Denver Health’s 21st Century Care: Population Health-Informed Primary Care Services

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Acknowledgements and Disclaimers

• Core Team, Clinical Teams, IT Team, Evaluation Team, ACS and Executive Leadership (past and present)

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• The analysis presented was conducted by the awardee. Findings may or may not be consistent with or confirmed by the independent evaluation contractor.

• The Colorado Multiple Institutional Review Board determined this project to be Quality Assurance, Not Human Subject Research.
Presentation Outline

• Denver Health: integrated safety net delivery system
• 21st Century Care: a population health approach to primary care delivery
• Population Segmentation/Risk Stratification:
  – Who?
  – How?
  – Why?
• Super-Utilizer Case Study
Improve access and achieve Triple Aim: better care, smarter spending, healthier people

Enhanced clinical services through redesigned health teams (~$9m)
  – Clinical pharmacists
  – Behavioral health consultants
  – RN care coordinators
  – Patient navigators
  – Social workers
  – Specialized high intensity teams

Enhanced health information technology (~$9m)
  – Population segmentation/patient risk stratification
  – 3M™ Clinical Risk Groups (CRGs)
  – eTouch Services

Administration and Evaluation (~2m)
  – Rapid Cycle Evaluation NOT Research

Data Notes: Adapted from Rachel M. Everhart, EVALUATION OF A MEDICAL HOME TRANSITIONS OF CARE INTERVENTION IN A SAFETY NET SETTING, Health Services Research PhD Program Thesis Defense. April 24, 2014
Population Health “Tiered” Delivery of Enhanced Care Management Services

Notes: Baseline period is July 2010 through June 2011. This initial "proof of concept" tiering algorithm was implemented by Milliman using CDPS predictive modeling tool thresholds to define tiers. Tier sizes were pre-determined according to estimated resource capacity. The attributed managed care population was identified through membership files, whereas the fee-for-service population was selected at a single point in time at the beginning of the time period and fixed for the duration. All attributed individuals were tiered. MM: Member months, PMPMs: Per member per month, PN: Patient Navigator, RN CC: Nurse Care Coordinators, PharmD: Clinical Pharmacist, BHC: Behavioral Health Consultant, SW: Social Worker, HIT: Health Information Technology.

How We Tier?

1. Assemble multi-disciplinary team
2. Choose macro accountable population
3. Develop risk stratification rules to define population segments (risks/tiers)
4. Evaluate financial stratification & clinical coherence of tiers
5. Develop care models for use within tiers
6. Identify individuals who are good candidates for care model
7. Develop associated workflows
8. Develop performance monitoring & evaluation

Iterate to optimize population segmentation & patient identification


Inspired by Institute for Healthcare Improvement (IHI) BHL C Collaborative
CRG (Clinical Risk Group) predicts future costs, BUT also needed to include consideration of severity & “actionable patients”

CMMI Adults by CRG Status
CRGs (diagnosis grouper) are primary basis for tier assignment.

Utilization overrides CRG-assigned tier.

How are Tiers Used Administratively?

- Triggering outreach activities
- Triggering activities at the point of care
- Matching resources to populations (slide 34)
- Describing/risk-adjusting provider panels (slide 35)
- Describing patients/users (slides 36-7)
- Hot-spotting/mapping (slide 38)
- Evaluating program reach/performance (slide 39)
- In-depth analysis of population subgroups *
Population Segmentation: Deep Dive

CRGs are primary basis for tier assignment

Utilization overrides CRG-assigned tier

Tier 4
n=3,266
Super Utilizers (40%)

Tier 3
n=7,411

Tier 2
n=27,325

Tier 1
n=31,490

Total
N=69,492

CRGs 1 & 2
(94%)

Predictive Model Criteria
(97%)

Tier Promotion Criteria
(3%)

CRG 7
(60%)

CRG 6
(82%)

CRG 9
(3%)

