STA Idol: Preventing Hospital Readmission

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“What’s Your Problem?” by Jacob Cade

• 30 Day ED Postoperative Readmission
  • Cause of patient dissatisfaction
  • Surrogate for operative complications
  • Considered a CMS sentinel events and is a marker of poor care quality
  • Up to 75% are due to an underlying condition present at discharge
“Gold Standard” by Blue Claw Jazz

**HOSPITAL Score for Readmissions**

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Value</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin level at discharge, g/dL</td>
<td>&lt;12</td>
<td>-1</td>
</tr>
<tr>
<td>Discharged from oncology service</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Sodium level at discharge, mEq/L</td>
<td>&lt;135</td>
<td>-1</td>
</tr>
<tr>
<td>Any ICD-9 coded procedure performed during hospital stay</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Index admission type</td>
<td>Elective</td>
<td>0</td>
</tr>
<tr>
<td>Number of hospital admissions in the previous year</td>
<td>0-1</td>
<td>0</td>
</tr>
<tr>
<td>Length of stay</td>
<td>&lt;5 days</td>
<td>0</td>
</tr>
</tbody>
</table>

**LACE Index for Readmission**

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Value</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of stay (days)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Acute/emergent admission</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Chronic Comorbidity Index</td>
<td>0 points</td>
<td>0</td>
</tr>
<tr>
<td>Number of ED visits within 6 months, not including ED visit of current admission</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

If using current admission ICD codes: (Highlighted in red)
“Close Enough” by Gary Charlson

Automated Assessment of Existing Patient's Revised Cardiac Risk Index Using Algorithmic Software

[Diagram with bars]

“My Strongest Weakness” by Wynonna

- Need to wait until the **end** of hospitalization for score application
- Typically based on ICD codes (Charleston comorbidity) which are not always accurate
- Existing models not created for surgical patients and need to be validated for this specific population
“Machine Learning” by Telephone Exchange

- Process an extraordinary amount of data with high execution speeds
- No need for surrogate data, can consume raw sources
- Tree ensemble models like random forests have longstanding track records in other industries
- Jobs can be scheduled to run automatically at set intervals

“Panoramic” by Random Forest

- 70% of available data needed for training. This is a one-time setup. 30% validation.
- Randomly generate hundreds of trees, then keep the best ones. Once calibrated, the best performing trees can be recreated to execute the model on new data.
- Run model 10 times and average the results.
- Typically programmed in R or Python scripts
“Data Warehouse” by Kyohei Nishizawa

- General case/patient data
- Medication administrations
- Medical team assignments
- Laboratory results

“Importance” by Peter Michaels Jr.
“The Next Step” by Rishi & Harshil

- Extracts on retrospective data… need to get this real-time
- How can you prevent an admission that you don’t know the reason for? Blind faith?
- Study a group of patient prospectively and see what might be possible
- Get the python scripting to run on our servers (*next slide*)
“Future State” by Firestorm

- Current problem is that outcomes come with little insight into the cause
- The future needs to be able to create trees of different models to describe possible favorable outcomes
“Human Simulator” by La Vie C’est Facile

- This will require extensive collaboration with simulation models
- Needs to offer specific changes that can reduce readmission (i.e. can’t modify age)
- Suggestions need to be clinically sound (i.e. recommends extubating a comatose patient)
- Needs to have good performance so that the model can run hundreds of times for each patient

“Top Ranking” by Blonde Redhead

- How to rank results:
  - Rank by most likely to improve outcome
  - Rank by most clinically feasible
  - Rank by least costly intervention
  - Rank by most realistic change
“In Conclusion” by Chong the Nomad

• 30 day ED readmission can be predicted with random forest tree models
• Can be automated and run on inpatient as soon as 36 hours after surgery
• Prediction does not come with recommendations on how to prevent the outcome
• Future models need to be integrated with simulation to propose modifiable risk factors