Use of Electronic Health Record Data to Evaluate Overuse of Cervical Cancer Screening

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Electronic Health Records (EHRs) and Quality

- EHR data has been used to measure and improve quality\(^1,2\)
- Efficiency is a dimension of quality
- EHR data can be used to measure and minimize overuse of low-value services
- Minimizing overuse of low-value services will improve quality and decrease costs

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Pap Tests as a Prototype for Overuse Measurement

- Professional guidelines in agreement
- Commonly performed and overused\(^1\)
- Overuse has downstream consequences
- Data reported in uniform manner in EHR
- Data reported in searchable fields in EHR

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Aims

1) Assess if EHR data can be used to accurately identify women eligible for an extended screening interval (i.e., every 3 years).

2) Determine the proportion of women eligible for an extended screening interval who received a low-value Pap test sooner than recommended (<3 years).

3) Determine the downstream consequences of these low-value Pap tests.
   • Colposcopies and Costs
Practice Setting and EHR

• Urban, academic, primary care practice
  • 60,000 clinic visits yearly
  • Part of multi-specialty group

• Epic EHR
  • Includes data on all Pap tests and human papilloma virus (HPV) tests

• Pap test electronic alert
  • Default frequency of one year
  • Providers can manually change frequency
Identifying Low-risk Women

- Women 30 to 65 years old
- Low-Risk:
  - Negative (NIL) Pap test in 2007 and 2 previous NIL paps in 2004-2006
  - Negative (NIL) Pap test in 2007 and Negative HPV test in 2007
Exclusion of High-Risk Women

- Diagnosis/Historical code indicative of:
  - Immunosuppression (e.g. HIV)
  - Chemotherapy administration
  - Abnormal Pap smear in 2004-2007
  - History of Cervical Intraepithelial Neoplasia (CIN) II or III
  - History of cervical cancer
  - HPV positive in 2007
  - History of diethylstilbestrol (DES) exposure

- Immunosuppressive medication in 2007
Analysis

• Chart review to assess query accuracy:
  • 100 randomly selected women
  • All women receiving colposcopy
• Identified overuse of low-value Pap tests
  • Any 2008-09 Pap test in low-risk women
• Identified consequences of low-value Pap tests
  • Any 2008-09 colposcopy in low-risk women
Identifying Low-risk Women

NIL Pap test in 2007 (n=4,002)

Met inclusion criteria (n=2,253)
- 3 NIL Paps from 2004-2007 (n=2,008)
- NIL Pap and Neg. HPV test in 2007 (n=245)

Eligible for extended interval (n=1,705)

Did not meet inclusion criteria (n=1,749)

Excluded (n=548)
Chart Review Confirms Query Accuracy

• 99 of 100 randomly selected women were appropriately classified as low-risk

• Misclassified patients had pertinent information recorded only in free text notes
Overuse and Consequences

Eligible for extended interval (n=1,705)

• Colposcopy Results:
  • 20 colposcopies with benign findings
    • CIN I or HPV changes or normal
  • 1 colposcopy with adenocarcinoma in situ

Received colposcopy after low-value Pap test (n=21 (1.2%))
• Number of colposcopies in 2008: 10
• Number of colposcopies in 2009: 11

Excluded after manual chart review (n=2)*

*These 2 women were excluded after manual chart review of all patients receiving colposcopy after unnecessary Pap testing.
EHR Data can be Used to Measure Pap Test Overuse

- Pap tests are commonly overused
- Overuse has downstream consequences
- Pap test overuse and its consequences are costly
  - Approximately $105,000 in our clinic in 2008-09
  - Approximately $1 billion per year nationally

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1. Eltoum IA and Roberson J. Cancer Cytopathology. 2007 February 25; 111(1).
Limitations

• Single EHR
• Single Practice Study
• Single type of cervical cancer screening overuse measured
• Definition of overuse based on professional guidelines and some may disagree
Implications of EHR-Based Overuse Measurement

- Our methods can be replicated for other overused services
- Improve quality measures to reflect optimal use of preventive services
- Facilitates EHR-based quality improvement interventions to improve efficiency
- Cut costs by reducing use of low-value services
Research Support

• Jason Mathias’s fellowship is supported by AHRQ T32 HS000078-13 PI: Holl

• Thank you
Thank You
EHRs Identifying Overuse

• EHRs can identify low-value services
  • Cancer screening in the elderly
  • Redundant diagnostic tests
  • Likelihood of abnormal test results
### Defining Pap test Overuse

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<tbody>
<tr>
<td></td>
<td>• Women $\geq$ 30 may extend interval:</td>
<td>• Women $\geq$ 30 may extend interval:</td>
<td>• Screen at least every 3 years.</td>
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<tr>
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<td>• To 2-3 years if:</td>
<td>• To 2-3 years if:</td>
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<td>• 3 consecutive NIL results</td>
<td>• 3 consecutive NIL results</td>
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<tr>
<td></td>
<td>• To 3 years if:</td>
<td>• NIL result</td>
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<td></td>
<td>• NIL result</td>
<td>• HPV negative</td>
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<td></td>
<td>• HPV negative</td>
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3. USPSTF: Screening for Cervical Cancer. AHRQ Pub. No. 03–515A
Immunosuppressive Meds

