30-Day Pediatric Readmissions

Measurement and Prevention

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Pediatric Readmission Outline

• Background of readmissions

• Comparison of readmission metrics

• Conclusions and future directions
Most Prevalent Pediatric Hospitalizations

All-Cause
(n = 6.6 million)

Newborn
(n = 4.1 million)

Non-Newborn
(n = 2.5 million)

Acute Illness

Pneumonia
Cellulitis
Gastroenteritis

Appendicitis
Arm fracture

Chronic Illness

Asthma
Epilepsy

Tonsillectomy
Digestive operations
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Pediatric Readmission Metrics In Use

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- Digestive operations
Readmission Metrics for Children with Complex Chronic Conditions

• Complex chronic conditions
  – Rare, severe conditions
  – Associated with high care coordination needs, inpatient resource utilization and early readmission

• 30-day readmission
  – Sickle cell disease
    (National Association of Children’s Hospitals)
  – Ventricular shunt operations for hydrocephalus
    (National Quality Forum)
Pediatric Readmission Uncertainty

• Impact
  – Prevalence and cost

• Preventability
  – True reasons for readmission

• Attribution
  – Hospital, ambulatory providers, patient / family

• Interpretation
  – Performance comparison
## Patient Case-Mix Differences Between Children’s and Non-Children’s Hospitals

<table>
<thead>
<tr>
<th>Patient Type</th>
<th>Children’s Hospitals (n = 150)</th>
<th>Non-Children’s Hospitals (n = 4000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children with Complex Chronic Conditions</td>
<td>79%</td>
<td>20%</td>
</tr>
<tr>
<td>Healthy Newborns</td>
<td>11%</td>
<td>83%</td>
</tr>
</tbody>
</table>
Pediatric Readmission Comparison

• Compare the prevalence, cost, prevention and attribution of selected pediatric 30-day readmissions:
  – Newborns
  – Disease-specific acute illnesses
  – Disease-specific chronic illnesses
  – All-cause
    • All children
    • Children with complex chronic conditions
Healthy Newborn Readmissions

• Measure
  – All cause 30-day readmission following hospital discharge for routine, term newborn care

• Exclusions
  – Prematurity
  – Major congenital anomalies

• Data source
  – Peer-reviewed publications
  – Healthcare Cost and Utilization Project (AHRQ)
Healthy Newborn Readmissions

• 30-day readmission = 3%
  – N = 90,000 (national estimate)
  – Cost = $200 million (national estimate)

• Prevention
  – Dehydration and jaundice readmissions
    • 40% of newborn readmissions
    • Non-early discharge for high-risk infants
    • In-hospital bilirubin screening and home treatment programs

• Attribution
  – Shared between inpatient and outpatient providers
Pediatric Acute Illness Readmissions

• **Measure**
  – Non-elective 30-day readmission for any reason following an acute illness admission
    • Cellulitis, pneumonia, bronchiolitis, gastroenteritis
    • Appendicitis, arm fractures

• **Exclusions**
  – Newborns
  – Oncology patients
Pediatric Acute Illness Readmissions

• Data Source

  – National Association of Children’s Hospitals and Related Institutions Case-Mix Dataset

  – Administrative data of 667,543 hospitalizations from 87 children’s hospitals in 2009

  – Unique patient identifiers permit tracking across multiple hospitalizations
Pediatric Acute Illness Readmission Rates

Data Source: National Association of Children's Hospitals and Related Institutions (NACHRI)
Pediatric Acute Illness Readmission Rates

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Data Source: National Association of Children's Hospitals and Related Institutions (NACHRI)
# Pediatric Acute Illness Readmission Impact

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<th>30 Day Readmission</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>N</td>
<td>Cost*</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>5.4%</td>
<td>1605</td>
<td>$39.3</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>8.6%</td>
<td>1180</td>
<td>$31.6</td>
</tr>
<tr>
<td>Bronchiolitis</td>
<td>4.9%</td>
<td>1613</td>
<td>$26.6</td>
</tr>
<tr>
<td>Appendectomy</td>
<td>4.5%</td>
<td>755</td>
<td>$10.3</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>2.7%</td>
<td>487</td>
<td>$6.8</td>
</tr>
</tbody>
</table>

*millions (2010 dollars)
Acute Illness Readmission Prevention and Attribution

• Appendectomy and cellulitis
  – Constant readmission prevalence reached at 14 days
  – Inpatient care quality may be a major contributor

• Gastroenteritis, pneumonia, bronchiolitis
  – Readmission prevalence continuously increases
  – Further exploration of reasons for readmission
Pediatric Chronic Illness Readmissions

• Measure
  – Non-elective 30-day readmission for any reason following a chronic illness admission
    • Asthma, diabetes, seizure, sickle cell disease
    • Tonsillectomy, digestive operations, ventricular shunt operations for hydrocephalus

