The HOMERUN Collaborative – Leveraging data to support comparative effectiveness research and catalyze healthsystem innovation

Andrew D Auerbach MD MPH
Associate Professor of Medicine
UCSF Department of Medicine – Division of Hospital Medicine

Peter K Lindenauer MD MSc
Associate Professor of Medicine
Baystate Medical Center – Center for Quality and Safety Research
Overview

• Rationale for the Hospital Medicine Reengineering Network (HOMERUN)
  – CER and healthsystem innovation
  – Good science with ‘bad’ (read: Administrative) data

• Description of sites, work to date
Overview

• Key talking points:
  – What are the regulatory (or other) obstacles impacting your work?
  – What are the resource needs?
  – What are the priority short term "translational" questions that represent the most rapid payoff on investment?
21st century opportunity – Research to support health system innovation

Biomedical ‘T1’ research

- Bench/Biomedical Research
- Bench to bedside translation
- Clinical efficacy knowledge
- Determine causal pathways
- Clinical efficacy trials

Current focus

- Comparative effectiveness research
- Determine associations between treatments and outcomes
- Outcomes and health services research

Health system innovation research

- Comparative effectiveness knowledge
- Implement practices effectively
- Determine how patient, provider, and delivery system changes influence outcomes
  - Health system redesign
  - Scaling and dissemination of delivery system changes
  - Research in redesign and dissemination

Key ingredients include all of these (and more)

HIT and EMR’s
Education and training
Policy makers
CER and Healthsystem innovation research – key ingredients

• The ‘distal’ translational step should be made
  – No feedback to earlier steps as to what is practical or useful to patients and caregivers
  – Limited ability to inform policymakers

• Provide access to key methodologies:
  – Biostatistics, sociology, informatics, management theory, industrial design/engineering.
  – CTSA’s/University resources critical
CER and Healthsystem innovation research – key ingredients

• Engage front-line caregivers and delivery systems
  – Community engagement may mean engaging communities of caregivers AND communities of patients
CER and Healthsystem innovation research – key ingredients

• **Develop networks**
  – Rigorous CER, study of health system redesign or variations in practice need lots of ‘subjects’
    • Subjects: Hospitals, Clinics, Physicians... and patients
    • More subjects = More generalizability, more ability to undertake research using experimental designs (RCT’s)
Example 1 – Compare delivery models: Hospital medicine systems

• Study question:
  – Do hospitalists provide more effective and less expensive care? (Lindenauer, NEJM 2007)

• Comparison of hospital medicine (hospitalist) physician care to internists to family medicine

• 45 Hospitals, ~60,000 patients

• Summary of results:
  – Hospitalists provided care that was generally lower cost, but had similar mortality
Example 1 – Compare delivery models: Hospital medicine systems

What can we learn from the high and low performers? Can we translate best practices more effectively? Can we eliminate/de-translate ineffective ones? Who do we talk to when we want (or need) to do that?
Example 2 – Compare treatments.
Venous thromboembolism prevention in joint replacement surgery

• Study question:
  – Is aspirin an effective alternative to standard preventive treatments for thromboembolism after knee replacement? (Bozic, JBJS 2009)

• 60,000 total knee replacement surgeries, ~200 hospitals

• Aspirin: equivalent protection to enoxaparin, warfarin treatment, slightly less risk for bleeding.
Example 2 – Compare treatments.
Venous thromboembolism prevention in joint replacement surgery

• Aspirin:
  – Seemed to be used in a few hospitals or by a few surgeons in a single hospital
  – Patients also had shorter LOS, were more likely to go home (rather than rehab)

  – Conclusion:
    • Aspirin is not superior, but the systems where it used may have features worth replicating (Translating into practice)
    • At least 1 RCT now in the works – how to select the correct patients for a less expensive, easier, and equally effective drug
Example 3: Understand opportunities for improvement
Volume and care quality in cardiac surgery

• Study question:
  – Should patients seek the busiest hospitals/surgeons when getting bypass surgery, or should they look at the highest-rated hospitals (e.g. hospitalcompare.org)? (Auerbach Annals of IM 2009)

• 81,000 surgeries, ~300 hospitals

• First level analyses:
  – Individual measures of quality (derived from RCT data) very inconsistently associated with improved outcomes
  – Busier surgeons had somewhat better outcomes
  – But which is more important?
Example 3: Understand opportunities for improvement
Volume and care quality in cardiac surgery

If all surgeons in our data improved by just 1 quality measure = 140 lives saved/year
If all 700K CABG in 1997 improved by just 1 quality measure = 3,500 lives saved/year
Take aways

• You can do a lot with widely available (administrative) data
  – Simply linking pharmacy charge data to administrative data allows powerful studies
  – Good news: Pharmacy charge data are key part of hospital accounting
Take aways

• Everyone’s patients are sicker than everyone else’s
  – ...and administrative data not viewed as adequate
    Risk adjustment key for both scientific validity and engagement of front line providers
Good news: These risk adjustment data are available in standard data systems.
Hospital Medicine Reengineering Network (HOMERUN)

- Leveraging the role of hospitalists in the care of general medical patients in US hospitals
  - >60% of Medicare patients getting care from hospitalists
  - <1,000 in US in 1999, now >20,000
Why hospitalists?

