Driving Physician Engagement and Patient Outcomes with AI

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Conflict of Interest

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Has no real or apparent conflicts of interest to report.
Agenda

• Process for building tools
• Determine how to build it
• Test your assumptions
• Build an AI model
• Ensure continuous learning of the AI model
Learning Objectives

1. List the attributes of a sound AI/Machine Learning model
2. Analyze the process to engage physicians in using predictive tools
3. State the advantages of stratifying risk in the acute coronary syndrome (ACS) example
Process for building tools

• Do stakeholders recognize that they have the problem?
  – Do physicians want to make better admit/discharge decisions for chest pain patients?
  – How do data scientists/engineers make tools that are needed by physicians?

“I want to know why when I’m in a room people ignore me.”
Process for building tools

• If there was a “product” that solved the problem, would stakeholders use it?
  – Would physicians use a tool that helps them make better admit/discharge decisions for chest pain patients?
  – Would data scientists/engineers build different products if they knew what the physicians want?
Can we build a sustainable business around the product?

- Could we implement the tool across sites to reach our target users given realistic revenue and expense projections?
- Could we build tools that are intuitive to use, easy to scale, and deliver measurable returns?
Process for building tools

• Can we build a “product” to solve the problem?
  – Can we build a tool that accurately predicts the likelihood of adverse cardiac event in a way that is usable and scalable?
  – Can we calculate the ROI for this tool?
Physicians want to make better decisions

- Physicians make many decisions
  - In an emergency department, decision is often made at bedside in first minute or so of encounter
  - Remainder of encounter is ensuring the decision is validated
Physicians want to make better decisions

- Physicians believe they are right
  - Serve as their own gold standard
  - The patient has pneumonia because I diagnosed “pneumonia”

\[
Ego = \frac{1}{\text{Knowledge}}
\]

“More the Knowledge
Lesser the Ego,
Lesser the Knowledge
More the Ego…”

-Albert Einstein.
As a Physician, what information do I want?

• Information that justifies what I want to do
  – I believe the patient is safe to send home, I want information that confirms my decision.

• Information that warns me I am about to make a mistake
  – I believe the patient is safe to send home, I want to be notified if I am wrong.

• If I believe the patient should be admitted, then a predictive model will not change my mind.
Agenda

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- **Determine how to build it**
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Data scientists/ engineers want to tools that are used and drive change

- Data scientists and engineers build many tools
  - They have a wealth of data and numerous opportunities to build AI/ML models
  - Key is to provide clinicians with the right model at the right time in the right way so that
  - Tools are utilized and drive value
As a data scientist/engineer where do I start?

• Align with the desired outcome
• Understand the physician workflow
• Build the required criteria
Assumptions of successful AI prediction

• Information is desired in the context of clinician wanting to send patient home
  – Model needs to have high sensitivity to detect risk of adverse events
  – Safe to discharge based on model is truly safe

• Criteria
  – Must have miss rate of less than 2%
  – Must be better than available tools with less effort
    • HEART score, TIMI score

• Workflow criteria
  – Must be “pushed” to clinician prior to making decision, which is the first point of contact
  – Prediction must surface to clinician prior to evaluating the patient
Question 1

Why is it crucial that predictive tools are used regularly?
A. They continually learn and improve
B. They grow stale
C. CMS mandates it
D. Stakeholders will forget how to use them
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The minimum viable product (MVP)

- Meet the physician requirements
- Deliver value
- Get feedback for future product release
The Cardiac minimum viable product

- Create a conceptual tool design
- Test with group of practicing physicians
- Meets assumptions
  - <2% miss rate
  - Superior performance to existing tools
  - Available prior to seeing the patient
- Delivered in a specific format (likelihood with confidence interval)
- “Given this clinical scenario, would having this information [show the tool] change your decision, make you more confident of your decision, or not have much value?”
  - “How much would you pay for this information?”
The physician feedback

• Learned that the information was not actionable for the clinician
• Needed two elements from the predicted risk score
  – Composite risk of any cardiac event
    • Acute Myocardial Infarction
    • Coronary Artery Bypass Graft surgery
    • Percutaneous Coronary Intervention (Cardiac cath)
    • All-cause mortality
  – Confidence of predicted risk score
Question 2

What’s the best approach to engage physicians in using AI/predictive models?

A. Ask them to input data
B. Impose the tools upon them
C. Ignore their apprehensions
D. Help them solve a problem
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Build an AI model

• Identify the product - outcomes, timing, and insights needed by the clinician
• Identify the required data
• Prepare the required data sets
• Build and train models
• Validate model accuracy
• Test model
• Tune model parameters
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The tools can destroy their own accuracy

• The point of the tool is change outcomes
• Outcomes are changed when the tool successfully changes behavior
• The model was derived from data when all were behaving in a certain manner
• The successful tool changes the behaviors on which the model was built
• Thus, successful tools make themselves inaccurate over time
Creating a learning AI system

- Model should be built such that it can learn continuously and quickly adapt once deployed
- Gather real time feedback on the model once deployed
- Incorporate these data elements to incrementally improve the model
Conclusion

• Start with the “so what” questions
  – Do stakeholders recognize that they have the problem?
  – If there was a “product” that solved the problem, would stakeholders use it?
  – Can we build a sustainable business around the product?
  – Can we build a “product” to solve the problem?

• The AI should be built around sound principles to solve the problem as defined by the “so what” questions

• Iterate the learning to ensure accuracy as the target starts to move

• When the AI-powered product meets the “so what” questions defined by the clinicians, engagement and adoption are seamless
Question 3

• True or False: An AI/Machine Learning model must be able to explain its conclusions.
Questions

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