Stanford HEALTH CARE

It is time to learn from patients like mine

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SHC DIGITAL SOLUTIONS

Stanford | MEDICINE

Let’s meet Laura

A teenager with systemic lupus erythematosus, proteinuria, pancreatitis and positive for antiphospholipid antibodies

www.webmd.com/lupus/picture-of-acute-systemic-lupus-erythematosus

The Green Button project

http://greenbutton.stanford.edu

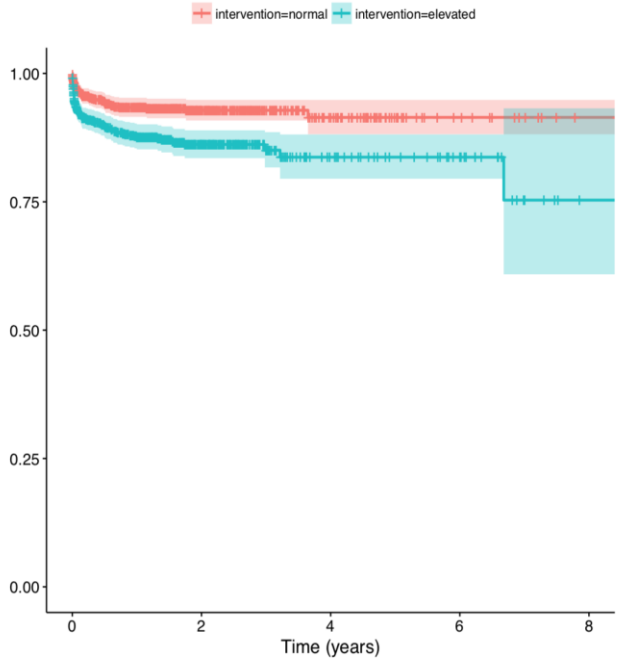
- Given a specific case, provide a summary of similar patients in Stanford's clinical data warehouse, the common treatment choices made, and the observed outcomes.
- An institutional review board approved study (IRB # 39709), which served 150 consultations across all service lines.
- **Invented novel technology to search medical timelines.**

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)

