

# The Evidence Base for Health Information Exchange: Protocol for Systematic Review and Some Preliminary Findings

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# Outline

- Rationale
- Past work
- Systematic review protocol
- Some early results
- Future directions

# US has made substantial investment in health information technology (HIT)

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**Obama's big idea: Digital health records**

President-elect Barack Obama, as part of his effort to revive the economy, is proposing a massive effort to modernize health care by making all health records standardized and electronic. The government estimates about 212,000 jobs could be created by this program, CNNMoney reports. [full story](#)

*“To improve the quality of our health care while lowering its cost, we will make the immediate investments necessary to ensure that within five years, all of America’s medical records are computerized ... It just won’t save billions of dollars and thousands of jobs – it will save lives by reducing the deadly but preventable medical errors that pervade our health care system.”*

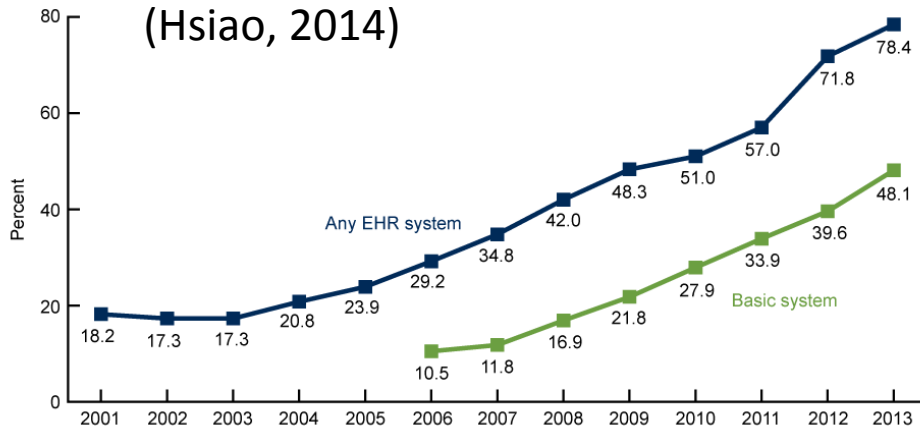
January 5, 2009

Health Information Technology for Economic and Clinical Health (HITECH) Act of the American Recovery and Reinvestment Act (ARRA)

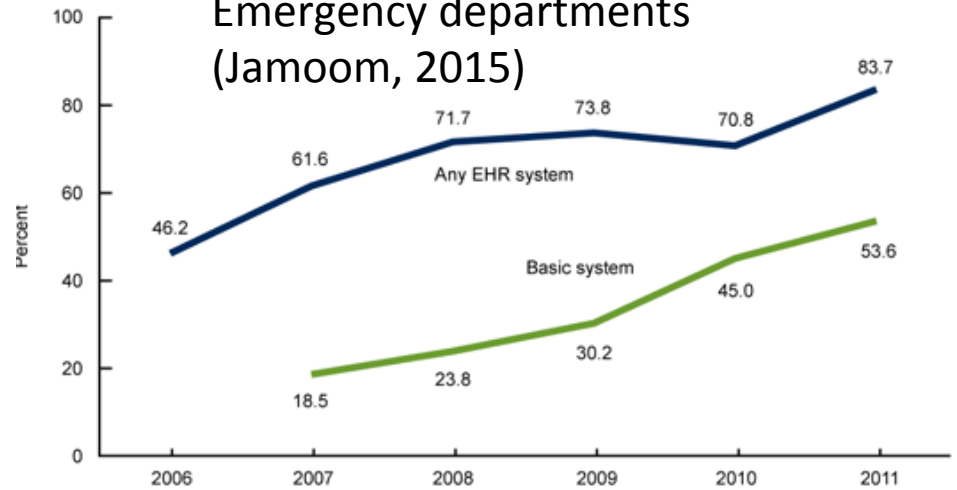
- Incentives for electronic health record (EHR) adoption by physicians and hospitals (\$30B)

