Clinical Informatics for Varied EHR Systems

State of Science and Gaps

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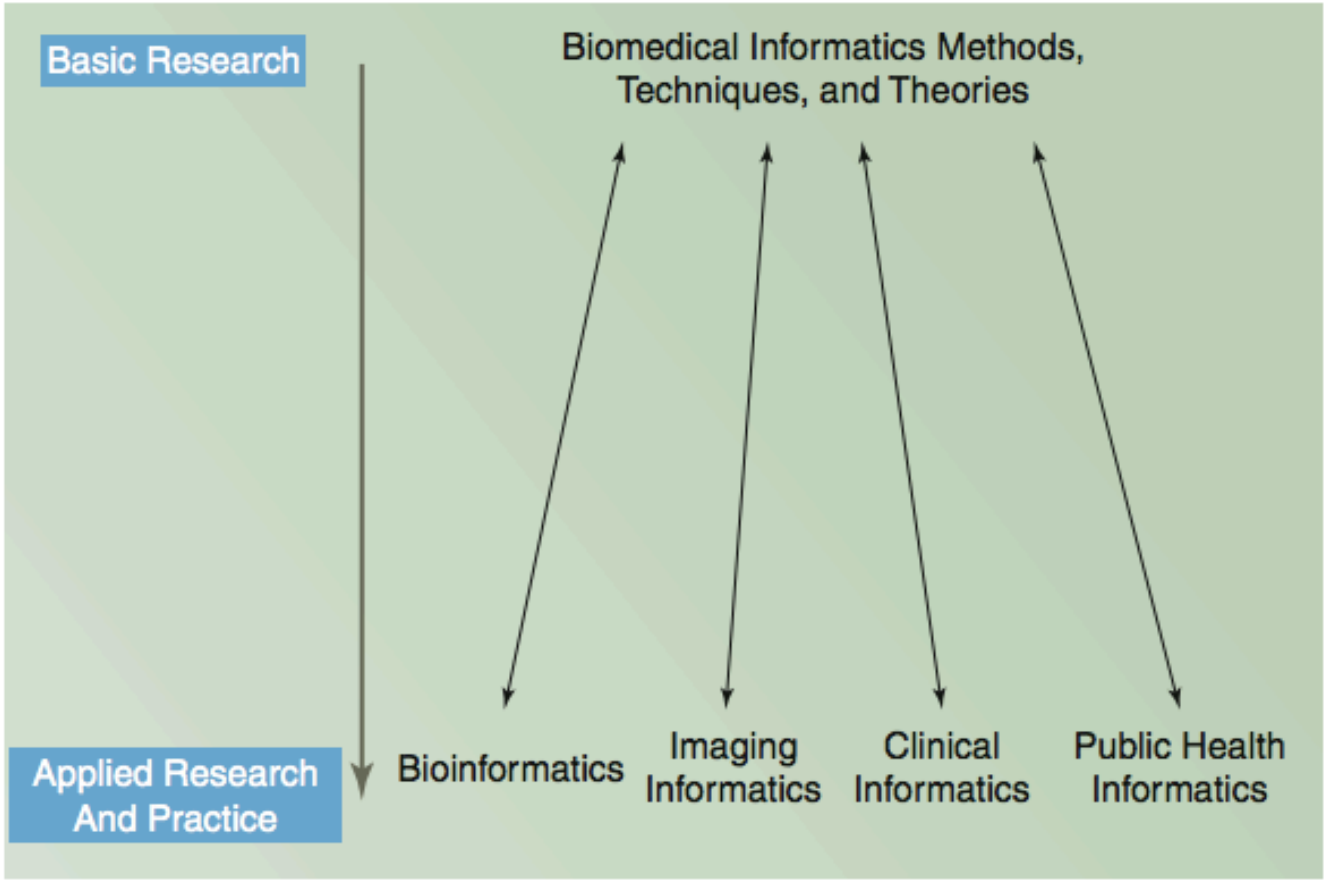
Goals