CRG 4
(5%)

CRG 8
(2%)

CRG 5
(43%)

<= 3% of adults; 30% of facility costs

Adverse Birth Outcomes (1%)

Adult High Risk (5%)

Super Utilizers (40%)

• “Super-utilizers” defined as patients who had three or more hospitalizations in a rolling twelve-month look-back period or had both a serious mental health diagnosis and two or more hospitalizations

• Setting: urban safety-net integrated delivery system

• N= 4774 (primarily publicly-insured or uninsured)

• Study Period: May 1, 2011-April 30, 2013

• Cross-sectional and longitudinal analyses
Percentages of 4,774 adult super-utilizers in Denver County, Colorado, with selected characteristics, May 1, 2011–April 30, 2013.

SOURCE Authors’ analysis of data from the data warehouse of Denver Health. NOTE Each population characteristic percentage was calculated from the cross-sectional snapshot of patients identified as super-utilizers in that month.

“Super-Utilizers” are Stable in Number, BUT Individual Turn-Over is High

Population And Individual-Level Analyses of Adult Super-Utilizers in Denver County, Colorado, May 1, 2011–April 30, 2013

DATA NOTES: Authors’ analysis of data from the data warehouse of Denver Health. NOTES “Not in original cohort” is people who became super-utilizers after the study period began (members of all other categories were in the original cohort). “Will die” is people from the original cohort who died during the study period; some people who died also permanently or temporarily lost super-utilizer status. “Will lose and not regain status” is people from the original cohort who stopped being super-utilizers and did not regain that status during the study period. “Will lose and regain status” is people from the original cohort who stopped being super-utilizers and did regain that status during the study period. “Continuously met criteria” is people who met the criteria for super-utilizers throughout the study period. Some people classified as “not in original cohort” also died, permanently or temporarily lost super-utilizer status, or both during the study period. However, these super-utilizer status changes were not tracked. Only status changes affecting the original cohort are shown in the exhibit.
Cost Savings Analysis: Why can’t we simply compare utilization/costs of before and after program enrollment?

This natural tendency for high-utilizing patients to become less high-utilizing over time is known as “regression to the mean”.

Charges reduced 44% & admissions reduced 53%, but NO clinical intervention was provided!
Regression to the Mean

Figure 3: Per Capita Inpatient And Outpatient Charges For 1,682 Adult Super-Utilizers In Denver County, Colorado, At Baseline And Years 1 And 2

<table>
<thead>
<tr>
<th>Year</th>
<th>Charges</th>
<th>Percent change from Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>$113,522</td>
<td>n/a</td>
</tr>
<tr>
<td>1</td>
<td>63,434</td>
<td>−44.1</td>
</tr>
<tr>
<td>2</td>
<td>47,017</td>
<td>−58.6</td>
</tr>
</tbody>
</table>

SOURCE  Authors’ analysis of data from the data warehouse of Denver Health. NOTES Charges are those for the original cohort of 1,682 super-utilizers identified in the first month of the study period and are in the relevant year’s dollars. (They were not adjusted for inflation.) The baseline year corresponds to the year prior to super-utilizer identification and was May 1, 2010–April 30, 2011. Year 1 corresponds to the year immediately after identification and was May 1, 2011—April 30, 2012. Year 2 corresponds to two years after identification and was May 1, 2012–April 30, 2013.