• At UCSF, 15 hospitalists have assumed care previously provided by > 100 physicians
  – Easier to get front line engagement, implement research protocols

• Hospitalists are a key ‘line item’ for hospitals
  – Hospitalists view systems reengineering as a key element of professional identity

• Hospitals have lots of data, with known strengths and weaknesses
HOMERUN as a CER/HSI Research Network

• Core values:
  – Support the rigorous evaluation of clinical practices at our sites and identify opportunities for improvement
  – Support rigorous empirical evaluation of health systems innovations
    • Study ‘QI’ using experimental and quasiexperimental designs
  – Create feedback between CER and HSIR in our network
HOMERUN sites:
16 hospitals, 6 states
HOMERUN as a CER/HSI Research Network

• Plan for HOMERUN – 2009-2011
  – Share data from easily available hospital sources to:
    • Provide benchmarking data required to engage front line caregivers, site administrators, and payors
    • Provide preliminary data required to engage funders and develop a portfolio of CER/HSIR projects
HOMERUN as a CER/HSI Research Network

• Vision – 2009-2010
  – Data sources:
    • Administrative data (Uniform Bill, 2004 Version)
      – Eclipsis (previously TSI)
    • Pharmacy Charge Data (including NDC identifiers)
      – From cost center lists in Eclipsis
    • Laboratory result data (CBC, Chem 10, Albumin, Micro results)
      – From GE Centricity lab system
    • Bed-tracking data (Admit-Discharge-Transfer)
      – From IDX bed tracking/patient census datasystems
    • Ad Hoc data – required for specific projects
HOMERUN 2009 work

• Finalizing IRB approvals at each site
  – Agreement on format for administrative data (UB04)

• Data use agreements under review
  – Limited datasets only
  – Reports in aggregate form only, no site identifiers included

• Plan to move beyond UB04 as funds/resources permit
HOMERUN 2009-10 work

• Defining HOMERUN ontology and architecture
  – Implementing a HOMERUN i2b2 instance at UCSF (Rob Wynden, Michael Kamerick pivotal)
  – Initially: FTP-based data transfers
  – Audit and ad hoc data collection (e.g. chart reviews) via RedHat tools deployed at sites
  – As soon as possible – Grid architecture

  • Strategy: Focus on sites with IDR or CDR, preferably i2b2 based, for short term
Blueprint for HOMERUN beyond 2010

Limited dataset
No IRB approval for research but access restricted by DUA, HOMERUN steering cmte

PHI retained at sites
Centrally specified audit/query tools deployed to sites
IRB approvals required for analysis
Barrier 1: Infrastructure is hard to sell

• What is the ROI?
  – How can we build infrastructure to be faster, better, and cheaper than the current model?
  – Can it be more ‘real time’ and flexible?

• For HOMERUN
  – Each site is currently doing similar data collection for internal use
  – Leverage investments already made in IDR/CDR
  – Economies of scale
  – Opportunities to gain broader view of practices
  – Use cases critical
Barrier 2: Doesn’t someone do this already?

- CER/HSI networks seem similar to other benchmarking organizations
  - UHC, PREMIER

- Why CER/HSIR networks have a key role
  - For most benchmarking organizations, CER is not a core function
    - External reporting (e.g. core measures reporting) and benchmarking for purchasing remain primary
  - Limited front-line provider engagement
  - Often support collaboration, but no specific interest or expertise in HSIR
Barrier 3: Why grid computing? Which grid type?

• Seems different (and scary) to those holding data
  – What are the true resources required to implement a 20 hospital grid? 200? Why not just do things the old fashioned way
  – Do costs for implementing/installing fall quickly enough as you get experience?

• ....are there other technologies, systems to consider
  – HOMERUN
    • Start small w/ i2b2, aim for grid which is open source, customizable to local IT needs
Barrier 4: Can grids support complex analyses needed for CER/HIS research?

• Can grids support longitudinal analyses?
  – Can I follow repeated patient visits for 1, 5, 10 years after study entry?

• Can grids support complex multivariable models?
  – Hierarchical models (e.g. generalized estimating equations, generalized linear models, etc)
  – Can these analyses run ‘in the background’ fast enough to be near ‘real time’
  – HOMERUN
    • Installing R in its grid environment as a first step.
Barrier 5: Can we thread the needle?