• Exclusions
  – Newborns
  – Oncology patients

• Data source
  – NACHRI CaseMix dataset
Pediatric Chronic Illness Readmission Rates

Data Source: National Association of Children's Hospitals and Related Institutions (NACHRI)
Pediatric Chronic Illness Readmission Rates

![Graph showing Pediatric Chronic Illness Readmission Rates. The graph plots days to readmission on the x-axis and readmission rate (%) on the y-axis. Two lines are shown: one for diabetes (squares) and one for asthma (triangles). The data source is the National Association of Children's Hospitals and Related Institutions (NACHRI).]
Pediatric Chronic Illness Readmission Rates

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# Pediatric Chronic Illness Readmission Impact

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<tr>
<td></td>
<td>%</td>
<td>N</td>
<td>Cost*</td>
</tr>
<tr>
<td>Ventricular Shunt</td>
<td>18.6%</td>
<td>984</td>
<td>$25.1</td>
</tr>
<tr>
<td>Seizure</td>
<td>4.8%</td>
<td>1269</td>
<td>$22.9</td>
</tr>
<tr>
<td>Sickle Cell</td>
<td>18.5%</td>
<td>1483</td>
<td>$15.6</td>
</tr>
<tr>
<td>GI Operations</td>
<td>12.2%</td>
<td>474</td>
<td>$10.7</td>
</tr>
<tr>
<td>Asthma</td>
<td>2.8%</td>
<td>1063</td>
<td>$9.6</td>
</tr>
</tbody>
</table>

*millions (2010 dollars)
Pediatric Chronic Illness Readmission Prevention and Attribution

- Ventricular shunt malfunction
  - Readmission prevention with high quality surgical care
  - Limited ambulatory care prevention

- Sickle cell readmission
  - Readmission prevention with hydration and hydroxyurea
  - Ambulatory care and treatment compliance may be major contributors
All-Cause Pediatric Readmissions

• Measure
  – Non-elective 30-day readmission for any reason after any prior admission for (1) all children and (2) children with complex chronic conditions

• Exclusions
  – Newborns
  – Oncology patients

• Data Source
  – NACHRI CaseMix dataset
All-Cause 30-Day Pediatric Readmission Rates

Data Source: National Association of Children’s Hospitals and Related Institutions (NACHRI)
All-Cause 30-Day Pediatric Readmission Rates

Days to Readmission vs. Readmission Rate (%)

Data Source: National Association of Children’s Hospitals and Related Institutions (NACHRI)
All Patients (n = 667,187)

Complex Chronic Condition Present (n = 232,419)

Complex Chronic Condition Absent (n = 434,768)

All-Cause 30-Day Pediatric Readmission Rates

Data Source: National Association of Children's Hospitals and Related Institutions (NACHRI)
All-Cause 30-Day Pediatric Readmission Cost

Days to Readmission

Readmission Cost ($ billions)

All Patient Readmissions (n = 51,599 at 30 days)

Data Source: National Association of Children's Hospitals and Related Institutions (NACHRI)
All-Cause 30-Day Pediatric Readmission Cost

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All-Cause Pediatric Readmission Prevention and Attribution

• 7-day readmissions for all children
  – Prevented with high quality discharge care
  – Inpatient care responsibility

• 30-day readmissions for children with complex chronic conditions
  – Prevented with proactive care planning, care coordination, and ambulatory urgent care
  – Shared inpatient and outpatient responsibility
Conclusions and Future Directions
Highest Pediatric Readmission Prevalence

- 30-day readmission rates
  - Disease specific
    - Sickle cell disease (18%)
    - Ventricular shunt operations for hydrocephalus (18%)
  - All cause
    - Children with complex chronic conditions (13%)
Highest Pediatric Readmission Cost

• Newborns
  – 30-day = $200 million (national estimate)

• All-cause
  – 7-day for all children
    = $550 million (children’s hospitals)
  – 30-day for children with complex chronic conditions
    = $1.1 billion (children’s hospitals)
Pediatric Readmission 
Prevention and Attribution

• Ventricular shunt operations, tonsillectomy, appendectomy
  – Clearer reasons for readmission than non-surgical readmissions
  – Most likely related to in-hospital care
  – Limited ambulatory care readmission prevention
Limitations

• Pediatric readmission impact within children’s hospitals may not be generalizeable to community hospitals who care for less children with complex chronic conditions

• Chart review and prospective methods to ascertain the reasons for readmission may be preferable to administrative data
Pediatric Readmission Future Directions

- Community hospital readmission rates
- True reasons for readmission
- Case-mix adjusted readmission rate variation
- Readmission rate disparities
- Realistic target setting with projected cost savings
Pediatric Readmissions

• Opportunity for improved care quality and cost savings

• Further development and use of meaningful and valid pediatric readmission metrics
  – Illuminate which readmissions are the most preventable
  – Inform which reduction strategies are the most effective
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