

Research Networks as Catalysts for Learning Health Care Systems

Tracy Lieu, MD, MPH
Director, Division of Research
Kaiser Permanente Northern California
for the Department of Population Medicine,
Harvard Pilgrim Health Care Institute
and Harvard Medical School
November 2017



Themes

- How modern research networks have evolved
 - DPM has played a key role
- Why we are struggling to fulfill the promise of big data
- How networks can move us forward
 - Via learning health care systems

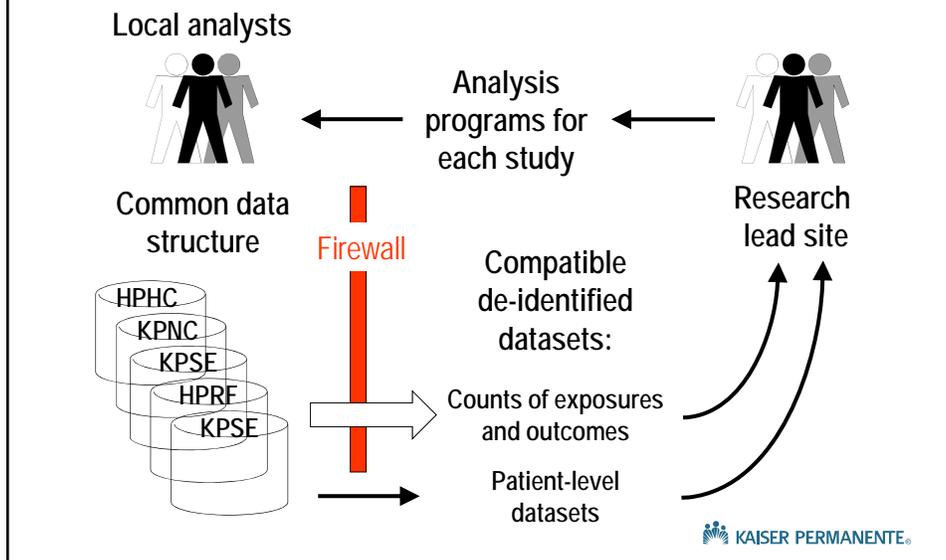


Data networks were born of public health necessity

- Vaccine safety research required “large linked data bases”
- 1991 – Vaccine Safety Datalink project initiated
- For a decade, VSD sites sent large patient-level datasets to CDC – “data pooling”
- 2001 – HPHC joined the VSD project



Platt et al advocated distributed data models for multi-site studies



A concerned Congressman requested VSD's data (2001)

- Dan Burton (R-Indiana)
 - Grandchild with autism
 - Chair of House Government Reform Committee
- Criticisms of VSD Project
 - Independent evaluation not conducted
 - Data not accessible to other researchers

Issued by the
UNITED STATES DISTRICT COURT
 EASTERN DISTRICT OF PENNSYLVANIA
 06-CV-1111

TRAJUM 03

LISA SYKES and SETH SYKES, Individually and as Parents and Natural Guardians of WESLEY ALEXANDER SYKES, a minor child **SUBPOENA IN A CIVIL CASE**
 Case Number: 06-CV-1111

v

GLAXO-SMITHKLINE, Individually and as successor-in-interest to SmithKline Beecham Corporation;

WYETH, INC., f/k/a AMERICAN HOME PRODUCTS CORPORATION, d/b/a WYETH, INC., WYETH LABORATORIES, WYETH-AYERST, WYETH-AYERST LABORATORIES, WYETH LEDERLE, WYETH LEDERLE VACCINES, and LEDERLE LABORATORIES; and

BAYERPHARMACEUTICALS CORPORATION, f/k/a Bayer Corporation, Individually and as Successor-In-Interst to Miles, Inc.

TO: Harvard Pilgrim Health Care
 Rebecca Ferrante-Crocker: Legal Dept
 93 Worcester Street, Suite 100
 Wellsley, MA 02481

RECEIVED
 JUN 13 2006
 LEGAL DEPT.