- 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



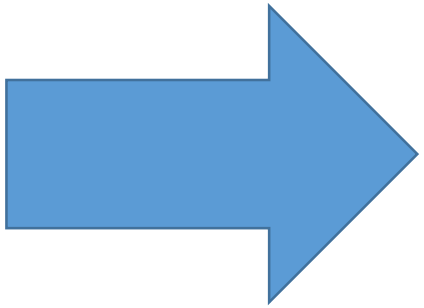
(Shortliffe & Cimino 2014 Fig 1.19. Biomedical Informatics as a Basic Science)

Clinical Informatics

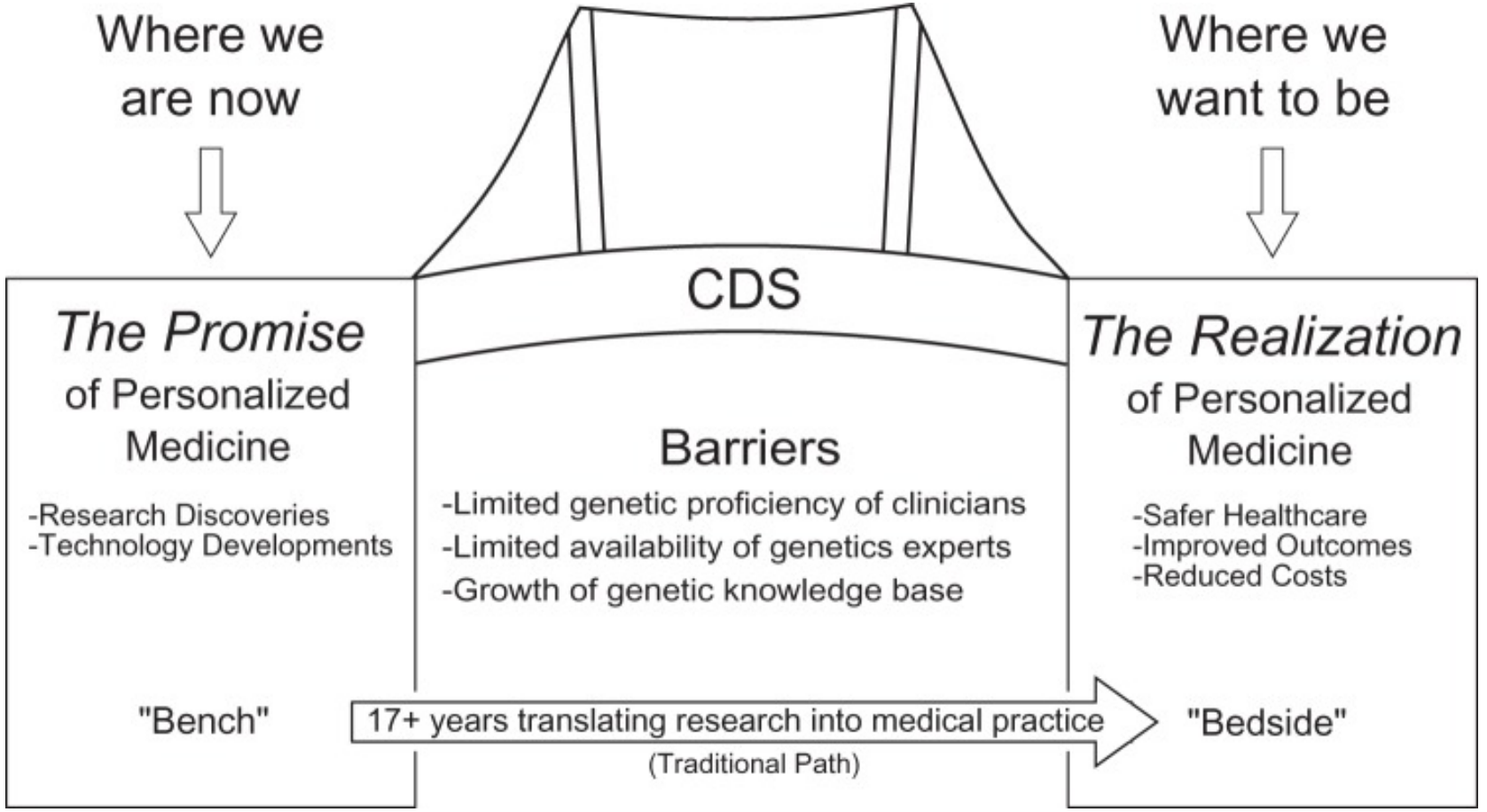
- “Clinical informatics is the application of informatics and information technology to deliver healthcare services” (https://www.amia.org/applications-informatics/clinical-informatics)
- Clinical care activities (medicine, pharmacy, nursing, dentistry, etc)
- Patient-oriented informatics applications