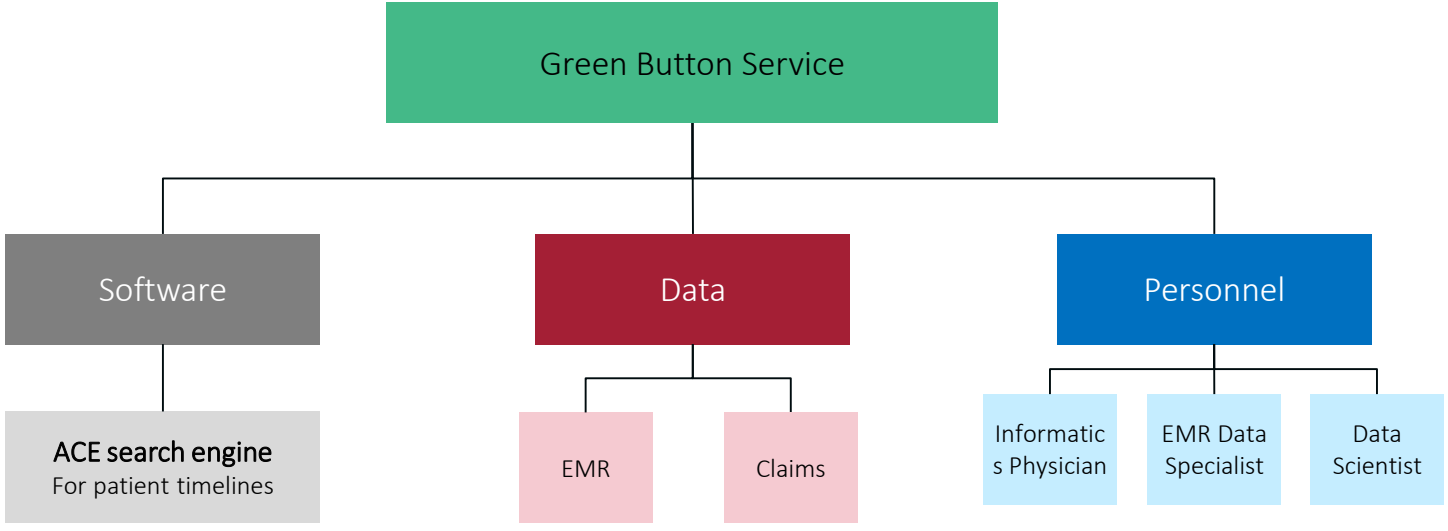
An example report

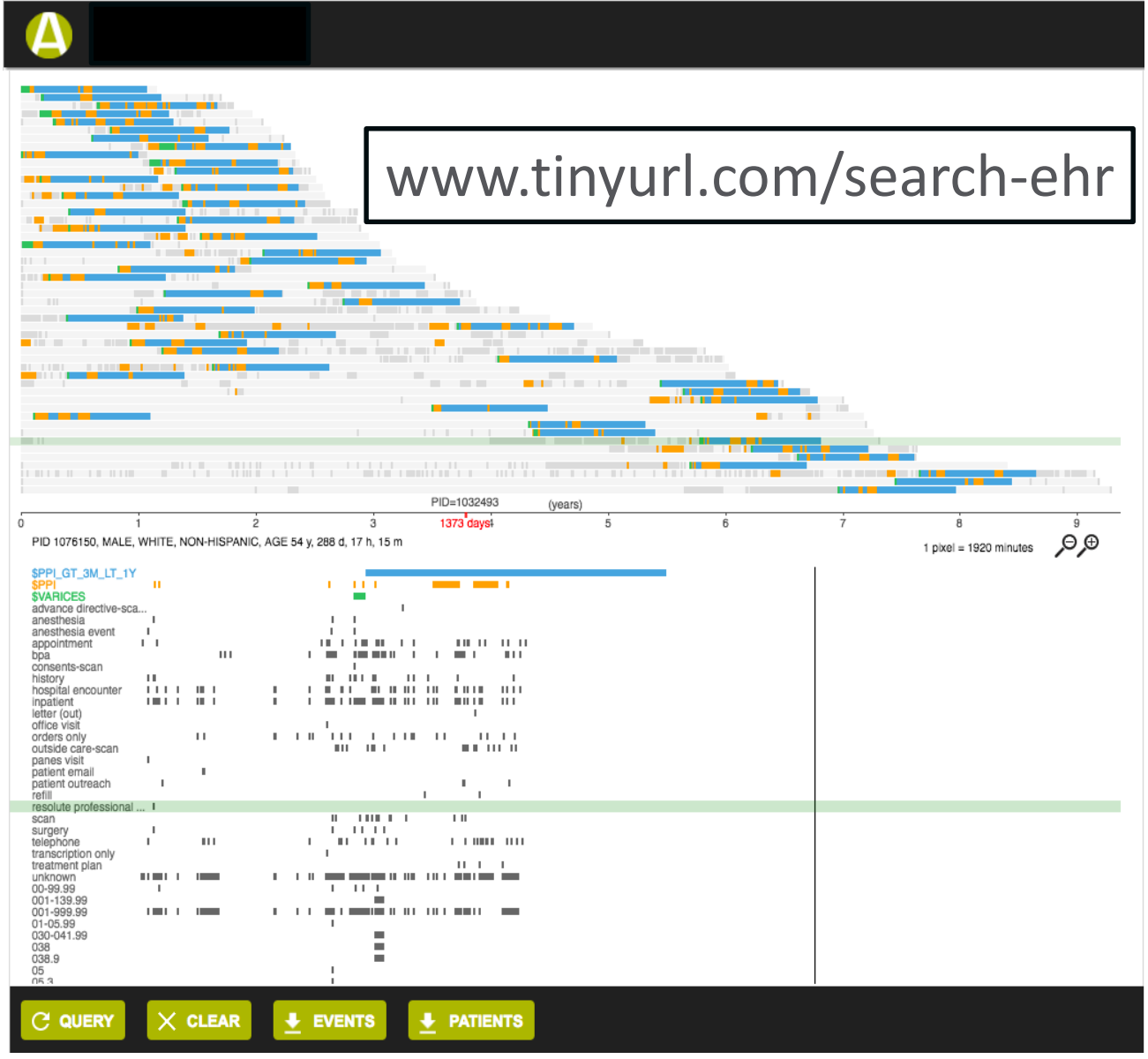
Mildly elevated serum free light chains and subsequent malignancy



