The Camden Coalition of Healthcare Providers Approach to Risk Stratified Care Management

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Camden Coalition of Healthcare Providers

www.camdenhealth.org
The mission of CCHP is to improve the health status of all Camden residents by increasing the capacity, quality and access to care in the city.
Hot Spotting: the ability to identify in a timely manner patients who are heavy users of the system and their patterns of use, so that targeted intervention and follow-up programs can be put in place to address their needs and change the existing, potentially ineffective, utilization pattern.

Understand the problem

Develop interventions to target the problem

Identify and engage patients needing intervention

Evaluate the impact of the solutions
Hotspotting Intervention Paradigm

Diabetes COPD Multi-CC No-CC High Utilizer
Identify and understand the problem.

Develop interventions to target the problem.

Identify and engage patients needing intervention.

Evaluate the impact of the solutions.
CCHP Data Access Solution: Camden Health Database

Yearly Claims Data
Data Use Agreements
IRB Agreement

Data processing/cleaning
Probabilistic matching
Geocoding

Camden Residents All-Payer Claims Longitudinal Dataset
- Demographics
- Inpatient and Emergency visits
- Diagnosis codes
- Charges/receipts
- Insurance
Cluster analysis

- an exploratory data analysis tool for solving classification problems. Its object is to sort cases (patient utilization history) into groups, or clusters, so that the degree of association is strong between members of the same cluster and weak between members of different clusters.
- Each cluster thus describes, in terms of the data collected, the class to which its members belong.
## Cluster Analysis Results

<table>
<thead>
<tr>
<th>Cluster</th>
<th>% total</th>
<th>% total ED</th>
<th>% total IP</th>
<th>% total LOS</th>
<th>% total charges</th>
<th>% total receipts</th>
<th>% total 60 readmits</th>
<th>Total charges</th>
<th>Total receipts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Utilization</td>
<td>36.9%</td>
<td>16.7%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>4.1%</td>
<td>3.9%</td>
<td>0.0%</td>
<td>$29,459,067</td>
<td>$3,216,749</td>
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<tr>
<td>Average Utilization</td>
<td>20.3%</td>
<td>21.2%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>5.0%</td>
<td>4.7%</td>
<td>0.0%</td>
<td>$35,843,429</td>
<td>$3,867,264</td>
</tr>
<tr>
<td>High ED Utilizers</td>
<td>10.1%</td>
<td>23.8%</td>
<td>3.0%</td>
<td>1.7%</td>
<td>6.5%</td>
<td>6.6%</td>
<td>0.0%</td>
<td>$46,579,465</td>
<td>$5,505,723</td>
</tr>
<tr>
<td>Borderline ED/IP Utilizers</td>
<td>7.9%</td>
<td>3.3%</td>
<td>8.1%</td>
<td>7.5%</td>
<td>7.8%</td>
<td>7.7%</td>
<td>0.0%</td>
<td>$56,204,358</td>
<td>$6,439,403</td>
</tr>
<tr>
<td>Moderate ED Utilizers</td>
<td>7.8%</td>
<td>9.5%</td>
<td>6.2%</td>
<td>3.7%</td>
<td>6.3%</td>
<td>6.5%</td>
<td>0.0%</td>
<td>$45,433,623</td>
<td>$5,391,079</td>
</tr>
<tr>
<td>Outlier ED Utilizers</td>
<td>2.1%</td>
<td>11.6%</td>
<td>2.5%</td>
<td>1.7%</td>
<td>3.9%</td>
<td>3.4%</td>
<td>0.0%</td>
<td>$28,203,522</td>
<td>$2,829,333</td>
</tr>
<tr>
<td>Borderline IP/ED Utilizers</td>
<td>11.3%</td>
<td>6.6%</td>
<td>41.9%</td>
<td>34.9%</td>
<td>27.3%</td>
<td>27.3%</td>
<td>0.0%</td>
<td>$196,526,193</td>
<td>$22,735,172</td>
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<tr>
<td>Moderate Inpatient Utilizers</td>
<td>2.6%</td>
<td>3.6%</td>
<td>24.5%</td>
<td>22.5%</td>
<td>18.5%</td>
<td>20.4%</td>
<td>75.9%</td>
<td>$133,209,990</td>
<td>$16,957,202</td>
</tr>
<tr>
<td>High Inpatient Utilizers</td>
<td>.8%</td>
<td>1.5%</td>
<td>13.0%</td>
<td>27.5%</td>
<td>20.0%</td>
<td>18.8%</td>
<td>23.0%</td>
<td>$144,148,652</td>
<td>$15,652,705</td>
</tr>
<tr>
<td>Extreme Utilizers</td>
<td>.1%</td>
<td>2.1%</td>
<td>.7%</td>
<td>.5%</td>
<td>.7%</td>
<td>.6%</td>
<td>.9%</td>
<td>$5,192,345</td>
<td>$537,555</td>
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<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>$720,800,645</td>
<td>$83,132,186</td>
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</tbody>
</table>
# High ED Utilizers