## Super-Utilizers are Heterogenous
### Program/Policy-Relevant Subgroups

Subgroups Of Super-Utilizers In Denver County, Colorado, And Associated Policies Or Interventions

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>Associated policy or intervention</th>
<th>Super-utilizers on May 1, 2011</th>
<th>Before and after identification as super-utilizers</th>
<th>Risk score, concurrent and predictive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recipients of emergency inpatient dialysis</td>
<td>Change in federal Medicaid policy to enable access to outpatient dialysis services under emergency Medicaid</td>
<td>30 1.8 43.3</td>
<td>$397,089, $408,567 33.9, 36.4 17.8, 15.7</td>
<td></td>
</tr>
<tr>
<td>Terminal cancer patients</td>
<td>Hospice, palliative care</td>
<td>11 0.7 36.4</td>
<td>$230,513, $682,176 5.8, 1.5 14.8, 9.0</td>
<td></td>
</tr>
<tr>
<td>Trauma patients</td>
<td>Highway safety/speed limits, violence prevention initiatives</td>
<td>195 11.6 45.1</td>
<td>$136,050, $79,366 4.4, 1.8 6.8, 4.7</td>
<td></td>
</tr>
<tr>
<td>Orthopedic surgery patients (not trauma related)</td>
<td>Shared decision making, infection prevention education, postdischarge follow-up</td>
<td>60 3.6 76.7</td>
<td>$201,334, $80,039 4.2, 1.4 10.0, 5.4</td>
<td></td>
</tr>
<tr>
<td>Individuals with serious mental health diagnoses</td>
<td>Integrated or collaborative behavioral health models</td>
<td>685 40.7 54.5</td>
<td>$87,236, $62,600 3.2, 1.1 5.4, 4.2</td>
<td></td>
</tr>
<tr>
<td>Patients with multiple chronic diseases/other</td>
<td>Redesigned primary care with enhanced social or mental health services</td>
<td>701 41.6 71.4</td>
<td>$120,520, $77,833 3.9, 1.5 7.4, 5.5</td>
<td></td>
</tr>
</tbody>
</table>

### NOTES
The numbers and percentages for the subgroups are based on the original cohort of 1,682 super-utilizers. Each pair of numbers represents before and after identification as super-utilizers.

Evaluation Implications

• Most existing programs have not been implemented under a research framework
• Most patient subgroups showed reduced utilization pre-vs. post-identification
• Programs that use a pre-post evaluation design may overstate program impact
• Randomized clinical trials and strong observational designs are needed
Total Cost of Care Analysis: Sample ("Mocked-Up") Data

$\text{ Savings}\text{ Per Member Per Month (PMPM)}$

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Baseline + Trend</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specialty</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Care</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Super-Utilizer Program Implications

• Real-time identification is critical
  – Billing data is helpful for descriptive analysis but “too old” for program identification
  – Window of opportunity may be short

• Where, when, how to intervene must be matched to the target population
  – Subpopulations differ by primary care use, reasons for utilization, and cost trajectory
  – Non-target populations are likely to be identified

Care of Super utilizers at DH: Clinical Feasibility Approach

- Organizational capacity
- Literature review of model types
- Review of existing clinical models (esp., Hennepin)
- Medical record review to fine-tune eligibility requirements and needed staffing
- Experimented with patient outreach approach
Super-Utilizer Program Development: Adult High Intensity Teams

CMMI: MHCD ACT Clinic & Denver Health Tier 4 Adult High Risk Clinic

“Ambulatory ICU” ➔

Denver Health - Intensive Outpatient Clinic

Assertive Community Treatment (ACT) Clinic

HIGH RISK

Medical Referral:
- 3+ admits
- Exclude: End stage renal disease (ESRD), out of county, commercial

Mental Health Center of Denver Referral:
- 2+ admits
- Mental illness diagnosis
- Exclude: out of county
Intensive Outpatient Clinic (aICU)

- Targeted to adults with multiple, potentially avoidable, inpatient admissions
- Serves as the patient’s medical home
- More robust staffing model
- Care coordination/plan inclusive of the medical, mental health/substance abuse, medication management, and social needs of the individual
- In addition to integrated behavioral health services also have strong connection to Mental Health Center of Denver
aICU Patient Recruitment

- Need real time patient identification
- Trigger event - when a patient was hospitalized and had index, or subsequent, qualifying admission
- Daily list pushed to IOC on patient admission
- IOC screens for clinical eligibility
- Team follows eligible patients until discharge to attempt to engage them in care
- More recent iteration - MD rounding in hospital
Daily aICU List