- Can we link CER and HSI in a way that aligns all stakeholders’ needs?
  - NIH – Can knowledge be advanced in a generalizable way?
  - Payors – Can costs be constrained?
  - Health system executives – Can costs (and increasingly, outcomes) be improved?
  - Physicians – Can you help me take care of my patients?
  - Patients – Can you save my life? Make my care cheaper, better, faster?

Community-based participatory research focusing on shared goal: Improving outcomes and value of healthcare
Barrier 6: IRB’s, DUA’s and sharing

• IRB’s inconsistent on how to deal with grid computing architecture, and QI
  – A project which does both is more challenging
  – HOMERUN: Using UCSF IRB as a stepping off place
  – Based our DUA on that used for other QI/benchmarking collaboratives (but seek approval after IRB approval).
Resources required

• Support* for the work required to move from FTP to grid computing
  – Early definition of resource requirements and return on investment for our base data platform for sites with and without IDR’s or CDR’s

• Support to implement audit and query mechanisms required for project specific needs

• Support to develop approaches for carrying out complex statistical modeling in near-real time

*Support = financial support, but at least as importantly: Vision support
Resources required

- Support to develop the intra-CTSA collaborative teams needed to carry out CER and HSI work.
- Support to crystallize inter-CTSA collaborative teams focusing on CER and HSIR
  - Can NIH help catalyze a CER/HSIR standard for IRB’s (reciprocity, as in the UC system)?
  - Ditto DUA’s
HOMERUN use cases/Short term payoff

• CER: What is the optimal treatment duration for community-acquired pneumonia?
  – Which approach (short or long duration, cheap or expensive antibiotics) improves outcomes and produces the least antimicrobial resistance?
    • Saving even 1/3 of a hospital day, spread over 100,000 admissions is a lot of savings
    • Reducing hospital acquired resistant organisms a major NIH goal
HOMERUN use cases/short term payoff

• CER: What are the factors associated with unplanned ICU transfer in medical patients?
  – How do varying monitoring strategies influence ICU transfer?
  – The majority of hospital costs are accrued in ICU’s
  – More importantly, unplanned ICU transfers are likely a marker for less safe care
HOMERUN use cases/short term payoff

• HSI: Can a patient-focused discharge checklist reduce risk for readmission?
  – Cluster-randomized trial of a patient-facing discharge protocol vs. usual care
  – Reducing readmissions a primary goal of CMS, potential savings in the hundreds of millions/year.
HOMERUN use cases/short term payoff

• HSI: How do hospitals differ in the costs and outcomes of care after hospitalization?
  – Linking HOMERUN data to Medicare outpatient charge data accrued 180 after index admission
  – Identifying commonly repeated tests or procedures may represent opportunities to improve
The 21st century opportunity – Research to support health system innovation

- Investment in CER/HSI research can provide substantial ROI:
  - 100K spent on our CABG study. HOMERUN could lower costs further
  - Empirically evaluate QI ‘mandates’ at low cost relative to ongoing costs borne by hospitals
  - What is more expensive? Knowing or doing?

- Back translation from HSI to CER to Bench-to-Bedside research is an untapped resource
  - Aspirin in VTE has prompted new RCTs
  - Resource such as HOMERUN could define new translational opportunities (failures, or unexpected successes) at low costs
CTSA’s and the NIH can be an engine for CER/System innovations research

✓ Availability of key methodologic resources
✓ Investment in IT
✓ Availability of patients and sites
✓ Community engagement focus
✓ Engagement of sites’ leadership
✓ Recognition that spread of knowledge is a key public good
NIH support for CER/HSIR networks can be an engine for research which resolves this tension

- HOMERUN is a CER/HSIR model which provides a strong test-case for this approach
Thanks from the HOMERUN team

• UCSF
  — Andrew Auerbach MD MPH
  — Rob Wynden MS
  — Michael Kamerick PhD
  — Caroline Hartridge-Beam BA
  — Judith Maselli MSPH
• Baystate/Tufts:
  — Peter Lindenauer MD MSc
  — Penelope Pekow PhD
• University of Pennsylvania
  — Josh Metlay MD PhD
• Kaiser Permanente, N. Cal
  — Gabriel Escobar MD MPH
• Sutter Health System
  — Jeffrey Newman MD MPH, Vernon Giang MD, Fabiola Corrubias MD

• Brigham and Women’s Hospital
  — Jeffrey Schnipper MD MPH, Anuj Dalal MD MPH
• Vanderbilt University
  — Sunil Kripalani MD MSc, Eduard Vasilevskis MD MCE
• Northwestern University
  — Mark Williams MD
• University of Chicago
  — David Meltzer MD PhD
• University of Michigan
  — Scott Flanders MD, Sanjay Saint MD MPH
• University of Washington
  — Joanne Elmore MD MPH
• For more information on HOMERUN or this slideshow, call or email:

Andrew D. Auerbach MD MPH
UCSF Division of Hospital Medicine
415-502-1412 (Office)
415-514-1414 (Administrative Assistant)
ada@medicine.ucsf.edu