2,854 patients (10%)

<table>
<thead>
<tr>
<th>Mean # ED visits</th>
<th>Mean # IP visits</th>
<th>Mean total LOS</th>
<th>Mean % of all unique primary CD classified as chronic</th>
<th>Mean % of IP that are 60 day readmissions</th>
<th>Mean total charges</th>
<th>Mean total receipts</th>
<th>Median Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.24</td>
<td>.09</td>
<td>.25</td>
<td>8%</td>
<td>0%</td>
<td>$16,321</td>
<td>$1,929</td>
<td>31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% total</th>
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</tbody>
</table>

## Common Diagnoses

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Patients</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>URIN TRACT INFECTION NOS</td>
<td>382</td>
<td>2.8</td>
</tr>
<tr>
<td>ABDOM PAIN NOS (Begin 1994)</td>
<td>319</td>
<td>2.4</td>
</tr>
<tr>
<td>ACUTE PHARYNGITIS</td>
<td>302</td>
<td>2.2</td>
</tr>
<tr>
<td>BACKACHE NOS</td>
<td>277</td>
<td>2.0</td>
</tr>
<tr>
<td>NO PROC/PATIENT DECISION</td>
<td>265</td>
<td>2.0</td>
</tr>
<tr>
<td>HEADACHE</td>
<td>224</td>
<td>1.7</td>
</tr>
<tr>
<td>ACUTE URI NOS</td>
<td>215</td>
<td>1.6</td>
</tr>
<tr>
<td>CHEST PAIN NOS</td>
<td>214</td>
<td>1.6</td>
</tr>
<tr>
<td>ABDOM PAIN NEC (Begin 1994)</td>
<td>190</td>
<td>1.4</td>
</tr>
<tr>
<td>VAGINITIS NOS</td>
<td>189</td>
<td>1.4</td>
</tr>
</tbody>
</table>
## Moderate Inpatient Utilizers

786 patients (2.8%)

<table>
<thead>
<tr>
<th>Mean # ED visits</th>
<th>Mean # IP visits</th>
<th>Mean total LOS</th>
<th>Mean % of all unique primary ICD classified as chronic</th>
<th>Mean % of IP that are 60 day readmissions</th>
<th>Mean total charges</th>
<th>Mean total receipts</th>
<th>Median Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.91</td>
<td>2.72</td>
<td>12.15</td>
<td>32%</td>
<td>49%</td>
<td>$169,478</td>
<td>$21,574</td>
<td>53</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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### Top Diagnoses

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Patients</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEST PAIN NOS</td>
<td>74</td>
<td>2.0</td>
</tr>
<tr>
<td>URIN TRACT INFECTION NOS</td>
<td>65</td>
<td>1.8</td>
</tr>
<tr>
<td>SHORTNESS OF BREATH (Begin 1998)</td>
<td>56</td>
<td>1.5</td>
</tr>
<tr>
<td>RESPIRATORY ABNORM NEC</td>
<td>53</td>
<td>1.5</td>
</tr>
<tr>
<td>NO PROC/PATIENTDECISION</td>
<td>51</td>
<td>1.4</td>
</tr>
<tr>
<td>ABDOM PAIN NOS(Begin 1994)</td>
<td>50</td>
<td>1.4</td>
</tr>
<tr>
<td>PNEUMONIA ORGANISM NOS</td>
<td>50</td>
<td>1.4</td>
</tr>
<tr>
<td>CEREBRAL ART OCCLUS NOS W/ INFARCT(Begin 1998)</td>
<td>40</td>
<td>1.1</td>
</tr>
<tr>
<td>CHEST PAIN NEC</td>
<td>40</td>
<td>1.1</td>
</tr>
<tr>
<td>ACUTE RENAL FAILURE NOS</td>
<td>38</td>
<td>1.0</td>
</tr>
</tbody>
</table>
# High Inpatient Utilizers

