The Green Button Project

DELIVERING ON-DEMAND EVIDENCE VIA AN INFORMATICS CONSULTATION SERVICE

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November 26 2019

Agenda

- Origin of the Green Button
- Anatomy of the consult service
- Learning from the first 100 consults
- Deploying the service at a new site
- Ongoing efforts

Acknowledgements

Informatics Consult team


Saurabh Gombar


Alison Callahan


Vladimir Polony


Ken Jung


Nigam Shah


Robert Harrington


Rob Tibshirani


Trevor Hastie

Stanford Health Care partners


David Entwistle


Tip Kim

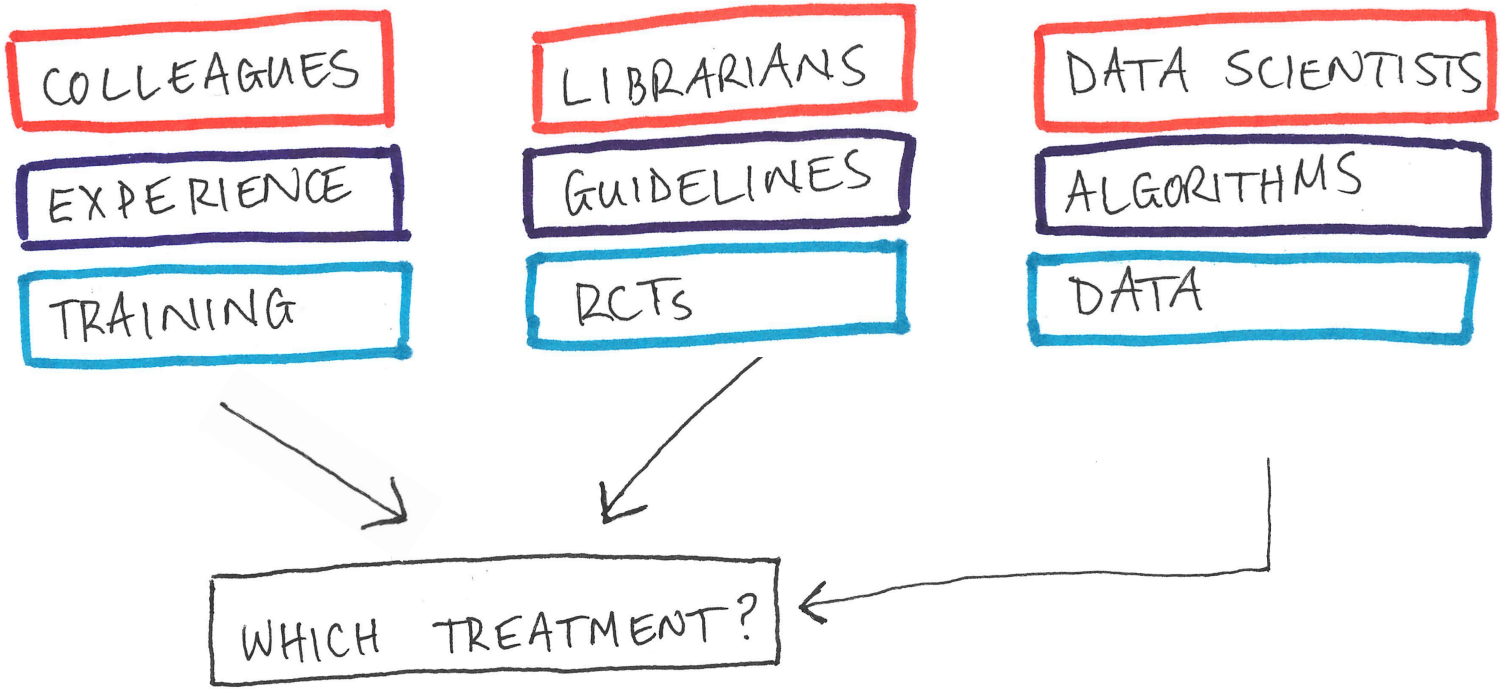

Christopher Sharp

Funding: NLM, NIGMS, Stanford School of Medicine, Department of Medicine, Department of Biomedical Data Science, Center for Population Health Sciences, an anonymous donor

By Christopher A. Longhurst, Robert A. Harrington, and Nigam H. Shah

A 'Green Button' For Using Aggregate Patient Data At The Point Of Care

DOI: 10.1377/hlthaff.2014.0099
HEALTH AFFAIRS 33,
NO. 7 (2014): 1229–1235



Timeline

2014 **Green button**: using aggregate patient data at the bedside (vision paper in Health Affairs)