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

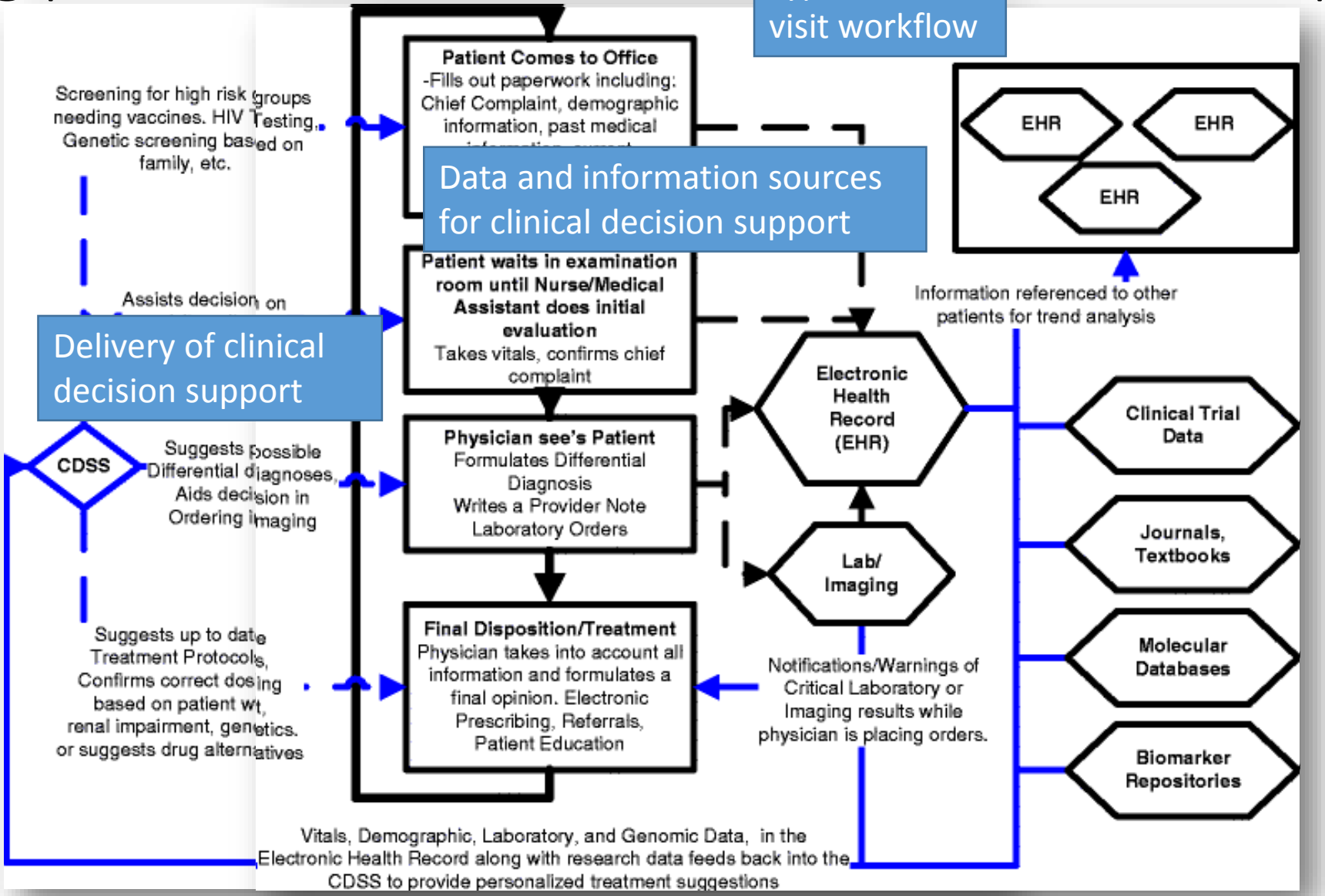


Clinical decision support as a bridge to overcome barriers to realizing precision medicine



(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



(Castaneda et al. Journal of Clinical Bioinformatics, 2015. Retrieved from: http://jclinbioinformatics.biomedcentral.com/articles/10.1186/s13336-015-0019-3)