A TRUE COPY ATTEST
 DAVID D. AYLES, PROCESS SERVER
 AND DISINTERESTED PERSON

 KAISER PERMANENTE.

This crisis prompted VSD to adopt one of the first distributed data models

危機

Danger Opportunity

Distributed data models avert key problems at 3 levels:

- Patients – protect confidentiality
- Researchers – reduce concerns about others re-using data
- Health care system executives – prevent data misuse to cause reputational or competitive harm



Many national research networks have adopted and refined this approach

- HMO Research Network (now the Health Care Systems Research Network), 1994
- Cancer Research Network, 1999
- Cardiovascular Research Network, 2004
- Sentinel, 2008
- Mental Health Research Network, 2010
- PCORnet, 2013
- Addiction Research Network, 2015



The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

FEBRUARY 6, 2014

VOL. 370 NO. 6

Intussusception Risk after Rotavirus Vaccination in U.S. Infants

W. Katherine Yih, Ph.D., M.P.H., Tracy A. Lieu, M.D., M.P.H., Martin Kulldorff, Ph.D., David Martin, M.D., M.P.H., Cheryl N. McMahon-Walraven, M.S.W., Ph.D., Richard Platt, M.D., Nandini Selvam, Ph.D., M.P.H., Mano Selvan, Ph.D., Grace M. Lee, M.D., M.P.H., and Michael Nguyen, M.D.

ABSTRACT

BACKGROUND

International postlicensure studies have identified an increased risk of intussusception after vaccination with the second-generation rotavirus vaccines RotaTeq (RV5, a pentavalent vaccine) and Rotarix (RV1, a monovalent vaccine). We studied this association among infants in the United States.

METHODS

The study included data from infants 5.0 to 36.9 weeks of age who were enrolled in three U.S. health plans that participate in the Mini-Sentinel program sponsored by the Food and Drug Administration. Potential cases of intussusception and vaccine

From the Department of Population Medicine, Harvard Medical School and Harvard Pilgrim Health Care Institute (W.K.Y., T.A.L., M.K., R.P., G.M.L.), and the Division of Infectious Diseases and Department of Laboratory Medicine, Boston Children's Hospital (G.M.L.) — all in Boston; the Division of Research, Kaiser Permanente Northern California, Oakland (T.A.L.); the Center for Biologics Evaluation and Research, Food and Drug Administration, Rockville, MD (D.M., M.N.);

Yih N Engl J Med 2014

 KAISER PERMANENTE®

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Risk of Intussusception after Monovalent Rotavirus Vaccination

Eric S. Weintraub, M.P.H., James Baggs, Ph.D., Jonathan Duffy, M.D., M.P.H., Claudia Vellozzi, M.D., M.P.H., Edward A. Belongia, M.D., Stephanie Irving, M.H.S., Nicola P. Klein, M.D., Ph.D., Jason M. Glanz, Ph.D., Steven J. Jacobsen, M.D., Ph.D., Allison Naleway, Ph.D., Lisa A. Jackson, M.D., M.P.H., and Frank DeStefano, M.D., M.P.H.

ABSTRACT

BACKGROUND

Although current rotavirus vaccines were not associated with an increased risk of intussusception in large trials before licensure, recent postlicensure data from international settings suggest the possibility of a small increase in risk of intussusception after monovalent rotavirus vaccination. We examined this risk in a population in the United States.