2015 Outlined steps for rapid cohort studies at the bedside

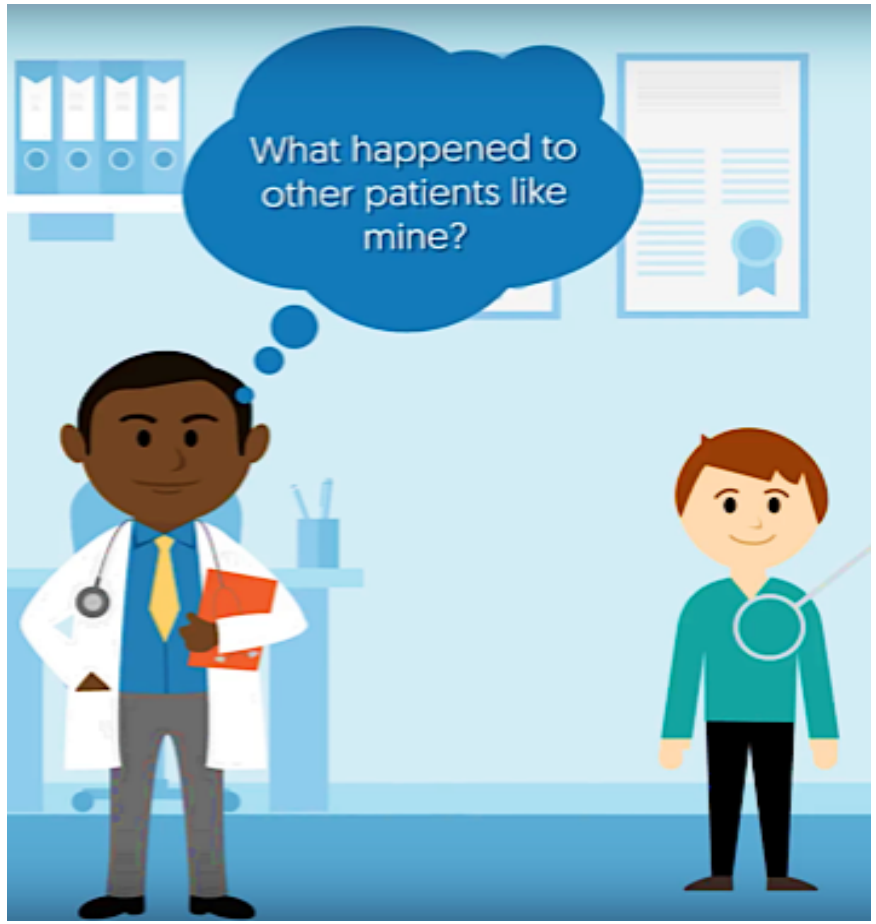
2016 Built a search engine for patient timelines

2017 Launched a pilot of the service

2018 Described the methods used in the consult service, and a perspective on why “It is time to learn from similar patients”

2019 Completed the pilot study (writing up results)

The Green Button project



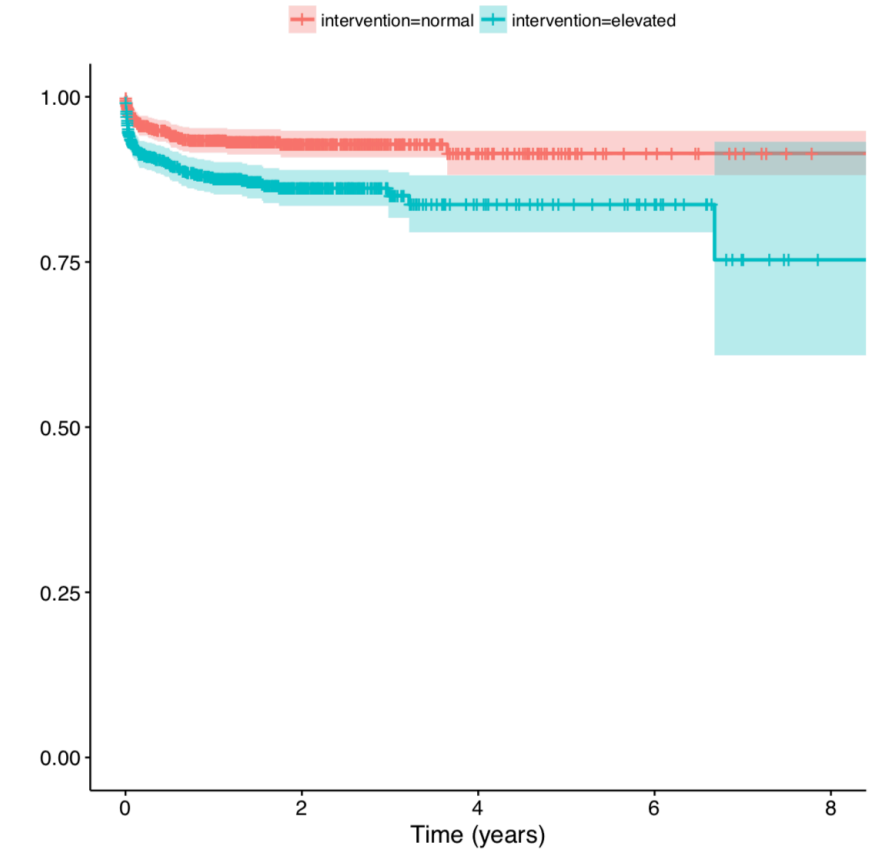
http://greenbutton.stanford.edu

Given a specific case, provide a summary of similar patients in Stanford's clinical data warehouse, the common treatment choices made, and the observed outcomes.

An institutional review board approved study (IRB # 39709), which served 150 consultations across all service lines.