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)

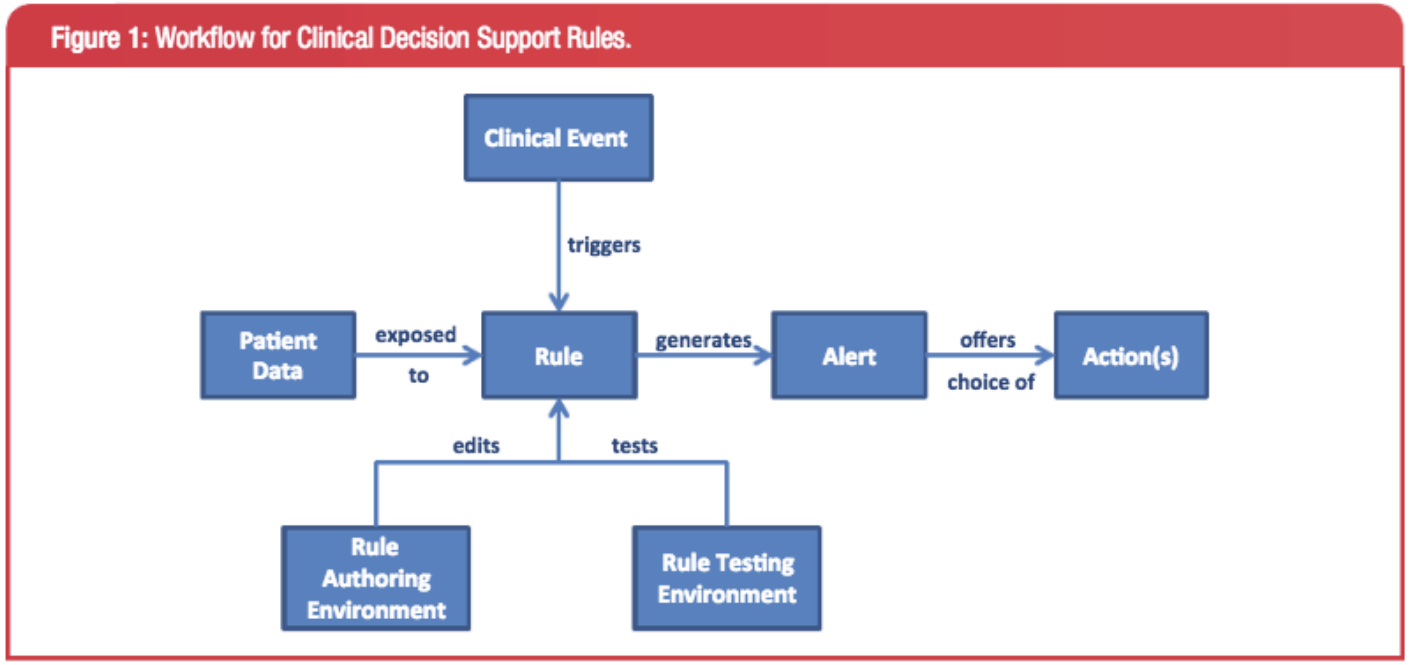
- Data and information sources for clinical decision support
  - Various data sources
  - Data storage, access and exchange (while ensuring privacy & security)
  - Ensure high quality and identify actionable data and information