	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

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1
2
3
1373 days
5
6
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8
9
PID 1076150, MALE, WHITE, NON-HISPANIC, AGE 54 y, 288 d, 17 h, 15 m
1 pixel = 1920 minutes
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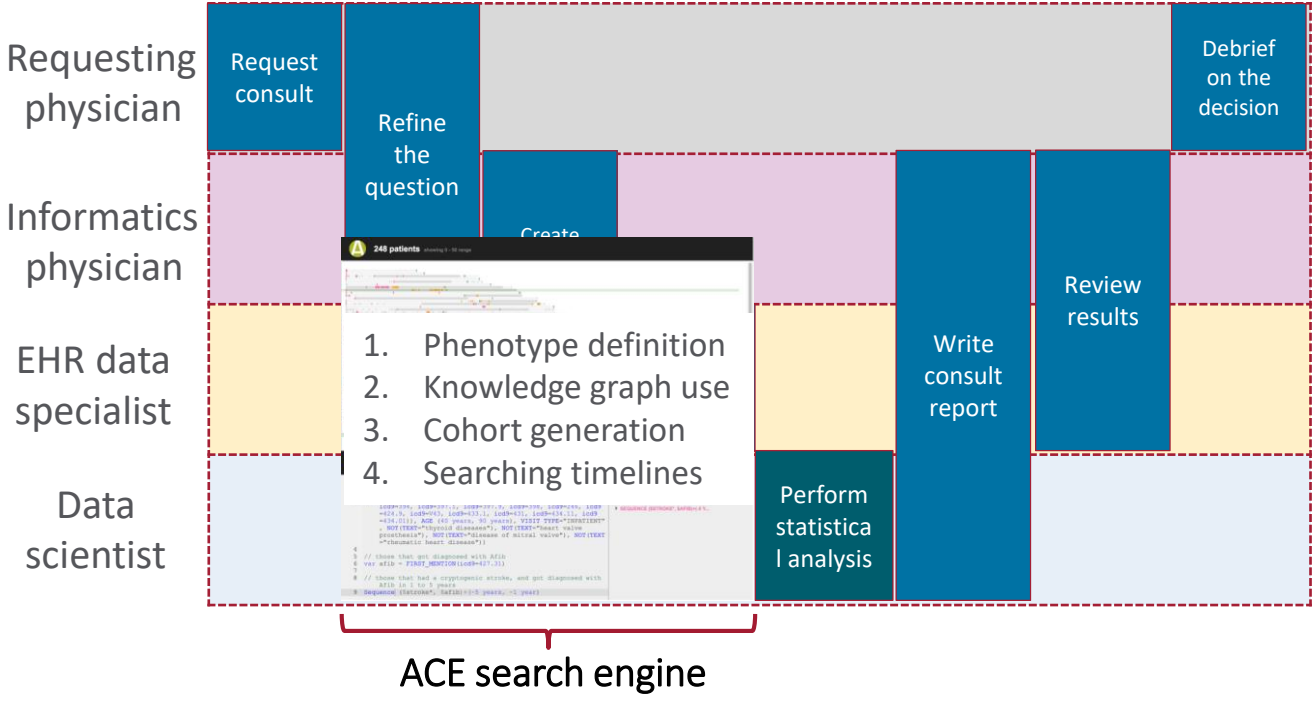
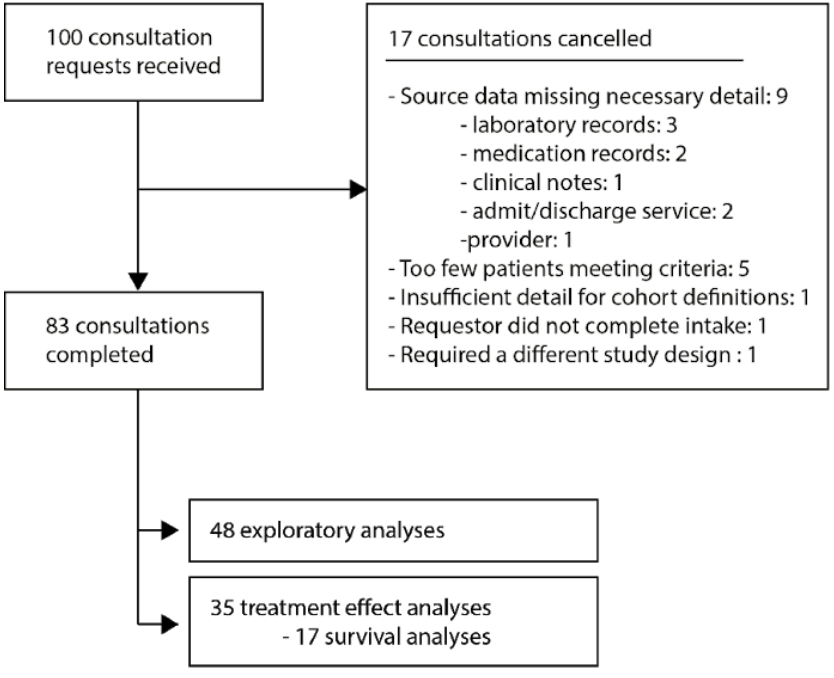
anesthesia
anesthesia event
appointment
bpa
consents-scan
history
hospital encounter
inpatient
letter (out)
office visit
orders only
outside care-scan
panes visit
patient email
patient outreach
refill
resolute professional ...
scan
surgery
telephone
transcription only
treatment plan
unknown
00-99.99
001-139.99
001-999.99
01-05.99
030-041.99
038
038.9
05
QUERY
CLEAR
EVENTS
PATIENTS