METHODS

Participants were infants between the ages of 4 and 34 weeks who were enrolled in six integrated health care organizations in the Vaccine Safety Datalink (VSD) proj-

From the Centers for Disease Control and Prevention, Immunization Safety Office, Atlanta (E.S.W., J.B., J.D., C.V., F.D.); Marshfield Clinic Research Foundation, Marshfield, WI (E.A.B.); Center for Health Research, Kaiser Permanente Northwest, Portland, OR (S.I., A.N.); Vaccine Study Center, Kaiser Permanente Northern California, Oakland (N.P.K.); Kaiser Permanente Colorado, Aurora (J.M.G.); Kaiser Permanente Southern California, Pasadena (S.J.J.); and Group Health Research Institute, Se-

Weintraub N Engl J Med 2014

 KAISER PERMANENTE®

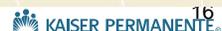
Why we are struggling to fulfill the promise of big data

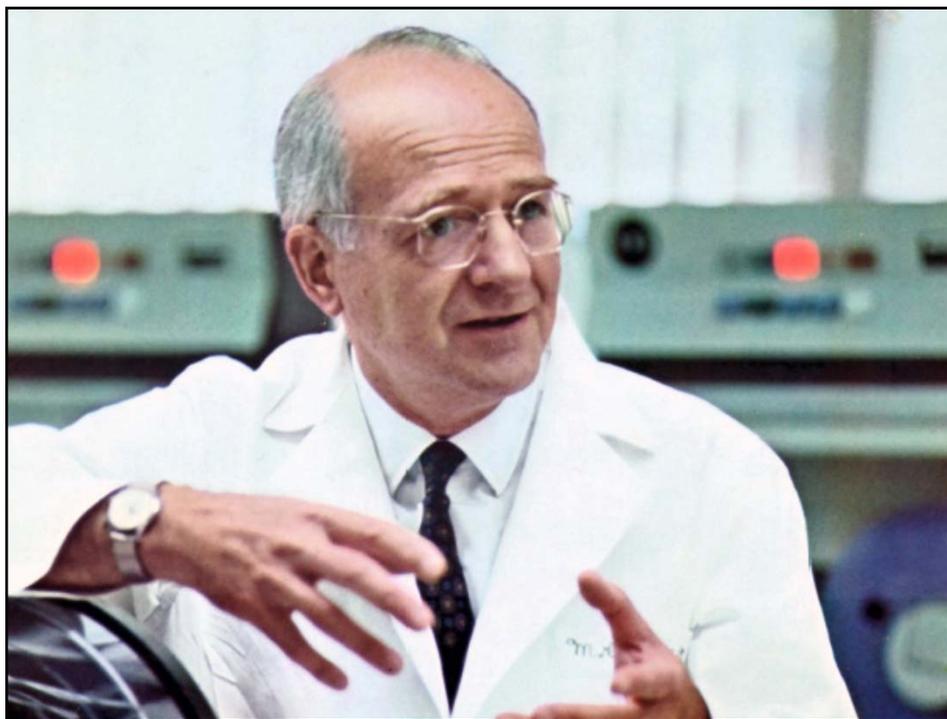
- Vision:
 - Use rich clinical data to create generalizable knowledge, and apply it in real-life health care
- Falling short:
 - Many more people need to be able to access and use the data
 - People internal and external to embedded research groups need to work closely together



Kaiser Permanente Northern California is a rich environment for research

- 4.1 million patients
- 9,000 physicians
- 21 hospitals
- Fully electronic health record





PAGE 6 SAN FRANCISCO CHRONICLE, Monday, March 21, 1966 CCCCA

Automated Medicine

A Computerized Health Checkup



Taking blood pressure on a tilt-table

By David Perlman
Science Correspondent

The age of automation has really reached the world of medicine, and 4000 patients a month at the Kaiser Health Plan know what it means. Filing through a series of electronic analyzers, weighers, checkers and measurers, these patients undergo what must be the most exhaustive "fraternal" checkup in the world.

For three hours or more they are photographed, x-rayed, x-radiated and cardiographed. They answer hundreds of medical and psychological queries on IBM cards. Their blood and urine are sampled, their eyes and hearing are tested, their lungs are squeezed, their lung capacity is probed, their pulse and blood pressure are registered.

