
- What is the sequence of events that must occur in the average patient who presents to the ED with chest pain and must be admitted to the inpatient unit?
- What are the sequences of events for patients in contingencies 1 & 2?
- What clinical data need to be monitored, detected, and managed during the ED work-up of the patient? Does this change for contingencies 1 & 2?
- What are the functions of CDS in data management to ensure quality?

Inpatient CDS Case Study Considerations for Clinicians and IT

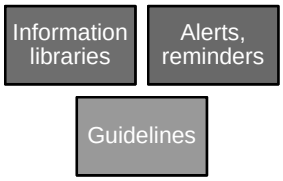
- Order sets
  - How do order sets help assure safety and quality?
  - How are order sets created, implemented, and maintained?
- Alerts and reminders
  - How do alerts and reminders interact with users?
  - How can alerts pose problems in patient safety?
- Access to drug dictionaries and patient data
  - What are patient safety functions that CPOE/CDS linked to patient data offer?
  - What patient safety functions can drug dictionaries offer to DCS and what challenges exist in implementing them?

Clinical Decision Support (CDS) Ambulatory Care Case Study

Community ambulatory practices want to keep track of patients who are admitted for chest pain (especially those who are diagnosed with heart disease). They would like to improve ongoing management of heart disease in their population by being alerted to patient admission to the hospital and hospital management and disposition of these patients (new medications, management by specialists, etc.). They have a good working relationship with the hospital and some of the ambulatory practices affiliated with the hospital already have a common electronic health record that connects to the hospital information systems.

Ambulatory Care CDS Case Study Considerations for Clinicians and IT

- For practices with connected EHRs,
  - What kinds of patient data need to be made available to the ambulatory practices?
  - What forms of CDS will be helpful to assure continuity of care?



Ambulatory Care CDS Case Study Considerations for Clinicians and IT

- For practices without connected EHRs,
  - What are alternatives to implement CDS?
  - What are challenges and barriers?
  - What business strategies might be considered by the hospital and the practices to improve EHR adoption?
- How can CDS be used in ambulatory EHRs improve prevention?
  - Information libraries for practitioners and patients
  - Evidence-based care guidelines
  - Alerts and reminders
  - Analysis tools for practice data

Clinical Decision Support (CDS) Public Health Case Study

The State Health Department targets cardiac disease in the community and wants to implement programs to discover and intervene in both acute and preventive care. It would like to establish state health information exchange (HIE) for cardiac care. Public health policy makers would like to have decision support that would help improve cardiac care in the state. In meeting with clinical cardiologists from community hospitals and a tertiary university center, public health officials are in discussion with an IT team to improve the functionalities of the local health information registries (primarily for immunizations, infant metabolic screening, and cancer).

Public Health CDS Case Study Considerations for Clinicians and IT

What is the public health information process for cardiac health and who determines this?

- Surveillance: types of data reported, by whom, and how often?
- Analysis: measures of importance?
- Response: public health responses?

What data do public health officials need to assess and make decisions about cardiac health in the state?

- Access to information (institutional, regional, national)
- Guidelines
- Alerts and reminders (to public health officials, to the public)

What information standards are needed (clinical data reporting, data reporting formats?)

Summary

- When implementing CDS, IT professionals should consider the primary need and target area, to whom and how information is to be delivered, and degree of user control.
- The 5 rights of CDS state that CDS should be designed to provide the right information to the right person in the right format through the right channel at the right time.
- Important considerations are: workflow integration, data entry and output, standards and transferability, and knowledge maintenance.

References

- Ash JS, Sittig DF, Campbell EM, Guappone KP, Dykstra RH. Some unintended consequences of clinical decision support systems. AMIA 2007 Symposium Proceedings. 11:26-30. 2007
- Bates D. Clinical Decision Support Workshop, ONC, August 25-26, 2009
- Chaffee BW. Future of clinical decision support in computerized prescriber order entry. American Journal of Health System Pharmacists. 67: 932-935. 2010.
- De Clercq PA, Blom JA, Hasman A, Korsten HHM. A strategy for developing practice guidelines for the ICU using automated knowledge acquisition techniques. Journal of Clinical Monitoring. 15:109-117. 1999.
- Edward E. Shortliffe, Conference on Medical Thinking University College, London, 2006 June 23.
- Handler JA, Feied CF, Coonan K, Vozenilek J, Gillam M, Peacock PR, Sinert R, Smith MS. Computerized physician order entry and online decision support. Academy of Emergency Medicine. 11(11):1135-1141. 2004.
- Kawamoto K, Houlihan CA, Balas EA, Lobach DF. Improving clinical practice using clinical decision sopport systems: a systematic review of trials to identify features critical to success. BMJ. 330(7494):765. 2005.

