Clinical Informatics for Varied EHR Systems
State of Science and Gaps

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Goals

• Define clinical informatics

• The role the EHR and CDS plays in precision medicine

• Technology and information gaps impacting precision medicine

• Clinical informatics approaches to address gaps
Biomedical informatics is motivated by problems from a biomedicine domain

(Shortliffe & Cimino 2014 Fig 1.19. Biomedical Informatics as a Basic Science)
Clinical Informatics

• “Clinical informatics is the application of informatics and information technology to deliver healthcare services”
  (https://www.amia.org/applications-informatics/clinical-informatics)

• Clinical care activities (medicine, pharmacy, nursing, dentistry, etc)

• Patient-oriented informatics applications
Clinical care activities in precision medicine

• P4 Medicine™ (Hood L, Nat Biotechnol, 2011)

  • Predictive  eg., family history of risk/susceptibility
  • Preventive  eg., prevent adverse drug reactions
  • Personalized eg., complex disease risk advice
  • Participatory eg., self-management of complex diseases
Clinical decision support as a bridge to overcome barriers to realizing precision medicine

(Welch & Kawamoto et al. JAMIA, 2012. Figure 1 Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3638177/)
Facilitating precision medicine with clinical decision support

Data and information sources for clinical decision support

Delivery of clinical decision support

Typical office visit workflow

Technology and information gaps in implementing precision medicine

• Healthcare delivery process
  • Workflows are variable (timing & transactions)
  • Multiple stakeholders (patient, healthcare providers, lab professionals, bioinformatics professionals, health IT professionals)

• Data and information sources for clinical decision support
  • Various data sources
  • Data storage, access and exchange (while ensuring privacy & security)
  • Ensure high quality and identify actionable data and information

• Delivery of clinical decision support
  • Mechanisms for delivery vary
  • Dependence on vendor specified capabilities
  • Current CDSS are inadequate
Clinical informatics approaches to address gaps: Healthcare delivery process

• Understand and document context and workflow for tailored solutions
  • Workflow process (what are pre-EHR, EHR, and post-EHR the tasks?)
  • Who are the stakeholders?
  • What and how data are used?

• Pre- & post- implementation monitoring

Gaps
• Workflows are variable (timing & transactions)
• Multiple stakeholders (patient, healthcare providers, lab professionals, bioinformatics professionals, health IT professionals)
Clinical informatics approaches to address gaps: Data and information sources for CDS

• Understand what are needs for and availability of data and information

• Use of standardized terminology and data exchange standards

• Establish an “integrated knowledge environment” to connect structured/disparate with unstructured/text-based database repositories (Castaneda et al. Journal of Clinical Bioinformatics, 2015)

• Share actionable interpretations and authoritative, concise, informative guidance

Gaps

• Various data sources
• Data storage, access and exchange (while ensuring privacy & security)
• Ensure high quality and identify actionable data and information
Clinical informatics approaches to address gaps: Delivery of clinical decision support

- Characterizing CDS capabilities
  - Most EHR’s lack some CDS capabilities (McCoy et al. JAMIA, 2015)

- Understanding readiness to adopt CDS

- User experience and design considerations

- Measure CDS adoption

- Measure impact of CDS on outcomes

Gaps
- Mechanisms for delivery vary
- Dependence on vendor specified capabilities
- Current CDSS are inadequate

(Colicchio et al. JBI, 2016. Figure 1 Retrieved from: http://www.sciencedirect.com/science/article/pii/S1532046416300727)
## Summary of gaps and challenges

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
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<tbody>
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