COMPUTER
And all the while a great IBM 1400 computer system is swiftly storing the data in its capacious magnetic memory.



Automatic analyzer runs one small blood sample through maze of eight analyses in 12 minutes

processing the facts and figures, and preparing its automated reports, patient by patient. The computer swallows that stack of punched cards. Its red cell count foot-candle? Or his white cell count high? Anemia or infection are possibilities that should be explored at once, warns the computer.

ADVANCE
Before a patient is even through this "automated" multiple health checkup the computer is beginning to generate advice for him. Is his blood sugar about normal? The computer signals to the Kaiser staff that this patient needs a more stringent test for diabetes.

ORIGINATOR
Kaiser's pioneering venture into automatic medicine actually began 15 years ago, when the medical group found itself keeping tabs on the health of thousands upon thousands of patients.

Dr. Morris F. Collen, an electrical engineer as well as a physician, was launched on the program as chief of Kaiser's "medical methods" research, lured to the new scene of high-speed data processing.

NEW ERA
As Dr. Collen put it in an interview recently: "We have embarked on a really new era of detecting and treating disease early. We want to catch disease before symptoms even start."

Vietnam Map

As a public service The Chronicle offers a completely indexed map of Vietnam, Laos and Cambodia at 30 cents per copy. Please write your name and address clearly and send it with cash, encry or check to The Chronicle, P.O. Box 277, San Francisco 19, Cal.

DOCTOR

By the time a Kaiser patient has finished his checkup, chat briefly in a dispensary, and question sheets, the Kaiser machines know far more about him than he does himself.

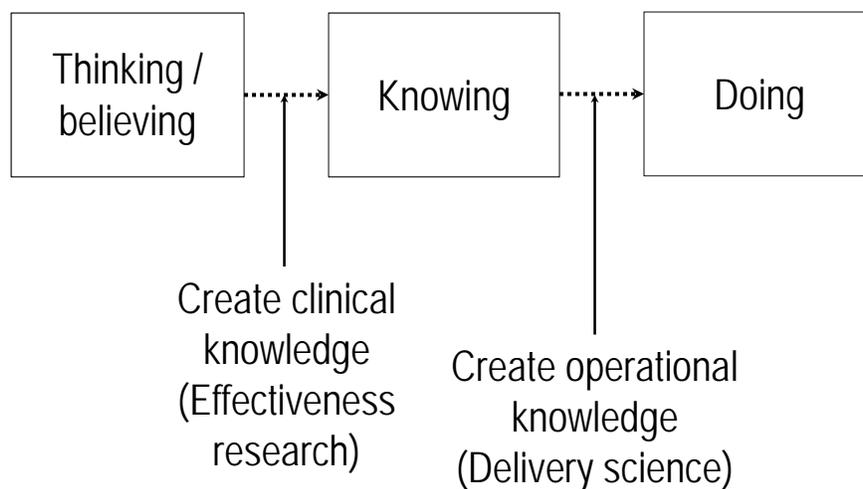
But most important, the machines will be able to furnish the patient's doctor with an extremely complete summary of everything the lab tests show, so that the patient's face-to-face physical examination can be truly productive.

S. F. LINK
So valuable is this data, in fact, that the United States Public Health Service has awarded Kaiser a \$200,000 grant to study the epidemiology of many diseases where the mass of controlled, uniform information may furnish important clues for new



Division of Research, Kaiser Permanente Northern California

- 50+ faculty-level researchers; 600 people
- Portfolio
 - ½ -- Epidemiology, externally funded
 - ¼ -- Clinical effectiveness, externally funded
 - ¼ -- Delivery science, internally funded
- Volume
 - 350 ongoing projects
 - 350 publications a year (NEJM, JAMA, Annals)



Barriers to giving outsiders broader access to clinical data

Perspective of a health care system stakeholder

Risks

- Executives – reputational and proprietary issues
- Researchers – competitive threats
- Patients – confidentiality

Benefits

- Executives – ?
- Researchers – scientific collaboration, credit, funding
- Clinicians – ?
- Patients – ?