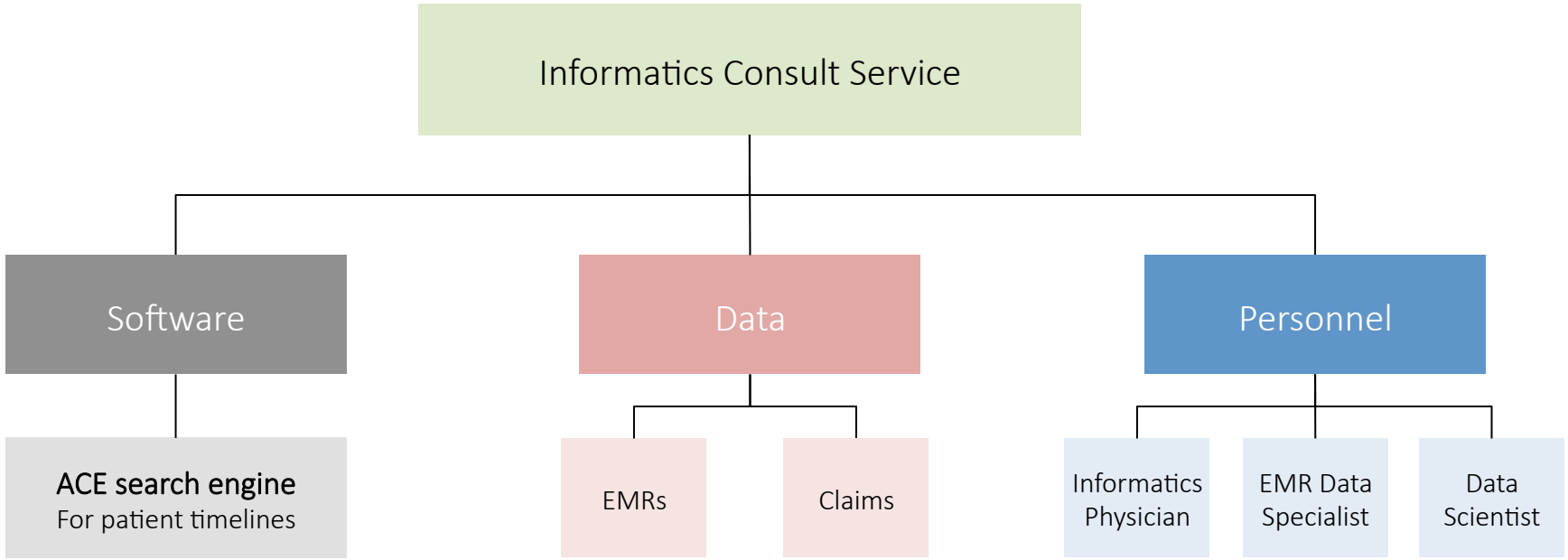
Invented novel technology to search medical timelines.

An example report

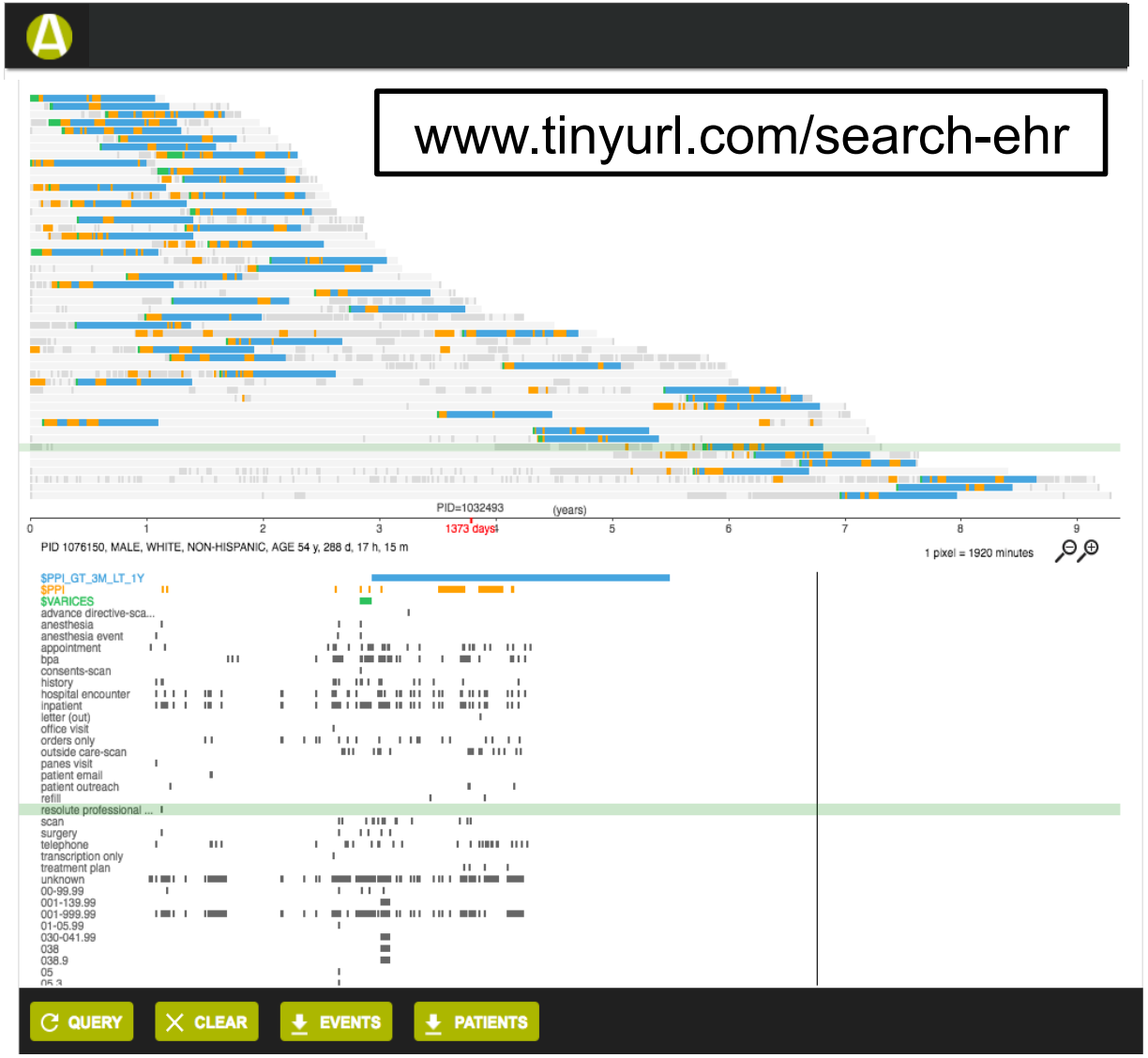


	N	Observed	Expected	$(O-E)^2/E$	$(O-E)^2/V$	chisq	pvalue
normal	760	49	73.365	8.092	16.413	16.4	5.09e-05
elevated	760	96	71.635	8.287	16.413	16.4	5.09e-05