# Leading to significant EHR adoption

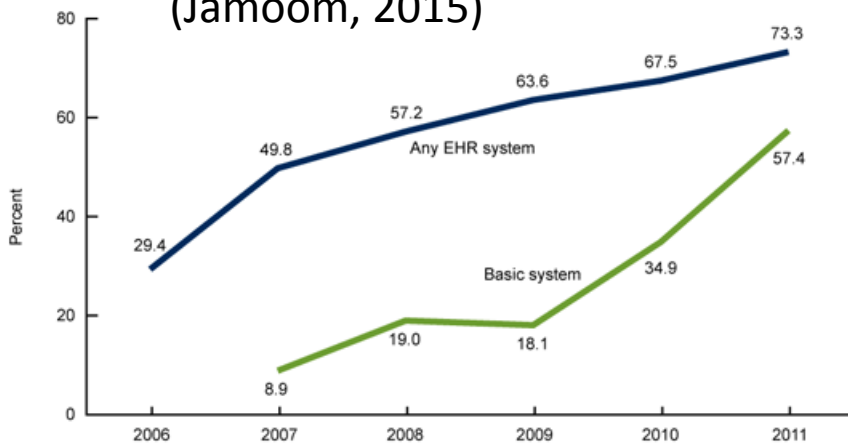
Office-based physicians  
(Hsiao, 2014)



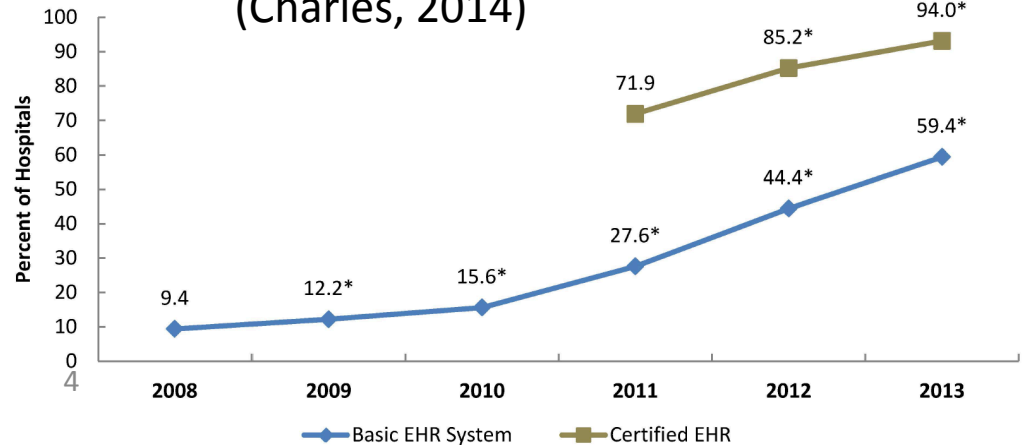
Emergency departments  
(Jamoom, 2015)



Outpatient departments  
(Jamoom, 2015)

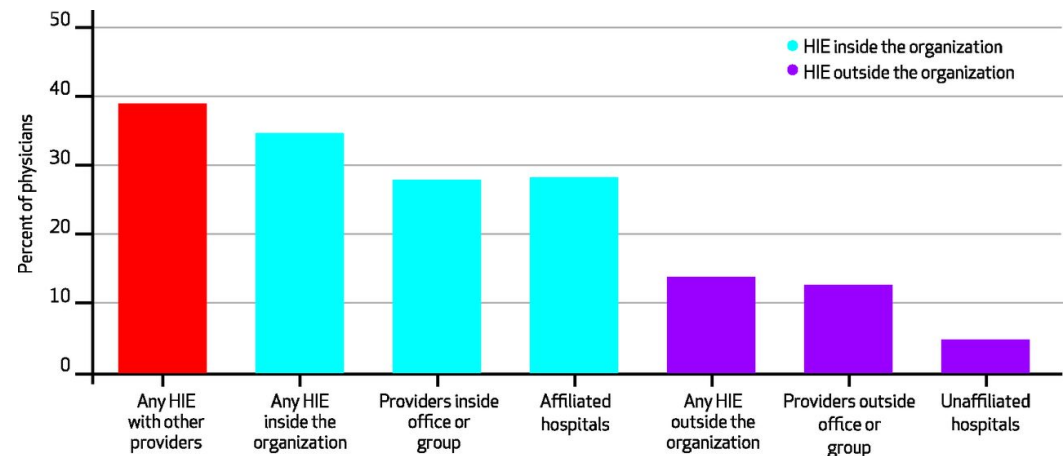
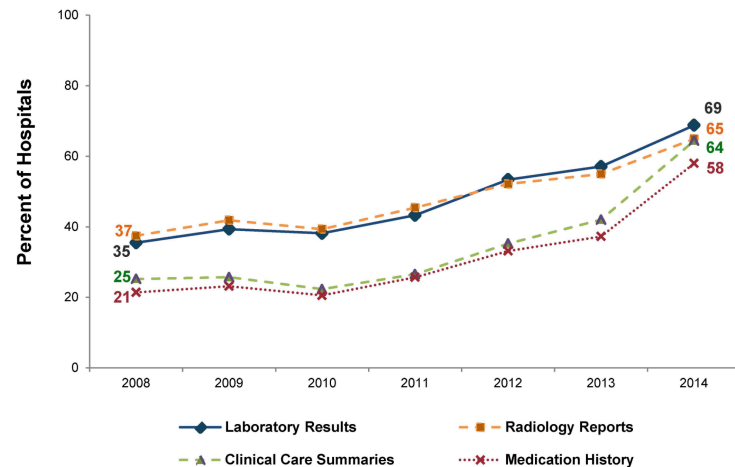