215 patients (1%)

<table>
<thead>
<tr>
<th>Mean # ED visits</th>
<th>Mean # IP visits</th>
<th>Mean total LOS</th>
<th>Mean % of all unique primary ICD classified as chronic</th>
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<th>Mean total charges</th>
<th>Mean total receipts</th>
<th>Median Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.48</td>
<td>5.33</td>
<td>54.71</td>
<td>34%</td>
<td>55%</td>
<td>$673,592</td>
<td>$73,143</td>
<td>57</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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## Top Diagnoses

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Patients</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESPIRATORY ABNORM NEC</td>
<td>34</td>
<td>2.2</td>
</tr>
<tr>
<td>CHEST PAIN NOS</td>
<td>29</td>
<td>1.9</td>
</tr>
<tr>
<td>SHORTNESS OF BREATH (Begin 1998)</td>
<td>28</td>
<td>1.8</td>
</tr>
<tr>
<td>REHABILITATION PROC NEC</td>
<td>26</td>
<td>1.7</td>
</tr>
<tr>
<td>ABDOM PAIN NOS (Begin 1994)</td>
<td>25</td>
<td>1.6</td>
</tr>
<tr>
<td>SEPTICEMIA NOS</td>
<td>23</td>
<td>1.5</td>
</tr>
<tr>
<td>ACUTE RENAL FAILURE NOS</td>
<td>21</td>
<td>1.4</td>
</tr>
<tr>
<td>URIN TRACT INFECTION NOS</td>
<td>21</td>
<td>1.4</td>
</tr>
<tr>
<td>PNEUMONIA ORGANISM NOS</td>
<td>19</td>
<td>1.2</td>
</tr>
<tr>
<td>ACUTE ON CHRONIC SYSTOLIC HEART FAIL (Begin)</td>
<td>17</td>
<td>1.1</td>
</tr>
</tbody>
</table>
Understand the problem

Develop interventions to target the problem

Identify and engage patients needing intervention

Evaluate the impact of the solutions
CCHP Data Access Solution: Camden Health Information Exchange

**HIE Daily Report**
- List of patients currently in hospital with 2+IP and/or 6+ ED in last 6 months
- CCHP care teams review cases
- Enroll patients in Care Management / Care Transitions program before discharge
Risk Stratification Workflow

- HIE daily admissions data
- Access to medical charts
- Triage tool

Identify

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Identify Eligible Patients

- Health Information Exchange (HIE) Daily Feed
  - Real time snapshot of currently hospitalized patients from 2 local hospitals
  - Emailed to teams each day
- Eligibility criteria
  - 2 or more inpatient admissions in last 6 months
  - ER utilization data is also collected & reported
- Access to Cooper and Lourdes’ EMR
  - More in-depth information about patients used to further determine eligibility through triage
Step 1: Identify patients with 2+ inpatient visits in last 6 months

### Recent Admissions for High Utilizers

<table>
<thead>
<tr>
<th>Facility</th>
<th>Days Since Last</th>
<th>6-Month Epis.</th>
<th>Days ED Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>abc</td>
<td>12</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>def</td>
<td>14</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>ghi</td>
<td>16</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>jkl</td>
<td>18</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>mno</td>
<td>20</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>pqr</td>
<td>22</td>
<td>12</td>
<td>2</td>
</tr>
</tbody>
</table>

- Days since last admission
- 6-month episode
- Days ED name
Triaging Eligible Patients

- Triage utilized with patients who meet initial eligibility criteria
  - Semi-structured qualitative tool collecting patient data from EMR
  - Data on current and historical inpatient admissions that help assess complexity
    - PCP & insurance information
    - Chronic conditions diagnoses
    - Inpatient admission causes
    - Medication information
    - Histories of social comorbidities – homelessness, lack of social support, barriers to accessing services, substance use
**Rule-out Criteria at Triage**

