Case Study: Choosing a Fall Risk Assessment
Case Study: XYZ Hospital

• At Baseline
  • Did not have a team accountable for fall risk reduction throughout the facility
  • Clinical judgment used to assess fall risk
  • Newly formed interprofessional fall risk reduction team
  • Sense of urgency to choose fall risk assessment tool for integration into EMR
  • Used work sheet created by CAPTURE Falls project to calculate measures of predictive validity for 3 different fall risk assessment tools using their own patient data
Case Study: XYZ Hospital

- Reviewed records from 2011 and 2012
  - 26 patients fell
  - 37 patients did not fall
- Determined Scores for 3 tools using 2 cut points for each tool
  - John Hopkins Fall Risk Assessment Tool\textsuperscript{1,2}
  - Morse Falls Scale\textsuperscript{3-5}
  - Fall Risk Assessment Scoring System (FRASS)\textsuperscript{6,7}
Test Performance Measure

Work Sheet

See worksheet that walks you through the steps of determining sensitivity, specificity, and predictive values of a tool using data from your setting.

Requires understanding of a 2 x 2 table

- 2 x 2 table combines results of two outcomes
- Rows contain the results of your assessment
- Columns contain the outcome of interest (fall vs no fall)
**General Format of 2 x 2 Table**

<table>
<thead>
<tr>
<th>Assessment Results</th>
<th>Did the patient fall?</th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall</td>
<td>No Fall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ Result</td>
<td>a</td>
<td>b</td>
<td></td>
<td>a + b</td>
</tr>
<tr>
<td></td>
<td>(true +)</td>
<td>(false +)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Result</td>
<td>c</td>
<td>d</td>
<td></td>
<td>c + d</td>
</tr>
<tr>
<td></td>
<td>(false -)</td>
<td>(true -)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a + c</td>
<td>b + d</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Row total = # of pts with + test result
Row total = # of pts with - test result

Column total = # of pts who fell
Column total = # of pts who DID NOT fall

Sensitivity = \( \frac{a}{a+c} \)
Specificity = \( \frac{d}{d+b} \)
Positive Predictive Value (PV+) = \( \frac{a}{a+b} \)
Negative Predictive Value (PV-) = \( \frac{d}{c+d} \)
Measures of Predictive Validity

Sensitivity is the test’s ability to obtain a positive test when the target condition is really present, or the true positive rate, and it tells the clinician how good the test is at correctly identifying patients with condition of interest (ie will fall).

Specificity is the test’s ability to obtain a negative test when the condition is really absent, or the true negative rate, and it tells the clinician how good the test is at correctly identifying the absence of a condition (ie will not fall).
Measures of Predictive Validity

Sensitivity and specificity have limitations due to false positives and false negatives.

Choosing the highest values for positive and negative predictive value minimizes false positive and false negative findings.
Measures of Predictive Validity

Positive predictive value is the probability that a person who tests positive actually has the condition of interest (they fell).

Negative predictive value is the probability that a person who tests negative does not have the condition of interest (they did not fall).
### FRASS Cutpoint at 8+ High Risk For Falls

<table>
<thead>
<tr>
<th>Assessment Results</th>
<th>Did the patient fall?</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall</td>
<td>No Fall</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>+ Result (FRASS ≥ 8)</td>
<td>a = 26 (true +)</td>
<td>b = 28 (false +)</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>- Result (FRASS &lt; 8)</td>
<td>c = 0 (false -)</td>
<td>d = 9 (true -)</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>37</td>
<td>63</td>
<td></td>
</tr>
</tbody>
</table>

Sensitivity = \( \frac{a}{a+c} \) = \( \frac{26}{26} = 100\% \) of fallers had + test (≥ 8)

Specificity = \( \frac{d}{d+b} \) = \( \frac{9}{37} = 24\% \) of nonfallers had – test (< 8)

PV+ = \( \frac{a}{a+b} \) = \( \frac{26}{54} = 48\% \) of those with + test (≥ 8) fell

PV- = \( \frac{d}{c+d} \) = \( \frac{9}{9} = 100\% \) of those with – test (< 8) did not fall
# FRASS Cutpoint at 15+ High Risk For Falls

<table>
<thead>
<tr>
<th>Assessment Results</th>
<th>Did the patient fall?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall</td>
</tr>
<tr>
<td>+ Result (FRASS ≥ 15)</td>
<td>a = 17 (true +)</td>
</tr>
<tr>
<td>- Result (FRASS &lt; 15)</td>
<td>c = 9 (false -)</td>
</tr>
<tr>
<td></td>
<td>26</td>
</tr>
</tbody>
</table>

- **Sensitivity** $\frac{a}{a+c} = \frac{17}{26} = 65\%$ of fallers had + test (≥ 15)
- **Specificity** $\frac{d}{d+b} = \frac{29}{37} = 78\%$ of nonfallers had – test (< 15)
- **PV+** $\frac{a}{a+b} = \frac{17}{25} = 68\%$ of those with + test (≥ 15) fell
- **PV-** $\frac{d}{c+d} = \frac{9}{38} = 76\%$ of those with – test (< 15) did not fall
## Comparing Results

<table>
<thead>
<tr>
<th>Tool (Cut Point)</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>+ Predictive Value</th>
<th>- Predictive Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johns Hopkins (6+)</td>
<td>100%</td>
<td>0%</td>
<td>41%</td>
<td>0%</td>
</tr>
<tr>
<td>Johns Hopkins (13+)</td>
<td>89%</td>
<td>41%</td>
<td>51%</td>
<td>83%</td>
</tr>
<tr>
<td>Morse (45+)</td>
<td>100%</td>
<td>24%</td>
<td>48%</td>
<td>100%</td>
</tr>
<tr>
<td>Morse (75+)</td>
<td>50%</td>
<td>70%</td>
<td>54%</td>
<td>67%</td>
</tr>
<tr>
<td>FRASS (8+)</td>
<td>100%</td>
<td>24%</td>
<td>48%</td>
<td>100%*</td>
</tr>
<tr>
<td>FRASS (15+)</td>
<td>65%</td>
<td>78%</td>
<td>68%**</td>
<td>76%</td>
</tr>
</tbody>
</table>

*100% of those who tested negative DID NOT fall

**68% of those who tested positive DID fall
Case Study Summary

XYZ Hospital plans to use FRASS as their fall risk assessment tool

Identify those patients with a score of 8 – 14 as high risk for falls: if score < 8, patient probably will not fall (Of the 9 with a score < 8, none fell).

Identify those patients with a score of 15+ as at very high/severe risk for falls; if score 15+, patient will likely fall if interventions are inadequate; of those patients who scored 15+, 68% actually fell.
References


2. Johns Hopkins tool is copyrighted. Contact: Stephanie S. Poe, spoejhmi.edu


5. Morse Fall Scale is freely available at http://cf.networkofcare.org/library/Morse%20Fall%20Scale.pdf


7. Contact Lee Hughes for permission to use the FRASS, email L.Hughes@alfred.org.au
The content in this document was originally shared as part of a CAPTURE Falls Collaborative Support Call on January 22, 2013.