Non-federal hospitals  
(Charles, 2014)



# Although less HIE uptake, especially in ambulatory settings

- 76% of hospitals electronically exchanged health information with outside providers by 2014 (Swain, 2015)
- 14% of ambulatory providers shared data with providers outside their organization by 2013 (Furukawa, 2014)



# What is the value of health information exchange (HIE)?

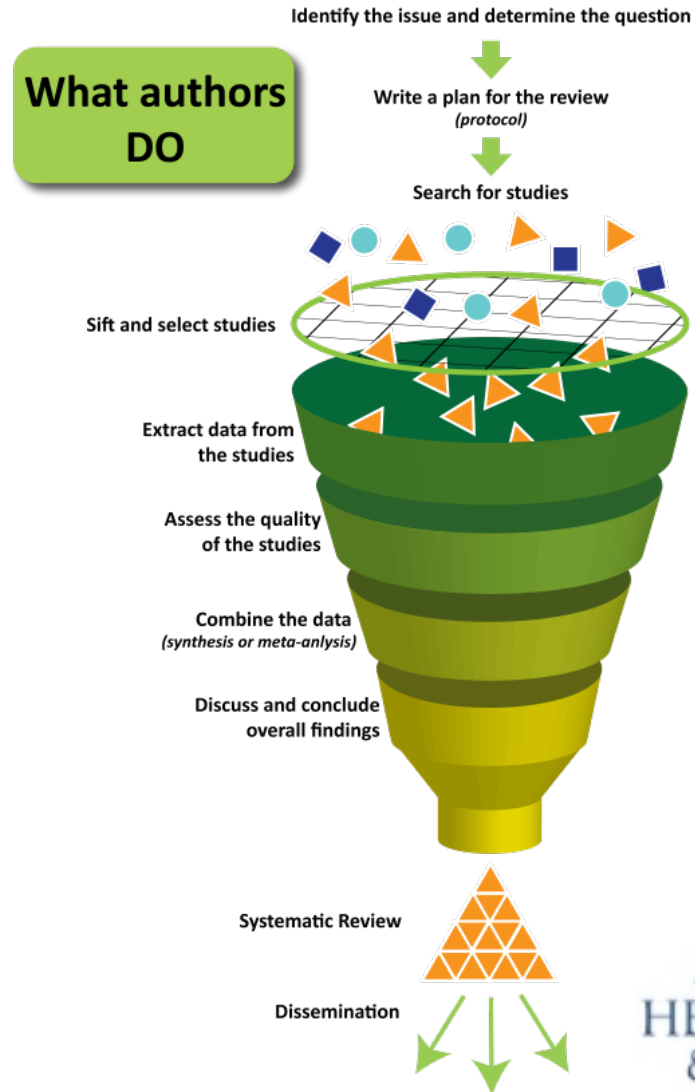
- Value as demonstrated by evidence from scientific studies
  - Can apply techniques of evidence-based medicine
  - When there are many studies, next step is to perform a systematic review
- We undertook a systematic review looking at four major aspects of HIE
  - Effectiveness
  - Use
  - Implementation
  - Sustainability
- Funded by Agency for Healthcare Research & Quality (AHRQ) Evidence-Based Practice Centers program
  - Contract No. 290-2012-00014-I, Task Order 11