- Current & historical inpatient admission data from EMR used to rule-out patients
  - Was the primary cause of admission:
    - Oncology-related?
    - Pregnancy-related?
    - Related to a surgical procedure for an acute condition?
    - Mental health-related without other conditions?
    - Acute disease-related?
    - Due to complications of a condition with limited treatment options?
  - Was patient discharged prior to triage?
Static Risk Score at Triage

- Certain data collected at triage form a static triage risk score
  - Sum of score for 3 risk factors
    - Inpatient admissions
      - 2 visits = +1 point
      - 3 or more = +2 points
    - ED visits
      - 4 to 5 visits = +1 point
      - 6 or more visits = +2 points
    - Medication information
      - 5 or more medications = +1 point
  - Used as a subtotal in calculation of patient’s Total Risk Score at bedside
Risk Stratification Workflow

- Identify
  - HIE daily admissions data
  - Access to medical charts
  - Eligibility

- Assign
  - Flexible rule-out criteria
Assign to Care Teams

- Assignment to a care team made based on most current primary care provider (PCP)
  - Gives care teams an in-depth understanding of a limited set of PCP practices
  - Allows care teams to begin developing relationships with PCP practices
Rule-Out Criteria at Assignment

- Flexible set of rule-out criteria
  - Adjusted based on qualitative information from care team members & programmatic needs
  - Current criteria:
    - Discharged prior to pre-enrollment (result of time lapse between triage & assignment)
    - Uninsured
    - Over the age of 80 years old/dementia co-morbidity
      - Increased probability of diminished mental capacity
      - Not conducive to behavior change needed to manage advanced chronic conditions in age group
    - Non-Camden primary care provider
Risk Stratification Workflow

**Identify**
- HIE daily admissions data
- Access to medical charts
- Eligibility

**Assign**
- PCP-focused assignment
- Increase relationship building with practices

**Stratify**
- Bedside outreach
- Risk Tool administration

**HIE Admissions Flag:**
- 2+ hospital admissions < 6 months

**Triage:**
- In-depth analysis of medical record to complete triage tool

**Flexible Rule-Out Criteria:**
- Uninsured
- Discharged prior to triage (no longer in hospital)
- Over 80 years old
- Non-Camden PCP

**Identify Risk Factors:**
- Behavioral health issues
- Language barriers
- Homelessness
- Poor Self-Rating of Health
- Mobility limitations
- Lack of social support

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Stratify by Risk

- Teams conduct bedside outreach to assigned patients (pre-enrollment)
  - Consent form process
  - Administration of risk stratification tool
- Mean total risk score for each team is monitored
  - To prevent over-assignment of higher risk patients to one team over the other
Assessment of Risk Factors

- Static risk factors (assessed only at pre-enrollment)
  - Language barrier
  - Number of chronic conditions
    - Increased # of risk points for increased # of conditions
    - Behavioral health co-morbidities weighted separately
    - Stroke history risk weighted separately

- Dynamic Risk Factors (can change throughout course of intervention)
  - Lack of PCP (or lack of recent PCP visit)
  - Housing barrier
  - Poor self-rating of health
  - Mobility barrier
  - Social support
Rule-out Criteria at Pre-enrollment

• Flexible set of risk-factors at pre-enrollment that rule-out official enrollment at hospital discharge
  – Currently receiving other care management services
  – Pass away in hospital
  – Decline to participate in services
  – Discharge to long-term rehabilitation
Enrollment

- Patients will be enrolled upon discharge from hospital or sub-acute rehabilitation
  - Goal of first home visit within 24-48 hours
  - Care plan is developed between pre-enrollment & discharge
- Validation of risk tool through tracking of hours spent with each patient by each care team staff member
  - Higher risk patients should require more intensive intervention/more hours
- Constant monitoring of re-admissions to hospital following discharge
Risk Follow-up

- Risk tool is re-administered at 30 days, 60 days, & 6 months post-discharge
  - Monitoring short-term & long-term reductions in risk following intervention
  - Reducing risk through targeting of dynamic risk factors from pre-enrollment
- Dramatic changes in self-rating of health, mobility, & social support scored to reduce risk score accordingly
- Re-admissions are factored into follow-up risk score
  - First re-admission = +1 point
  - All re-admissions after first = +0.5 points
Understand the problem

Develop interventions to target the problem

Identify and engage patients needing intervention

Evaluate the impact of the solutions
Thank you for your time

Questions/comments please contact me at ken@camdenhealth.org