Costs

- Financial
- Opportunity



Vendors of “big data” technologies don’t offer what health care systems need

We have . . .

Raw material – demographics, ICD-10s, vitals, labs



We need . . .

Machine tools – usable variables, e.g. “severe congenital heart disease”



They offer . . .

Analytics and predictive models – the easy part



Thanks to Jason Jones, VP, KP Info Mgmt for Care Trans



Research networks can be catalysts for learning health care systems

- Multi-way sharing of knowledge, methods, tools
- Distributed data models limit risks
- Examples of three types:
 - Facilitated case identification
 - Clinical decision support
 - Patients-like-me tools

 KAISER PERMANENTE®

Facilitated case identification: MDPHnet and Electronic Support for Public Health (ESP)



Mike Klompas

Software and architecture to extract, analyze, and transmit electronic health information from providers to public health

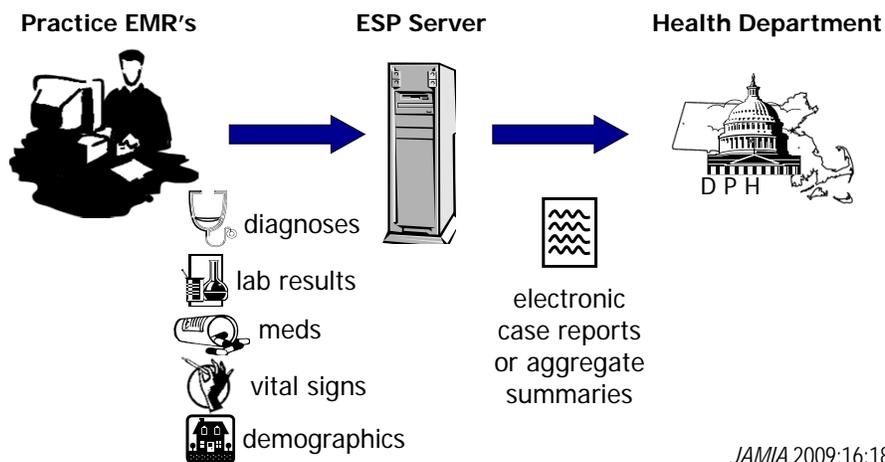
- Scans codes in electronic medical record data for patients with conditions of public health interest
- Generates secure electronic reports for the state health department
- Designed to be compatible with any EMR system