# Rationale

- Health information exchange (HIE) has been promoted as an important application of technology in medicine that can improve the efficiency, cost-effectiveness, quality, and safety of health care delivery
- HIE also requires considerable investment by sponsors, which have included governments as well as health care organizations
- We are carrying out a systematic review that aims to synthesize the currently available research addressing HIE effectiveness, use, usability, implementation, and sustainability

# What is a systematic review?

- A systematic review is a literature review focused on a research question that tries to identify, appraise, select and synthesize all high quality research evidence relevant to that question
  - Cochrane Collaboration
  - [www.cochrane.org](http://www.cochrane.org)
- A systematic review is only as good as the underlying studies reviewed





# Other systematic reviews of HIE

- Older
  - Hincapie, A and Warholak, T (2011). The impact of health information exchange on health outcomes. *Applied Clinical Informatics*. 2: 499-507
- Published while we were doing ours
  - Rudin, RS, Motala, A, et al. (2014). Usage and effect of health information exchange: a systematic review. *Annals of Internal Medicine*. 161: 803-811
  - Rahrurkar, S, Vest, JR, et al. (2015). Despite the spread of health information exchange, there is little evidence of its impact on cost, use, and quality of care. *Health Affairs*. 34: 477-483

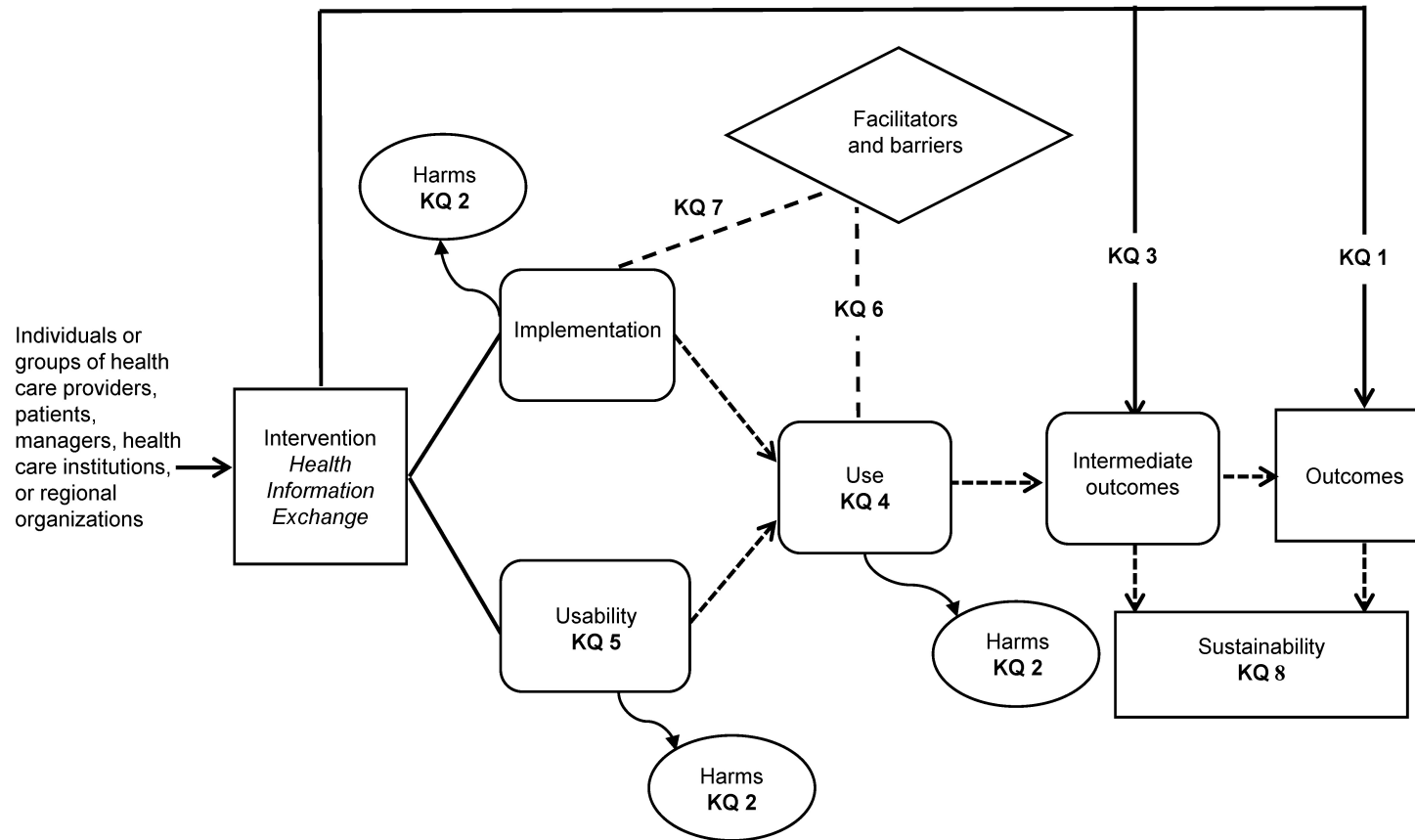
# Conclusions of other recent reviews

- Rudin et al.
  - HIE probably reduces emergency department usage and costs in some cases; effects on other outcomes unknown
  - Stakeholders claim to value HIE, but many barriers to acceptance and sustainability exist
  - Small portion of operational HIEs have been evaluated, and more research needed to identify and understand success factors
- Rahurkar et al.
  - Study designs with strong internal validity (e.g., randomized controlled trials or quasi-experiments) less likely than others to associate HIE with benefits
  - Overall, little generalizable evidence currently exists regarding benefits attributable to HIE