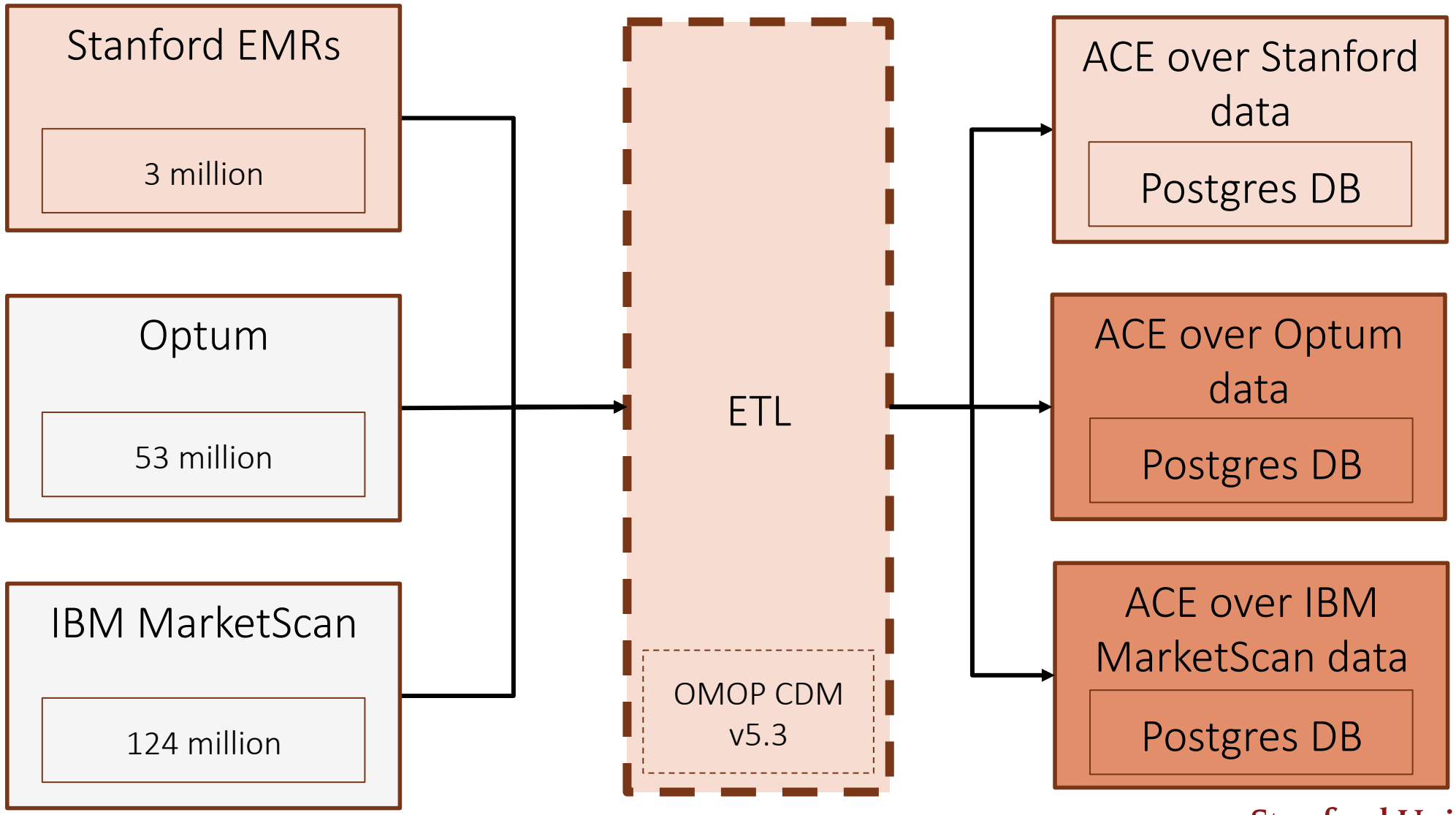
Service = software, data, and personnel



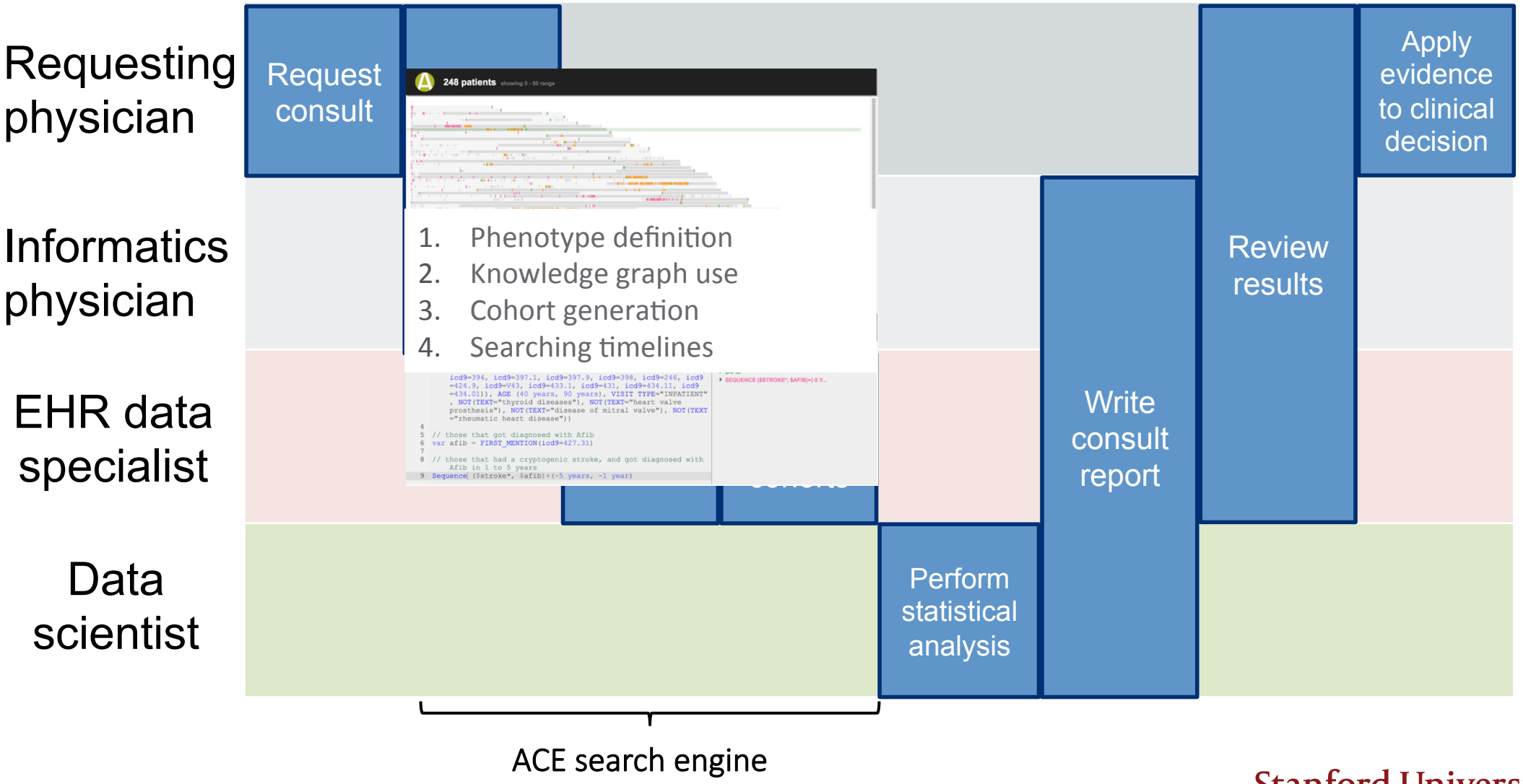
The search engine



The data


Stanford EMRs
3 million
Optum
53 million
IBM MarketScan
124 million
ETL
OMOP CDM v5.3
ACE over Stanford data
Postgres DB
ACE over Optum data