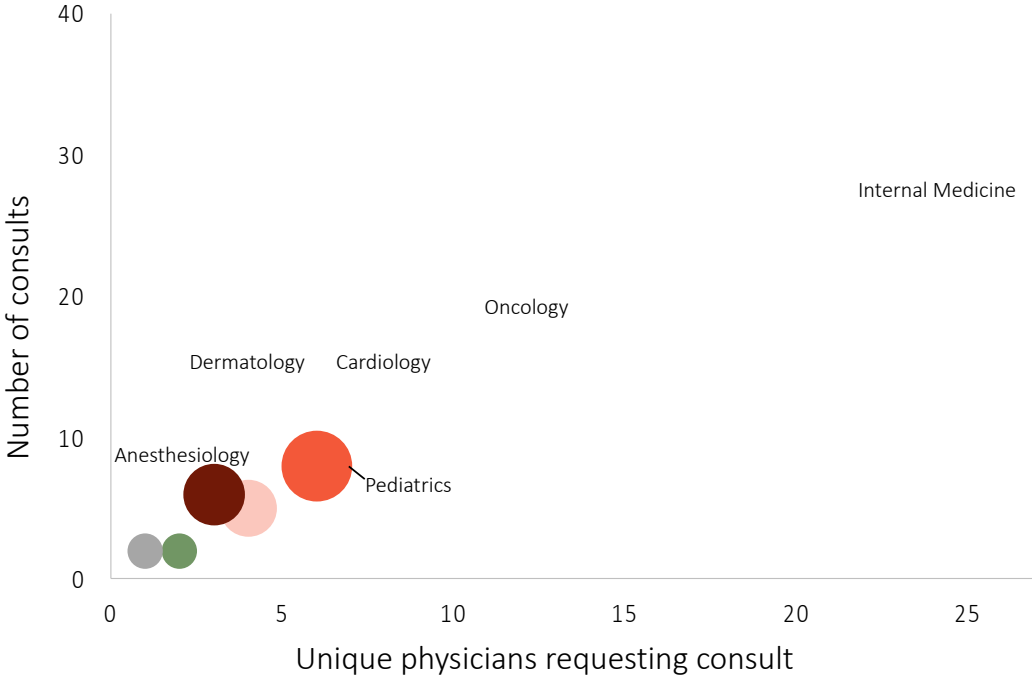
SHC DIC

The process: 24 – 72 hours

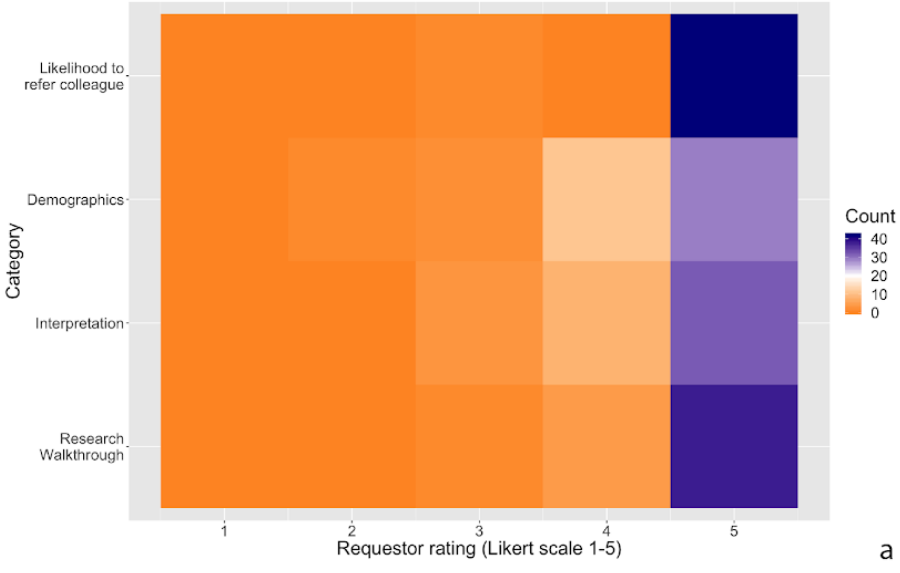


The first 100 consults





The first 100 consults



a

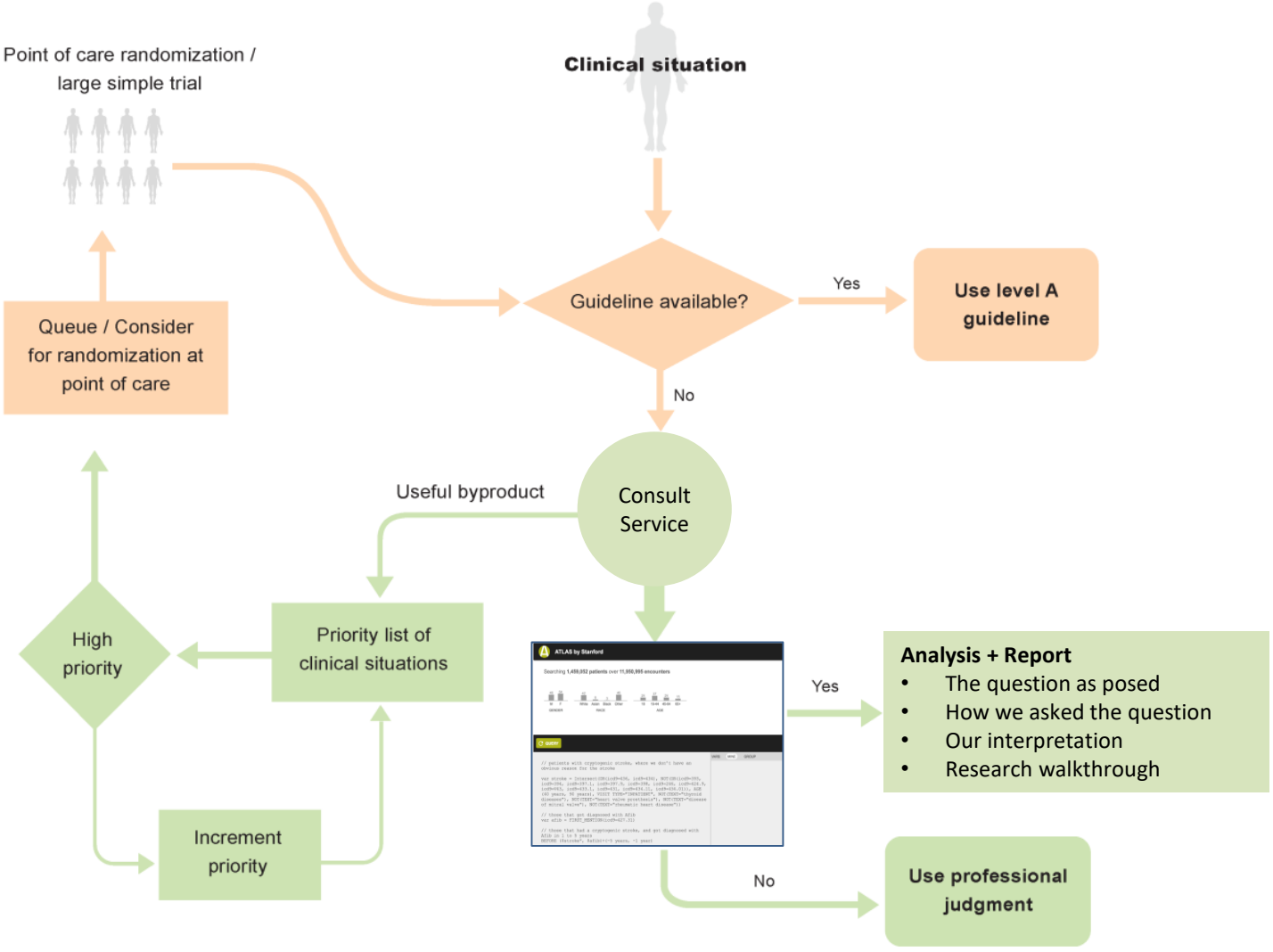
How ‘reliable’ are the results?

1. Comparing with two reference sets
   - Applies to the 18 treatment effect estimation consults
   - 13-22% were “false discoveries”

2. Comparing across datasets (Truven, Optum)
   - Agreed 68-74% of the time
   - About the same rate as how often RCTs agree with each other

3. Comparing patient matching strategies
   - Agreed 79% of the time

Green button → Informatics Consult



Green button and the Informatics Consult

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

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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.,

pand our ability to care for patients. This report describes how the experience is documented, stored, and retrieved so that it can be used in patient management. Data acquisition is integrated with patient care by means of forms that are part of the patient record. Follow-up information is obtained at six months, one year, and yearly thereafter. All data are stored in a computer information system that allows the doctor to recall the experience of pa-

nas been developing a system
method for capturing our clinical
perience with patients who have
chemic heart disease. We began
endeavor because we believed
the ability to recall what we had d
to whom we had done it, and w
had happened would improve our
ity to care for each new patient.
began to use this accumulated clir
experience, or data bank, in the n

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

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?