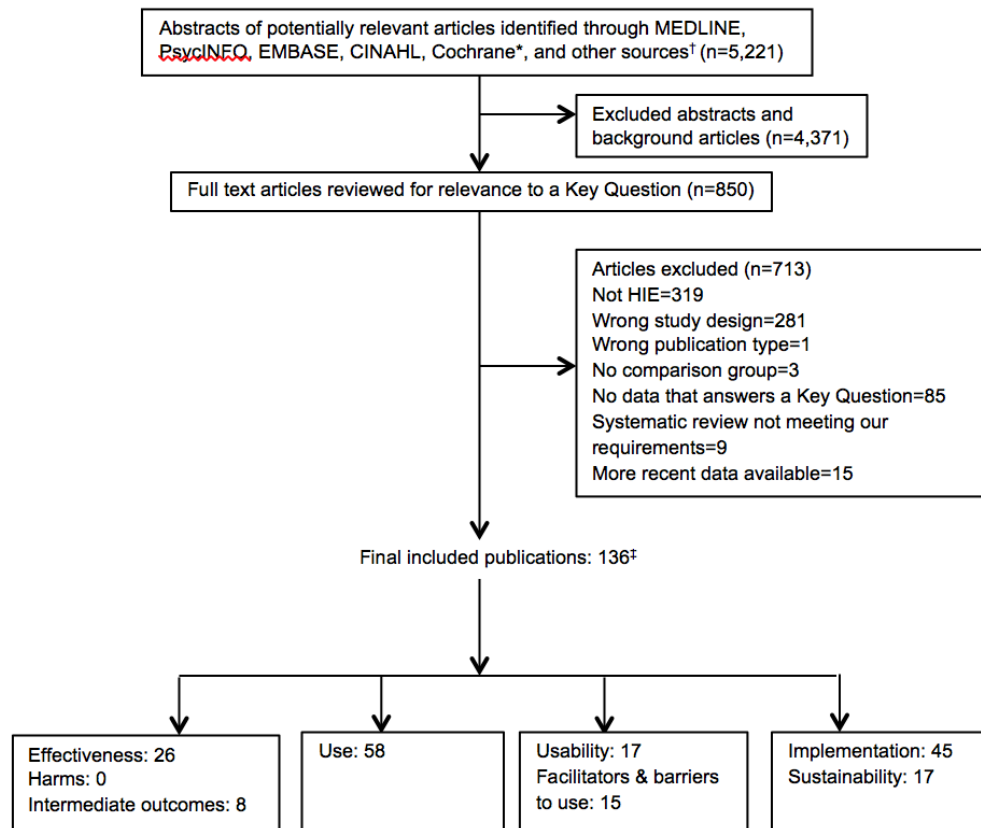
# Key questions

- Is HIE effective in improving clinical (e.g., mortality and morbidity), economic (e.g., costs and resource use, the value proposition for HIE), and population (e.g., syndromic surveillance) outcomes?
- What harms have resulted from HIE? (e.g., violations of privacy, errors in diagnosis or treatment from too much, too little or inaccurate information, or patient or provider concerns about HIE)?
- Is HIE effective in improving intermediate outcomes such as patient and provider experience, perceptions, or behavior; health care processes; or the availability, completeness, or accuracy of information?
- What are the current level of use and primary uses of HIE?
- How does the usability of HIE impact effectiveness or harms for individuals and organizations?
- What facilitators and barriers impact use of HIE?
- What facilitators and barriers impact implementation of HIE?
- What factors influence sustainability of HIE?

# Analytic framework



# Results of literature searching



\*Cochrane databases include the Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Database of Abstracts of Reviews of Effects, and National Health Sciences Economic Evaluation Database

†Identified from reference lists, hand searching, suggested by experts, and other sources

‡Publications may address more than one Key Question, studies may have multiple publications

# Consolidation of key questions

- Effectiveness
- Use
- Usability
- Implementation and sustainability

# Some early results: effectiveness

- 34 studies on outcomes
  - 26 studies reported clinical (intermediate), economic, or population outcomes – study methods included
    - Retrospective cohort – 18
    - Randomized controlled trials (RCTs) – 2 (3 papers)
    - Cross-sectional – 2
    - Case series – 2
  - 8 survey studies reported on perceptions of outcomes
- No studies evaluated primary clinical outcomes from HIE (e.g., mortality and morbidity) nor explicitly assessed harms

# Categories of outcomes (number of papers) reported

- Laboratory testing (6)
- Radiology testing (9)
- Hospital admissions (8)
- Hospital readmissions (2)
- Referrals and consultations (2)
- ED costs (2)
- Public health reporting (3)
- Quality of care in ambulatory settings (3)
- Other aspects of HIE (3)



# Laboratory testing

- 5 studies showed benefit for HIE in reducing overall tests, although estimates of impact on cost were mixed