References

- Kuperman GJ, Bobb A, Payne TH, Avery AJ, Gandhi TK, Burns G, Classen DC, Bates, DW. Medication-related clinical decision-support in computerized provider order entry systems: a review. Journal of the American Medical Informatics Association. 14(1), 29-40. 2007.
- Lami JB, Ebrahiminia V, Riou C, Seroussi B, Bouaud J, Simon C, Dubois S, Butti A, Simon G, Favre M, Falcoff H, Venot A. How to translate therapeutic recommendations in clinical practice guidelines into rules for critiquing physician prescriptions? Methods and application to five guidelines. BMC Medical Informatics and Decision Making. May 28;10:31. 2010.
- Metzger J, Macdonald K. Clinical decision support for the independent physician practice. Health Reports, California Health Care Foundation. 2002.
- Moxey A, Robertson J, Newby D, Hains I, Williamson M, Pearson S. Computerized clinical decision support for prescribing: provision does not guarantee uptake. Journal of the American Medical Informatics Association. 17:25-33. 2001.
- Nies J, Colombet I, Zapletal E, Gillaizeau F, Chevalier P, Durieux P. Effects of automated alerts on unnecessarily repeated serology tests in cardiovascular surgery department: a time series analysis. BMC Health Services Research. 10:70. 2010.

References

- Osheroff JA. Improving medication use and outcomes with clinical decision support: a step-by-step guide. Chicago, IL: The Healthcare Information and Management Systems Society. 2009.
- Schedlbauer A, Prasad V, Mulvaney C, Phansalkar S, Stanton W, Bates DW, Avery AJ What evidence supports the use of computerized alerts and prompts to improve clinicians' prescribing behavior? Journal of the American Medical Informatics Association. 16(4):531-8. 2009.
- Seidling HM, Schmitt SPW, Bruckner T, Kaltschmidt J, Pruszydlo MG, Senger C, Bertsche T, Walter-Sack I, Haefeli WE. Patient-specific electronic decision support reduces prescription of excessive doses. Quality and Safety in Health Care. 2010 April 27.
- Shah NR, Seger AC, Seger DL, Fiskio JM, Kuperman, GJ, Blumenfeld B, Recklet EG, Bates DW, Gandhi TK. Improving Acceptance of Computerized Prescribing Alerts in Ambulatory Care. Journal of the American Medical Informatics Association 2006; 13(1): 5–11. 2006.

References

- Teich JM, Merchia PR, Schmiz JL, Kuperman GJ, Spurr CD, Bates D. Effects of computerized physician order entry on prescribing practices. Arch Intern Med. 2000 Oct 9; 160 (18):2471-7
- Van Der Sijs H, Aarts J, Vulto A, Berg M. Overriding of drug safety alerts in computerized physician order entry. Journal of the American Medical Informatics Association. 2006; 13(2), 138-147.
- Vashitz G, Meyer J, Parmet Y, Peleq R, Goldfarb D, Porath A, Gilutz H. Defining and measuring physicians' responses to clinical reminders. Journal of Biomedical Informatics. 2009; 42(2):317-26.
- Wyatt J, Spiegelhalter D. Field trials of medical decision-aids: potential problems and solutions. Proceedings of the Annual Symposium on Computer Application in Medical Care. 1991; 3-7
- Zanetti G, Flanagan HL, Cohn LH, Giardina R, Platt R. Improvement of intraoperative antibiotic prophylaxis in prolonged cardiac surgery by automated alerts in the operating room. Infect Control Hosp Epidemiol. 2003; 24(1):13–16.