Microsoft Dynamics CRM

Workplace

Intervention Screenings

Screenings Pending Enrollment

Creating a list of intervention screenings with specific details for each entry.
Work Flow for aICU Enrollment

IOC Inpatient Transitions Workflow

<table>
<thead>
<tr>
<th>IOC TEAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>New patient identified as IOC eligible in PRM through IOC screening process</td>
</tr>
<tr>
<td>IOC TEAM</td>
</tr>
<tr>
<td>Patient Navigator</td>
</tr>
<tr>
<td>Patient identified as IOC eligible</td>
</tr>
<tr>
<td>IOC TEAM</td>
</tr>
<tr>
<td>LCSW</td>
</tr>
<tr>
<td>Checklist for final patient transition and discharge</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Other Tools:
- Prioritize to-do list
- Phone check-in sheet
- PCP follow-up instructions
Work Flow for aICU Enrollment
a ICU Clinic Staffing

- Providers: 1.0 NP + 0.8 MD
- Support: 1.0 navigator + 1.0 clerk
- Nursing: 1.0 RN + 1.0 medical assistant
- 1.0 LCSW
- 1.0 CAC
- 0.3 Psychologist
aICU Patient enrollment (2013)

Tier 4 Patients
7,219

Super-Utilizers
2,409

Not evaluated (prior to IOC opening)
1,113

Eligible
601

Ineligible
695

Refer to other high intensity team: MHCD, geriatrics, HIV, primary cancer dx

Deemed non preventable admissions, including emergency dialysis only patients

Enrolled to IOC
252

Eligible: not enrolled*
416
<table>
<thead>
<tr>
<th>Demographics (data from 2013)</th>
<th>Tier 4 pts (n=7219)</th>
<th>Tier 4 super utilizers (n=2409)</th>
<th>Ineligible (n=695)</th>
<th>Eligible, not enrolled (416)</th>
<th>Enrolled (n=252)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homeless (%)</td>
<td>15</td>
<td>26</td>
<td>22</td>
<td>30</td>
<td>29</td>
</tr>
<tr>
<td>African American (%)</td>
<td>17</td>
<td>19</td>
<td>18</td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td>Latino (%)</td>
<td>33</td>
<td>36</td>
<td>37</td>
<td>37</td>
<td>33</td>
</tr>
<tr>
<td>CHF (%)</td>
<td>14</td>
<td>17</td>
<td>19</td>
<td>25</td>
<td>31</td>
</tr>
<tr>
<td>MH and SA (%)</td>
<td>26</td>
<td>51</td>
<td>46</td>
<td>52</td>
<td>61</td>
</tr>
<tr>
<td># of meds</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>11</td>
</tr>
</tbody>
</table>
a ICU Sustainability

- Evaluation – evidence of cost avoidance
- Operational support – ongoing financing
- Organizational support – provider satisfaction
- Patient support – patient satisfaction
Preliminary Summary of Findings

• Most of the clients interviewed liked the IOC
• Felt respected (known to providers, not judged, not rushed, caring staff)
• Better access (regular/same day appts, can call IOC and talk to someone)
• IOC helped with medication management and connected them to other needed services
• Most don’t want to “graduate” to regular primary care

Areas for improvement

• Expand current clinic and establish more locations or “step-down” clinics
• Nurse advice line dedicated to IOC patients (currently 2 day call back)
• Home visits and social support outside the clinic
• Better parking options and help with transportation
Super utilizers: next steps

• Clinical model development
  – Transitions back to “regular” primary care
  – Step down IOC at other clinic sites
  – Frequent ED users

• Evaluation
  – Enhanced analyses of super-utilizer subgroups
  – Cross-sector “super-utilization” (homeless & jail services)
  – Quasi-experimental analyses re: cost/utilization
  – Actuarial analyses
Thank you!