  - 4 of these studies took place in ED setting, all showing some aspect of reduced testing and cost savings
- 2 studies in ambulatory settings, with one showing increase and other showing a reduction in increased overall rate of testing

# Radiology testing

- 7 studies in ED setting showed reduced testing
- 2 studies in ambulatory settings, with 1 showing decrease and other showing no change in rate of testing

# Hospital admissions and readmissions

- 2 studies found reduction in hospital admissions and lower costs
- 3 other studies also measured some benefit for HIE use in reducing hospital admissions, although 3 additional studies found no such reduction
- For reducing hospital readmissions, 1 study showed benefit for HIE but other did not

# Costs and quality

- Costs
  - 2 studies found reduced overall ED costs per patient when HIE was available
    - Neither study reported overall ED expenditures, so unknown what proportion of overall ED spending was impacted by HIE
  - 2 studies assessed HIE for reducing referrals and/or consultations, with conflicting results
- Quality
  - 2 retrospective studies found HIE associated with improved quality of care
  - An RCT focused on medication reconciliation found increased ability to detect medication adherence problems but was unable to show improvement in adherence after it was identified and addressed by providers

# Public health and other

- 3 studies assessed HIE in public health settings, all in US, reported improved automated laboratory reporting, improved completeness of reporting for notifiable diseases and improved identification of HIV patients for follow-up care
- 3 studies assessed other aspects of HIE
  - Reduction in time for processing of Social Security Disability claims
  - Increased ability to identify frequent ED users
  - HIE implementation associated with improved patient satisfaction scores in hospitals

# Conclusions

- Forthcoming but...
  - Most studies limited by retrospective nature (potential confounders) and limited questions (ED costs focused on absolute and not relative costs)
  - No patient-specific clinical outcomes studied
  - Many studies from a few HIE “leaders” (can results be generalized?)
- What is needed going forward?
  - More rigorous research methods
    - How to do since cannot really do classic RCTs?
  - Prospective evaluation of care delivered in presence of HIE?
    - Use of research data networks such as PCORnet?

# Questions?