JAMIA 2009;16:18-24

MMWR 2008;57:372-375

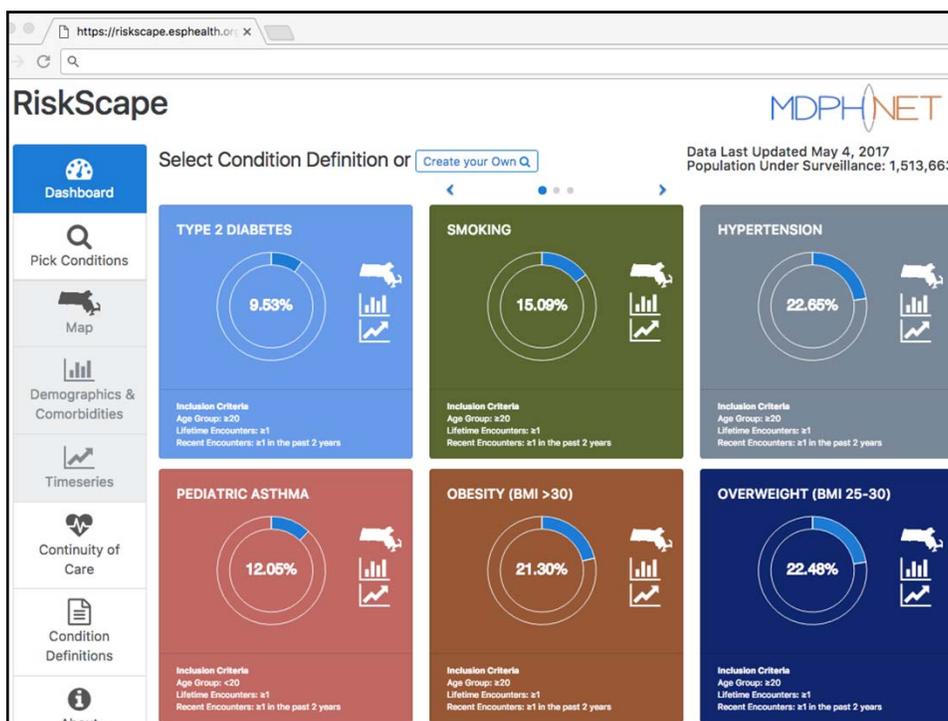
Am J Publ Health 2012;102:S325-S332

Electronic Support for Public Health (ESP)



Current Modules

- Notifiable diseases
- Influenza-like illness
- Vaccine adverse events
- Chronic diseases



Kaiser Permanente Clinical Research on Emergency Services and Treatments (CREST) Network

STEERING COMMITTEE

 DUSTIN BALLARD, MD, MBE <small>SAN RAFAEL, CA SOUTH CREST Network Co-Director, Pediatric Services from Merit CrestNetwork.org</small>	 DAVID R. VINSON, MD <small>ROSEVILLE, SACRAMENTO, CA SOUTH CREST Network MyVoice Page</small>
 LILI CHETTIPALLY, MD, MPH <small>EMERYVILLE, SACRAMENTO, CA SOUTH CREST Network LA State Senator KaiserCrest.org</small>	 JAMES LIN, MD <small>SAN JOSE, CA Assistant Physician in Chief</small>
 JAN MCLACHLAN, MD, MPH <small>SAN FRANCISCO, CA</small>	 SEAN ROUMET, MD <small>WALNUT CREEK, CA</small>
 DUSTIN MARK, MD <small>OAKLAND, RICHMOND, CA Emergency Medicine / Group Care Medicine</small>	 MAMATA KENE, MD, MPH <small>FREEMONT, SAN LEANDRO, CA</small>
 MARY E. REED, DrPH <small>DIVISION OF RESEARCH, OAKLAND, CA Research Scientist</small>	 ANDREW ELMS, MD <small>SOUTH SACRAMENTO, CA</small>
 DANA SAV, MD, MPH <small>OAKLAND, RICHMOND, CA</small>	 KAREN MURRELL, MD <small>SOUTH SACRAMENTO, CA</small>
	 ADAM SHARP, MD, MS <small>PIESADENA, CA</small>
	 CYRUS YAMIN, MD <small>DIVISION OF RESEARCH, OAKLAND, CA</small>
	 JOHN MOREHOUSE, MD <small>SAUNTER, RICHMOND, CA Group 1 Clinical and Quality Institute TRIO Director of Patient Quality</small>
	 STEVE OFFERMAN, MD <small>SOUTH SACRAMENTO, CA</small>

ASSOCIATE RESEARCHERS

 JOHN MOREHOUSE, MD <small>SAUNTER, RICHMOND, CA Group 1 Clinical and Quality Institute TRIO Director of Patient Quality</small>	 STEVE OFFERMAN, MD <small>SOUTH SACRAMENTO, CA</small>
---	--

Clinical decision support: Risk Stratification Tool (RISTRA)

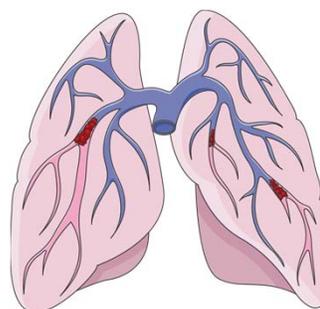
David Vinson, Uli Chettipally, Mary Reed, et al