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Why Tier?
Population-Matched Staffing

Traditional Care Team
Panel of approximately 1400 patients

Enhanced Care Team Members

Number of tier 3-4 patients per 1.0 staff FTE

<table>
<thead>
<tr>
<th>Care Team Member</th>
<th>Traditional</th>
<th>Enhanced</th>
<th>IOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Navigator</td>
<td>none</td>
<td>570</td>
<td>189</td>
</tr>
<tr>
<td>Clinical Pharmacist</td>
<td>5,988</td>
<td>1,996</td>
<td>N/A</td>
</tr>
<tr>
<td>Nurse Care Coordinator*</td>
<td>none</td>
<td>3,992</td>
<td>377</td>
</tr>
<tr>
<td>Social Worker</td>
<td>2,994</td>
<td>1,330</td>
<td>377</td>
</tr>
<tr>
<td>Behavioral Health Consultants</td>
<td>none</td>
<td>798</td>
<td>1,257</td>
</tr>
</tbody>
</table>

DHHA Confidential

IOC has reduced panel – 25% of traditional

* - pediatric only except IOC
### Why Tier?

**Provider Panel Analysis**

#### Provider Patient Dashboard

**CRG Status**

<table>
<thead>
<tr>
<th>CRG Status</th>
<th># of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Healthy</td>
<td>28</td>
</tr>
<tr>
<td>2 - History of Significant Acute Disease</td>
<td>5</td>
</tr>
<tr>
<td>3 - Single Minor Chronic Disease</td>
<td>11</td>
</tr>
<tr>
<td>4 - Minor Chronic Disease in Multiple Organ Systems</td>
<td>9</td>
</tr>
<tr>
<td>5 - Single Dominant or Moderate Chronic Disease</td>
<td>48</td>
</tr>
<tr>
<td>6 - Significant Chronic Disease in Multiple Organ Systems</td>
<td>122</td>
</tr>
<tr>
<td>7 - Dominant Chronic Disease in 3 or More Organ Systems</td>
<td>19</td>
</tr>
<tr>
<td>8 - Dominant, Metastatic and Complicated Malignancies</td>
<td>4</td>
</tr>
<tr>
<td>9 - Catastrophic Conditions</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>252</strong></td>
</tr>
</tbody>
</table>

#### # of Patients by Tier

- Tier 1: 36
- Tier 2: 131
- Tier 3: 60
- Tier 4: 20

#### # of Patients by Gender

- M: 157
- F: 85

#### Total Changes (Last 12 Months)

- Denver Care: $17,975
- Emergency Dept: $1,377,860
- Observation: $104,480
- Outpatient: $359,581
- Primary Care: $57,491
- Urgent Care: $2,406,262

#### # of Visits (Last 12 Months)

- Denver Care: 40
- Emergency Dept: 215
- Observation: 67
- Outpatient: 12
- Primary Care: 947
- Urgent Care: 100

#### Top 15 Primary Diagnoses

1. Diabetes Mellitus Without Mention of Complication, Type II (Non-Insulin, Severe)
2. Encounters for Other Specified Administrative Purpose
3. Hypertension Unspecified (Other Specific Type)
4. Depression, Major Depressive Affective Disorder, Recurrent
5. Other

#### # of Patients by Age Range

- 0-18: 54
- 19-35: 67
- 36-45: 29
- 46-55: 29
- 56-65: 83
- 66-75: 57
Why Tier?:
Service-Level Analysis (Daily Census)
Why Tier?
Patient-Specific Analysis

Patient Dashboard:
Why Tier?
Population-Level (Geographic) Analysis

Tier 4 High Utilizers by Zip Code

Count of vst_med_rec_no by Zip5
Why Tier?
Patient Reach Across Multiple Interventions

Population Segment: CRG=6,7,9 & Severity >3