How can a NAM Working Group help us reach the promised land sooner? (and safely)

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Education
Machine learning is a tool, not a sentient being.
We’re mostly talking about supervised machine learning (sometimes + NLP)

“Which of my diabetics is most likely to end up in the ED?”
What AI does best.

• Analyze – reveal prev. hidden patterns
• Optimize – best path forward
• Prophesize – what’s likely to happen
• Customize – tailor the approach
Commercially 6 years, 28 healthcare orgs

• Care Management (cost savings)
  • Matching individual patients to specific interventions sooner
  • Improved accuracy of outreach by 220%

• Risk Adjustment (new resources)
  • Ensure appropriate reimbursement for level of acuity
  • >$100M new resources to care for those most in need

• Member Retention (reduce churn)
  • Predict who’s likely to leave and why
  • Reduction of disenrollment by 66%
Machine learning represents a new epistemology.
Today’s approach to healthcare analytics

- Mostly reactive.
- Focus on mandated measures / dashboards.
- Assume all orgs have the same priorities, population, interventions.
- Limited data used (largely claims).

Very “one size fits all.”
L: Length of book
A: Age of reader
C: Content of book (1 of 10 categories)
E: Enjoyment (5% of readers surveyed)
Requires a different approach than we’re used to.
The ML opportunity is really about proactive customization.
Not about “off the shelf” software.

It’s about integrating learning into your processes.
Behavioral health example

Goals
• Reduce Unnecessary Admissions
• Patient satisfaction
• Increase Reimbursement

Populations
• Serious Mental Illness
  • SUD
  • Pediatric

Admission Types
• Inpatient Psych
• Resident Psych
Personalized approach means you need to evaluate performance on your own data.

Use metrics that matter for the specific application.
Metrics based on planned use

Predicted BH admits as of 1-October 2016
N members identified after 90 days

ML + NLP
50% will have admits
(200 / 400)

Total medical expense
21% will have admits
(82 / 400)

Baseline admission rate
(6%)
Use predictive performance to map to cost / benefit & ROI.
Example – predicting admissions of people with SMI

Predicted BH admits as-of 1-October 2016
N members identified after 90 days

Percent members admitted in 90 days

- Cyft
- TME
- Baseline Admit %

50% accurate at 400 predictions
Example – predicting admissions of people with SMI

41% accurate at 800 predictions
## What’s the cost / benefit?

<table>
<thead>
<tr>
<th>Members Enrolled</th>
<th>800 members x 90 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per intervention</td>
<td>$1,000 per member</td>
</tr>
<tr>
<td></td>
<td>$800,000 total</td>
</tr>
<tr>
<td>Predicted admissions</td>
<td>@ 41% Accuracy = 328</td>
</tr>
<tr>
<td>If you could prevent half of these admissions w avg cost of $12,500 per admit.</td>
<td>$2,050,000</td>
</tr>
<tr>
<td>Return on program (benefit = $2.05m / cost = $800k)</td>
<td>(2.56:1 ROI)</td>
</tr>
</tbody>
</table>
You can’t get to personalization and realize real value without design / process.
Difference between math and software

• Plan for feeding and nurturing

• Retrain to account for shifts in population

• Incorporate new data as introduced

• Monitor performance in production environments
Integration – learn the right time, place, formats

• Plan deployment / integration from the start.
• Clinicians don’t want more screens
• Integrate into existing systems whenever possible
• Understand workflows

Aim for minimally invasive
Putting it to work requires the right raw materials, expertise, and plan.
The opportunity is to incorporate learning in more of what we do.

Not a “master algorithm” but thousands of incremental improvements.
Interpretability

- Trade off performance for familiarity?
- Focusing people on the wrong issues?
Data Access & Quality

- Have we swung too far?
- Data as raw material
Sociotechnical

- Unintended consequences
- Introduction of inequity
Evaluation

What’s your model’s C-STAT?
Data will make our understanding smaller

- There are now 4 classes of asthma
- 12,000+ variations of colon cancer
- Help healthcare adapt to this
Regulation

- Algorithm, data, process?
- Dynamic nature
- Personalization
Where to focus? (incentives are everything)

- Incentives dictate
- VA = palliative care, suicide, opioid
- Hospitals = sepsis prevention
If you remember anything you just heard:

• ML is a tool and all that implies
• It’s good at finding patterns in data
• Using it to improve healthcare requires people, process, design
Machine learning will replace human radiologists, pathologists, maybe soon

As artificial intelligence, cognitive computing and machine learning systems become better than humans at medicine and cost less, it might even become unethical not to replace people.