- Physicians often want to estimate the risk of an adverse outcome for specific diagnoses
- Prediction scores are cumbersome to calculate by hand
- Risk Stratification Tool draws data from Epic and the user, creates a risk score – in real time



In pulmonary embolism, accurate risk assessment can lead to better outcomes

- Clot in blood vessels to lungs
- Can cause death, but risk varies widely
- Patients are often hospitalized
- Low-risk patients can be identified by risk scores and managed as outpatients

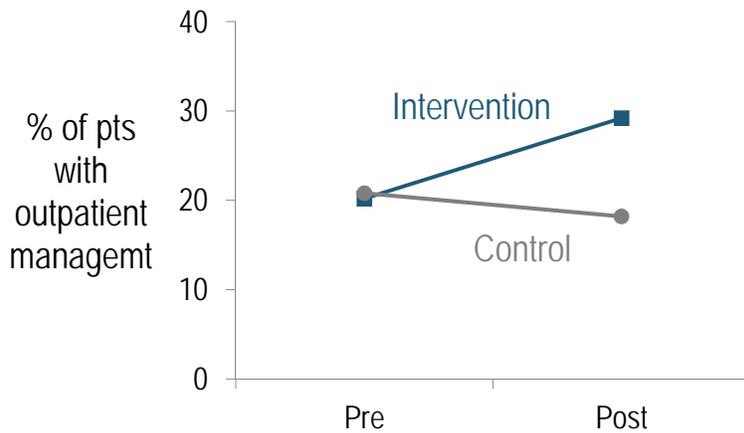


6 slides redacted here

Risk stratification tool was tested in a clustered non-randomized controlled trial

- Intervention (10 EDs)– education, ongoing promotion, gift cards x 3
- Control (11 EDs) – without full intervention
- Outcomes
 - Outpatient management = Discharge home or to short-term outpatient observation
 - Safety: 5-day PE-related returns, 30-day all-cause mortality, admission to hospital from outpatient observation
- Difference-in-difference design over 8 months

Outpatient management of PE increased. . .



. . . and safety outcomes were equivalent



Patients-like-me-tools: Cancer Prognostic Tool

- Problem:
 - Many patients with cancer are sicker than those enrolled in published trials
 - Patients (and their doctors) want to know the outcomes of patients who look like them
- Informatics solution:
 - Develop a tool to rapidly identify patients similar to a patient of interest, and show their outcomes



With the Cancer Prognostic Tool,* the oncologist can:

- Rapidly select cancer patients with a specific diagnosis
- Select patients based on cancer stage, age, sex, and comorbidity score
- Select those who had specific treatments
- Generate survival curves

* In prototype



3 slides redacted here

37

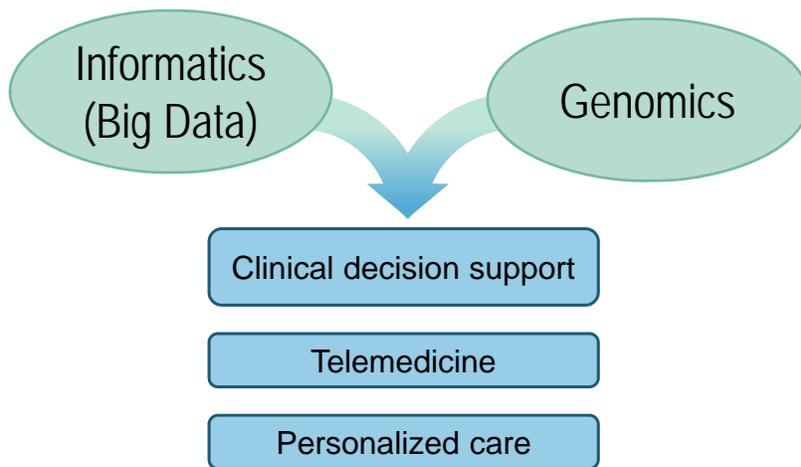


Cancer Prognostic Tool development draws together multiple stakeholders

- Physicians
- Researchers – cancer, biostatistics, health care delivery
- Informatics specialists – data architects, user workflow experts
- Physician education specialists
- Patients