Postgres DB
ACE over IBM MarketScan data
Postgres DB

The process: 24 to 72 hours



The software

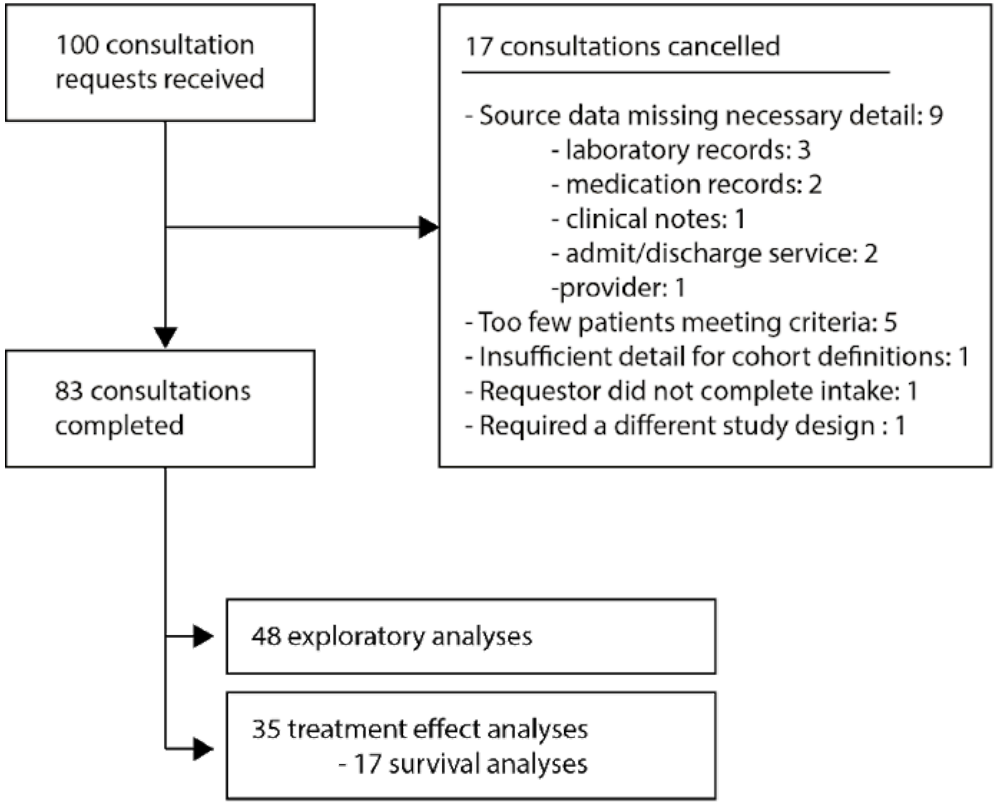
- ACE search engine
  - Available via Odysseus Inc. with support, or academic license via Stanford with no support
  - Push button installation and deployment

