Clinical Decision Support Technologies for Oncologic Pathology

Brian H. Shirts
Assistant Professor, Department of Laboratory Medicine
University of Washington,

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Clinical Decision Support (CDS)

Information presented to assist clinicians in appropriately interpreting and acting on diagnostic testing results.

“…knowledge and person-specific or population information, intelligently filtered or presented at appropriate times, to foster better health…”

Osheroff et al, 2007. JAMIA
Guidelines can take years to disseminate

Even with effective dissemination, implementation may be variable

Clinical decision support can be an ideal way to:
- Educate
- Remind
- Assist
Passive and Active CDS

- Passive – require user effort to access or interpret
  - Reference ranges
  - Dose or risk calculators
  - URLs with links to additional information
  - Infobuttons

- Active – situation or action specific triggers
  - Flags
  - Pop-ups
  - Diagnostic Management Teams
Passive Clinical Decision Support
What makes clinicians use passive CDS?

- In general passive CDS used infrequently
- Accessed for abnormal findings more often
- Accessed for unusual situations more often
- Accessed more often when there are changes in process

Active Clinical Decision Support
Barriers to Active CDS

- Physician Acceptance
- Coding molecular and pathology information for electronic health record
- Interoperability
- Cost
Alert fatigue... Sijs et al, 2006 JAMIA

PHARMACOGENOMICS ALERT

WARNING: Patient carries a genetic variant that influences clopidogrel (Plavix) metabolism, resulting in impaired responsiveness.
- Consider prasugrel (Effient) or other alternative therapy.

RESULT: NEXT Exome Cyp2C19 Result (Sendout)

NOTE: This is an experimental pharmacogenomics alert created for patients in the NEXT01 Exome sequencing study. You may receive an e-mail asking for your feedback on this alert.

Alert Action
- Cancel Order
- Override Alert
Not All Alerts are Created Equal

► Process Questions
  ► Do alerts cause providers to change medication or management?
  ► What percent of providers override alerts?

► Usability Questions
  ► What do providers like/dislike about CDS alerts?
  ► What makes a CDS alert more likely to be used?

Quality Active CDS

Specificity

Good design

Stakeholder Acceptance

Clinical Evidence

Ash et al, 2007. JAMIA

Hartzler et al 2014
Coding for Active CDS

- Patient
- Genetic Test
- Sequence Read-out
- Automated Filtration
- Geneticist Annotation
- Expert Panel Review
- CDS Rules Engine
- Results stored in EHR
- Submitted as Lab Result (Machine Readable)
- Report Generated (Print/PDF format)
- Care Provider
- Actionable variant identified

“Interoperability is the ability of different information technology systems and software applications to communicate, exchange data, and use the information that has been exchanged.”

http://www.himss.org/library/interoperability-standards/what-is
Interoperability for Active CDS

Figure courtesy of David Chou
Draft 10 Year CMS/ONC Interoperability Roadmap

Figure 1. Health IT Ecosystem

Active CDS costs

- What was the estimated development, implementation, and maintenance cost for active pharmacogenetic CDS at the University of Washington expressed as cost per alert?
  - $0
  - $46
  - $460
  - $4,600
  - $46,000
  - $∞
Active CDS costs

Cost of Genomic Clinical Decision Support per Useful Event

- Average probability each CDS rule will benefit a patient
- Number of institutions
- Number of CDS rules
- Efficiency gained by collaborating institutions
- Rule maintenance rate per year
- Initial cost for single CDS rule development and implementation
- Efficiency gained for multiple clinical decision support rules

Low Input
High Input

Mathias et al. AMIA Jt Summits Transl Sci Proc. 2016 Jul 20;2016:60-4
Most pathology reports, including molecular pathology reports, are currently not formatted to facilitate pathology data sharing and effective electronic clinical decision support. Improvements are needed.

The costs of building and maintaining clinical decision support networks are often ignored or minimized; however, these costs can be substantial, especially if clinical decision support is implemented independently at each health care institution. Dramatic improvements in data interoperability and inter-institution collaboration will be necessary to drive decision support costs down.

Take Home Points