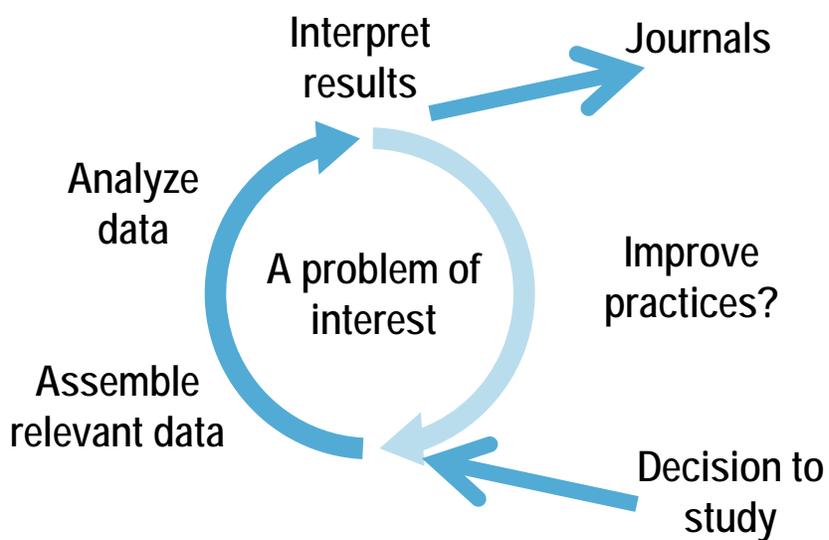


What will health care look like in 10 years?



KAISER PERMANENTE

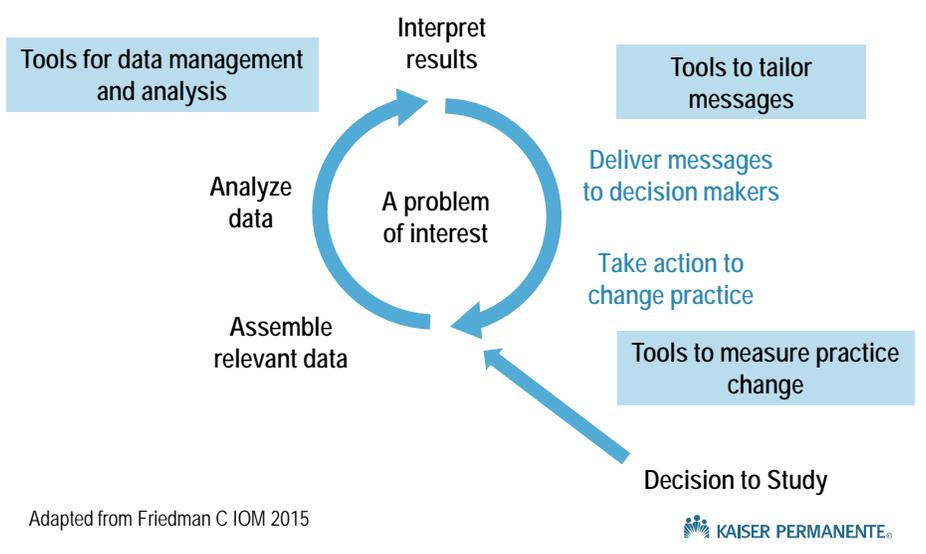
Research can miss being translated to practice



Friedman C IOM 2015

KAISER PERMANENTE

Tools developed and shared via research networks can close this gap



Summary

- Research networks have potential to transform health care
- To fulfill this promise, we need to focus more on the needs of clinicians and patients
- We can develop tools that integrate the needs of multiple stakeholders