- Azathioprine
- Basiliximab
- 6-Mercaptopurine
- Daclizumab
- Methotrexate
- Atgam
- Entanercept
- Cyclophosphamide
- Tacrolimus

- Cyclosporine
- Sirolimus
- Anakinra
- Infliximab
- Mycophenolate Mofetil
- Adalimumab
- Granulocyte Colony-Stimulating Factor
Results

NIL Pap test in 2007 \((n=4,002)\)

Did not meet inclusion criteria \((n=1,749)\)

Met inclusion criteria \((n=2,253)\)
- NIL pap in 2007 AND:
  - 2 NIL Paps between 2004 and 2006: 2,008
  - Negative HPV test in 2007: 245

Eligible for extended interval \((n=1,705)\)

Did not receive Pap test in 2008 or 2009 \((n=585)\)

Received unnecessary Pap test \((n=1,120)\)
- Number of Pap Smears in 2008: 839
- Number of Pap Smears in 2009: 712

Excluded after manual chart review \((n=2)\)*

Received colposcopy after unnecessary Pap test \((n=21)\)
- Number of colposcopies in 2008: 10
- Number of colposcopies in 2009: 11

*These 2 women were excluded after manual chart review of all patients receiving colposcopy after unnecessary Pap testing.
Results

• 1,705 women eligible for extended interval
• 1,120 (66%) received unnecessary Pap test
• 21 women (1.2%) received colposcopy as a consequence of unnecessary Pap testing
  • 5 women with CIN I
  • 15 women with squamous metaplasia or koilocytic atypia consistent with HPV changes
  • 1 woman with adenocarcinoma in situ
<table>
<thead>
<tr>
<th>Eligible for extended interval (n=1,705)</th>
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<tbody>
<tr>
<td>n (%)</td>
<td></td>
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<tr>
<td><strong>Marital Status</strong></td>
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<tr>
<td>Single</td>
<td>669 (39.2)</td>
</tr>
<tr>
<td>Married</td>
<td>904 (53.1)</td>
</tr>
<tr>
<td>Divorced</td>
<td>99 (5.8)</td>
</tr>
<tr>
<td>Widowed</td>
<td>26 (1.5)</td>
</tr>
<tr>
<td>Separated</td>
<td>5 (0.3)</td>
</tr>
<tr>
<td>Unknown</td>
<td>2 (0.1)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>856 (50.2)</td>
</tr>
<tr>
<td>African-American</td>
<td>379 (22.2)</td>
</tr>
<tr>
<td>Latino</td>
<td>101 (5.9)</td>
</tr>
<tr>
<td>Other</td>
<td>42 (2.5)</td>
</tr>
<tr>
<td>Unknown</td>
<td>327 (19.1)</td>
</tr>
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<table>
<thead>
<tr>
<th>Number of GIM Visits in 2007</th>
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<tr>
<td>≤2</td>
<td>1190 (69.8)</td>
</tr>
<tr>
<td>3-5</td>
<td>416 (24.4)</td>
</tr>
<tr>
<td>≥6</td>
<td>99 (5.8)</td>
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<thead>
<tr>
<th>Number of Chronic Conditions</th>
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<tbody>
<tr>
<td>0</td>
<td>1146 (67.2)</td>
</tr>
<tr>
<td>1-2</td>
<td>535 (31.4)</td>
</tr>
<tr>
<td>≥3</td>
<td>24 (1.4)</td>
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<tr>
<th>Chronic Conditions by Disease</th>
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<tbody>
<tr>
<td>Hypertension</td>
<td>367 (21.5)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>79 (4.6)</td>
</tr>
<tr>
<td>History of Cancer</td>
<td>9 (0.5)</td>
</tr>
<tr>
<td>Chronic Pulmonary Disease</td>
<td>222 (13.2)</td>
</tr>
<tr>
<td>Coronary Artery Disease</td>
<td>18 (1.1)</td>
</tr>
<tr>
<td>Congestive Heart Failure</td>
<td>5 (0.3)</td>
</tr>
<tr>
<td>Peripheral Vascular Disease</td>
<td>6 (0.4)</td>
</tr>
<tr>
<td>Chronic Liver Disease</td>
<td>3 (0.2)</td>
</tr>
<tr>
<td>Chronic Kidney Disease</td>
<td>4 (0.2)</td>
</tr>
<tr>
<td>Dementia</td>
<td>3 (0.2)</td>
</tr>
</tbody>
</table>
Results

Eligible for extended interval \( (n=1,705) \)

Received unnecessary Pap test \( (n=1,120) \)
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