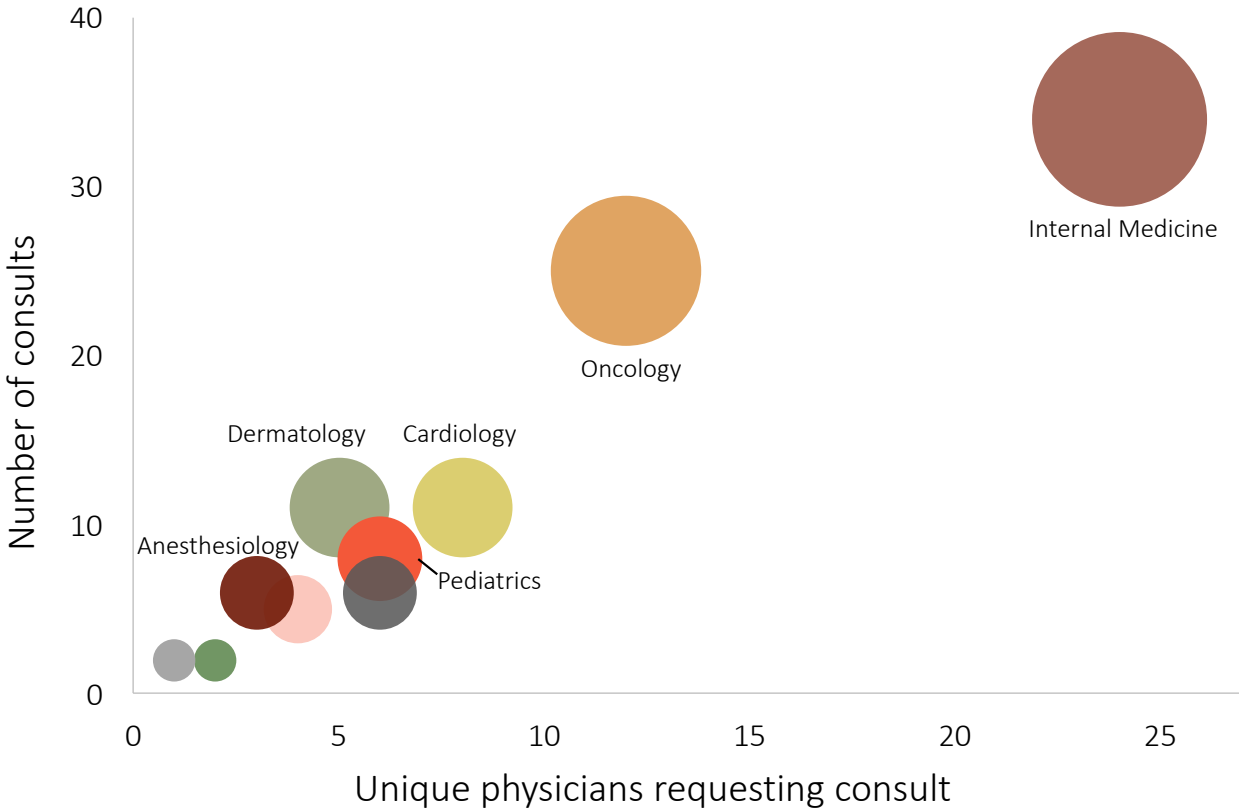
- Statistical analysis
  - Uses publicly available R libraries, including OHDSI CohortMethod
  - Push button environment setup and installation

What we do to not be wrong

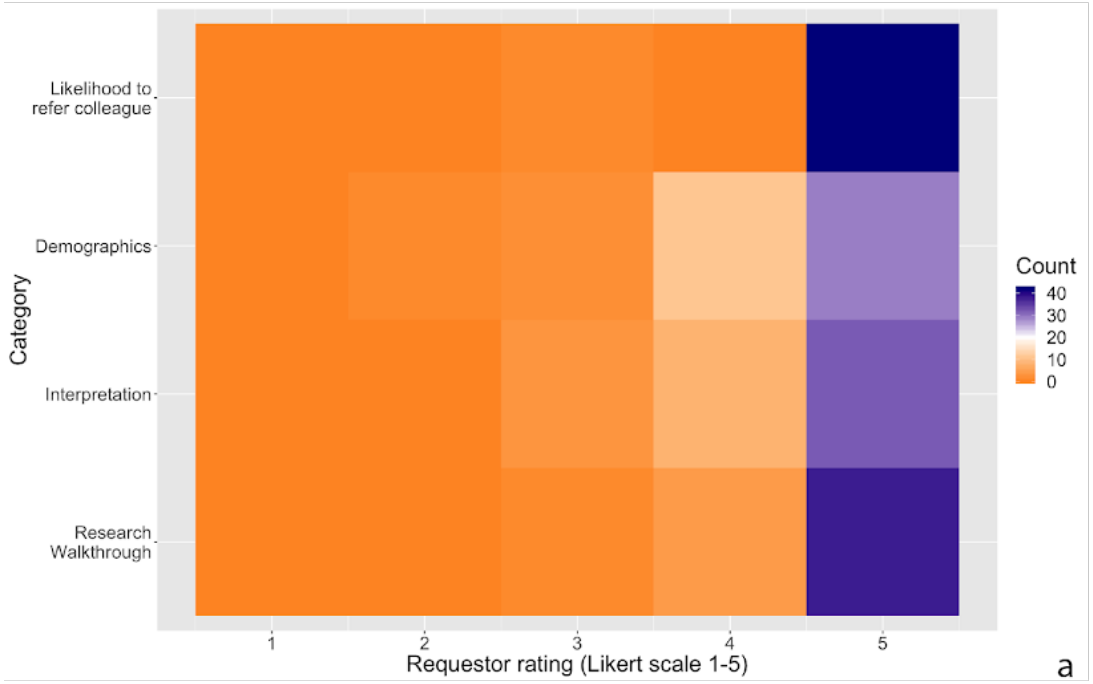
- Use CohortMethod's data diagnostics
- Use negative controls
- E-values to quantify the degree of confounding that can produce the observed effect
- Ask the question using multiple datasets
- Schedule an in-person debrief

