The Green Button Project

Delivering on-demand evidence via an informatics consultation service

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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

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PATIENTS & RESEARCH

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

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

COLLEAGUES
EXPERIENCE
TRAINING

LIBRARIANS
GUIDELINES
RCTs

DATA SCIENTISTS
ALGORITHMS
DATA

WHICH TREATMENT?
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

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.

http://greenbutton.stanford.edu
An example report

Mildly elevated serum free light chains and subsequent malignancy

<table>
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<tr>
<th></th>
<th>N</th>
<th>Observed</th>
<th>Expected</th>
<th>(O - E)^2/E</th>
<th>(O - E)^2/V</th>
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<td>96</td>
<td>71.635</td>
<td>8.287</td>
<td>16.43</td>
<td>16.4</td>
<td>5.09e-05</td>
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</table>
Service = software, data, and personnel

- Software
  - ACE search engine
    - For patient timelines

- Data
  - EMRs
  - Claims

- Personnel
  - Informatics Physician
  - EMR Data Specialist
  - Data Scientist
The search engine

www.tinyurl.com/search-ehr
The data

Stanford EMRs
- 3 million

Optum
- 53 million

IBM MarketScan
- 124 million

ETL

ACE over Stanford data
- Postgres DB

ACE over Optum data
- Postgres DB

ACE over IBM MarketScan data
- Postgres DB

OMOP CDM v5.3
The process: 24 to 72 hours

1. Phenotype definition
2. Knowledge graph use
3. Cohort generation
4. Searching timelines
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

100 consultation requests received

- 17 consultations cancelled
  - Source data missing necessary detail: 9
  - laboratory records: 3
  - medication records: 2
  - clinical notes: 1
  - admit/discharge service: 2
  - provider: 1
  - Too few patients meeting criteria: 5
  - Insufficient detail for cohort definitions: 1
  - Requestor did not complete intake: 1
  - Required a different study design: 1

83 consultations completed

- 48 exploratory analyses
- 35 treatment effect analyses
  - 17 survival analyses

Number of consultant requests

Internal Medicine

Unique physicians requesting consult

- Dermatology
- Cardiology
- Anesthesiology
- Pediatrics
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
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 Starner, 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.
Green button ➔ Informatics Consult

Point of care randomization / large simple trial

Queue / Consider for randomization at point of care

Consult Service

High priority

Priority list of clinical situations

Increment priority

Clinical situation

Guideline available?

Yes

Use level A guideline

No

Useful byproduct

Analysis + Report
- The question as posed
- How we asked the question
- Our interpretation
- Research walkthrough

Use professional judgment
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?
Ask me about the next phase of our study on measuring utility, and deploying the Green Button at Stanford Health Care
Thank you! Questions?

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