- 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 tailorec 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



(McCoy et al. JAMIA, 2015. Figure 1 Retrieved from:http://jamia.oxfordjournals.org/cgi/pmidlookup?view=long&pmid=26104739)

Gaps

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Clinical informatics approaches to address gaps: Data and information sources for CDS

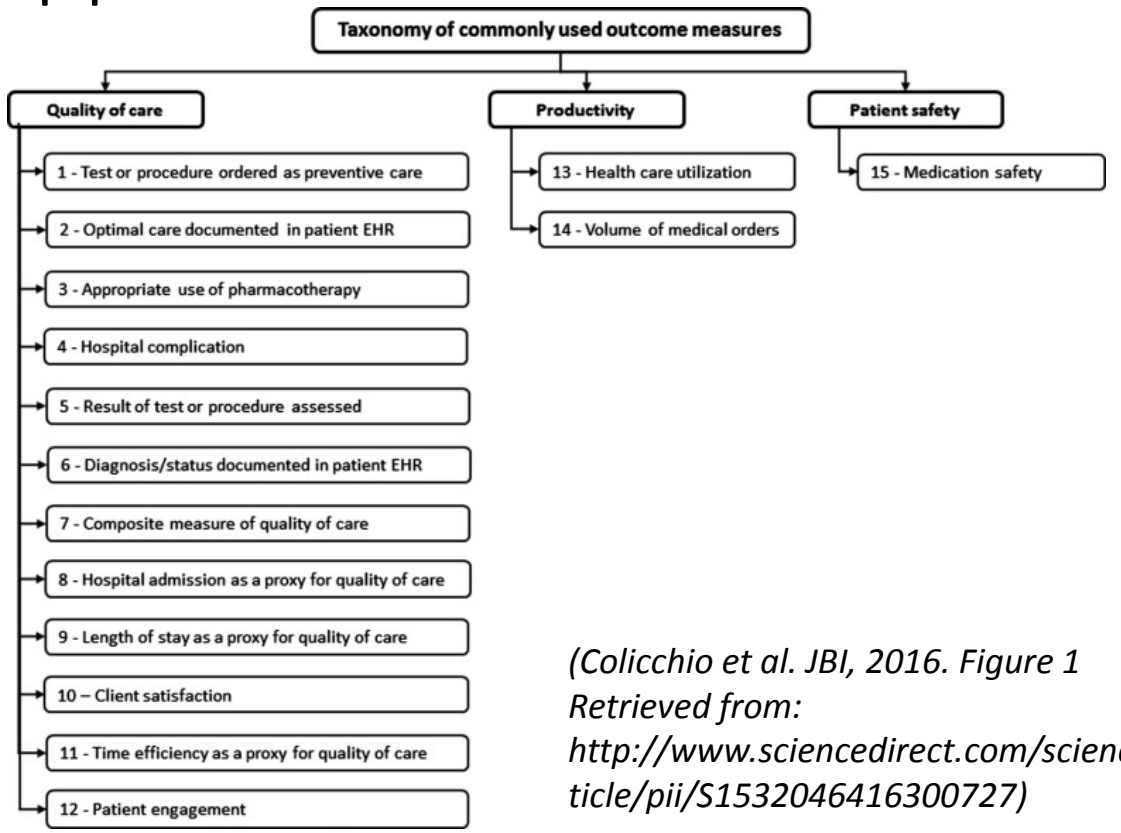
- Understand what are needs for and availability of data and information
- Use of standardized terminology and data exchange standards
- Establish an “integrated knowledge environment” to connect structured/disparate with unstructured/text-based database repositories
  (Castaneda et al. Journal of Clinical 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



(Colicchio et al. JBI, 2016. Figure 1 Retrieved from: http://www.sciencedirect.com/science/article/pii/S1532046416300727)

Gaps

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

Summary of gaps and challenges

- Healthcare delivery process
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- Understand and document context and workflow for tailored solutions
- Pre- & post- implementation monitoring

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