Learning from the first 100 consults





Learning from the first 100 consults



Learning from the first 100 consults

- Access to EMRs has a substantial impact on our ability to complete consultations
  - 36-40% of consultations completed using EMR data could be completed using insurance claims
- High levels of agreement across datasets and patient matching methods
  - Comparing with two reference sets
    - 13-22% were “false discoveries”
    - Applies to the 18 treatment effect estimation consults
  - Comparing across datasets (Truven, Optum)
    - Agreed 68-74% of the time
    - About the same rate as how often RCTs agree with each other
  - Comparing patient matching strategies
    - Agreed 79% of the time

Deploying the service at your site

- Institutional support
- Data science expertise
- Marketing
- A process to sanity-check data and consult findings

THE STANFORD INFORMATICS CONSULT SERVICE HANDBOOK

A guide to provide informatics consults as a clinical and research service

Related prior efforts

Estimating Prognosis with the Aid of a Conversational-Mode Computer Program

ALVAN R. FEINSTEIN, M.D., JOEL F. RUBINSTEIN, M.D., and WALTER A. RAMSHAW, M.A.,

A New Information System for Medical Practice

Robert A. Rosati, MD; J. Frederick McNeer, MD; C. Frank Starmer, PhD;
Brant S. Mittler, MD; James J. Morris, Jr., MD; Andrew G. Wallace, MD

Evidence-Based Medicine in the EMR Era

Jennifer Frankovich, M.D., Christopher A. Longhurst, M.D., and Scott M. Sutherland, M.D.

PROGNOSTIGRAM CIS - 79
FOR INDEX CASE : PATIENT A

WITH THE FOLLOWING CRITERIA :
HISTORY OF MYOCARDIAL INFARCTION
NO HISTORY OF RECURRENT CHEST PAIN
NO HISTORY OF CONGESTIVE HEART FAILURE
HEART SIZE NORMAL BY CHEST X-RAY
A SUBGROUP OF 18 PATIENTS WAS FOUND.

ASSOCIATED CLINICAL FINDINGS IN THIS SUBGROUP

MALES (% OF PATIENTS)	=	100.0%
AGE (% OF PATIENTS WITHIN 5 YRS.)	=	33.3%
DURATION OF IHD (% OF PATIENTS WITHIN 12 MONTHS)	=	5.6%
TYPICAL ANGINA (% OF PATIENTS)	=	.0%
CHEST PAIN STABLE (% OF PATIENTS)	=	.0%
NYHA FUNCTIONAL CLASS FOR ANGINA = 4 (% OF PATIENTS)	=	.0%
HISTORY OF MYOCARDIAL INFARCTION (% OF PATIENTS)	=	100.0%
NO HISTORY OF CONGESTIVE HEART FAILURE (% OF PATIENTS)	=	100.0%
NO HISTORY OF HYPERTENSION (% OF PATIENTS)	=	72.2%
NO HISTORY OF DIABETES MELLITUS (% OF PATIENTS)	=	94.4%
HISTORY OF SMOKING (% OF PATIENTS)	=	64.7%
NO PRIOR TREATMENT WITH B-BLOCKERS (% OF PATIENTS)	=	88.9%
NO VENTRICULAR GALLOP (% OF PATIENTS)	=	100.0%
NO PERIPHERAL BRUITS (% OF PATIENTS)	=	100.0%
SERUM CHOLESTEROL (MEAN +/- SD)	=	233.7+/- 53.2
HEART SIZE NORMAL, CHEST X-RAY (% OF PATIENTS)	=	100.0%
NO DIAGNOSTIC Q-WAVES, ECG (% OF PATIENTS)	=	43.8%
NO CONDUCTION ABNORMALITIES (% OF PATIENTS)	=	87.5%
NO RESTING ST-T WAVE CHANGES (% OF PATIENTS)	=	75.0%
EXERCISE TEST POSITIVE (% OF PATIENTS)	=	18.2%
LEFT VENTRICULAR END-DIASTOLIC PRESSURE (MEAN +/- SD)	=	10.6+/- 3.8
ARTERIOVENOUS OXYGEN DIFFERENCE (MEAN +/- SD)	=	4.8+/- 1.0
CARDIAC INDEX IN ML/MIN/SQ M. (MEAN +/- SD)	=	2931.0+/-615.3
EJECTION FRACTION (MEAN +/- SD)	=	45.5+/- 9.3
NO SIGNIFICANT CORONARY DISEASE (% OF PATIENTS)	=	5.6%
NORMAL LEFT VENTRICULAR CONTRACTION (% OF PATIENTS)	=	27.8%
NO LEFT VENTRICULAR ANEURYSMS (% OF PATIENTS)	=	94.4%
NO MITRAL INSUFFICIENCY (% OF PATIENTS)	=	100.0%

PROGNOSTIC TABULATION

	MEDICINE				SURGERY			
	ALIVE	DEAD	NRA*	SURVIVAL	ALIVE	DEAD	NRA*	SURVIVAL
SURGICAL					2	0	0	100.0%
SIX-MONTH	16	0	0	100.0%	2	0	0	100.0%
ONE-YEAR	10	0	6	100.0%	2	0	0	100.0%
TWO-YEAR	6	0	4	100.0%	2	0	0	100.0%
THREE YEAR	1	0	5	100.0%	2	0	0	100.0%

*NRA=NOT YET REACHED ANNIVERSARY

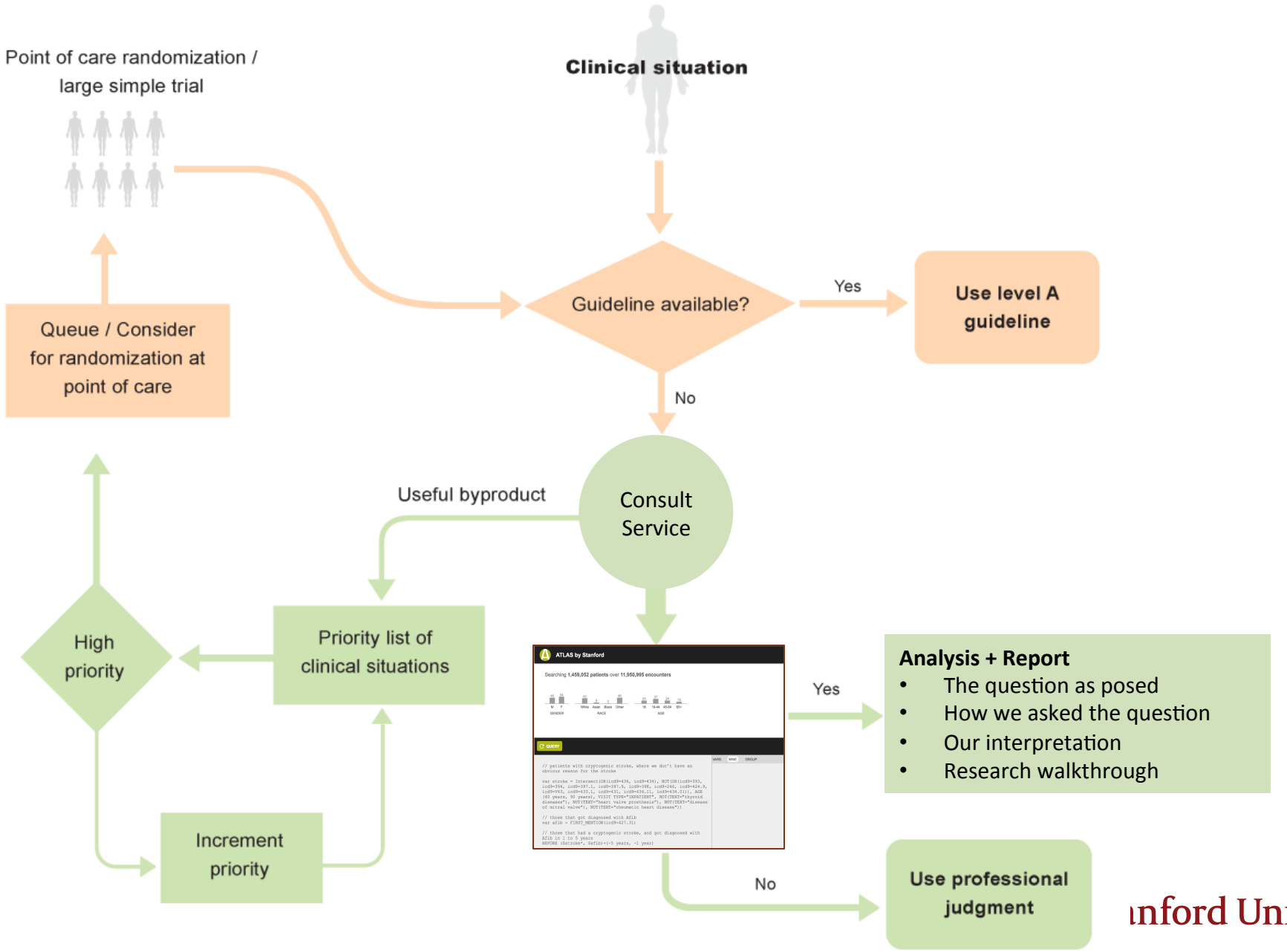
THERE WERE 0 PERIOPERATIVE MYOCARDIAL INFARCTIONS. SUBSEQUENTLY 0 SURGICALLY TREATED PATIENTS HAVE HAD INFARCTIONS. 0 MEDICALLY TREATED PATIENTS HAVE HAD INFARCTIONS.
AT THE TWO-YEAR FOLLOW-UP 3 OUT OF 5 MEDICALLY TREATED PATIENTS WERE PAIN-FREE AND 2 OUT OF 2 SURGICALLY TREATED PATIENTS WERE PAIN-FREE.

Fig 3.—Prognostic report of patient A.

Arch Intern Med—Vol 135, Aug 1975 Information System—Rosati et al 1021

Stanford University

Green button → Informatics Consult



Questions that remain

- Does having such a consult service change patient outcomes?
- How could we enable such consults nationwide?
- Could we automate such analyses to be “always on”?
- Could we get such a “curbside consult” from multiple health systems?
- Could patients benefit from having access to such reports?

http://greenbutton.stanford.edu

Ask me about the next phase of our study on measuring utility, and deploying the Green Button at Stanford Health Care

Stanford University

Thank you! Questions?

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 @clssfr