AUTOMATED CLINICAL RISK CLASSIFICATION SYSTEM

PRESENTED BY:
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HEALTH PROGRAM MANAGER III
AGENDA

• LOCAL PROBLEM
• DESIGN & IMPLEMENTATION
• HOW IT SOLUTION WAS UTILIZED
• VALUE DERIVED
LOCAL PROBLEM
High risk population are not consistently and accurately identified and placed throughout their incarceration to receive the right level of resources.
E V O L U T I O N   O F   M E D I C A L   C L A S S I F I C A T I O N

2006
Receivership Began

Little to no consideration for Healthcare Factors

2009
Medical Classification System Introduced

Healthcare Factors Introduced
- Rules Broadly Defined Risk & Open To Interpretation
- Often Inaccurate
- Often Not Up To Date
- Person Dependent Paper Process in Communicating to Custody

2012
Medical Classification e-Form Introduced

Communication to Custody Improved
- Paper Process Eliminated, But Still Person Dependent
- Rules Still Not Standardly Applied
- Inaccuracies Persisted
- Still Not Updated Timely

2013
Automated Clinical Risk Classification Implemented

•••
Prior to new solution...

Provider conducts chart review to determine clinical risk.
Provider manually enters clinical risk into Medical Classification e-Form.
e-Form transmits information to SOMS; custody uses healthcare factors to appropriately house inmate.
When clinical status changed: Provider manually updates e-Form.

Repeated audits found discrepancies between reported risk and actual risk.
Baseline Data

- Only 62% of High Risk Patients were Properly Placed

- 6/2013 Hospital Readmission Rate
  20% High Risk vs. 14% Total Population

- 6/2015 Potentially Avoidable Hospitalization (per 1,000)
  71 High Risk vs. 11 Total Population
EXPECTED PROJECT OUTCOMES

IMPROVE CARE & REDUCE COSTS

CLINICAL

• Increase Appropriate Placement of High Risk Inmates
• Reduce Preventable Morbidity & Mortality

LEVERAGE IT & DATA

ADMINISTRATIVE

• Automate Complicated Rules for Clinical Risk
• Provide Timely, Actionable Information
• Provide Near Real-Time Performance Reports
EVALUATING IT SOLUTION ALTERNATIVES

COTS SOLUTIONS WERE NOT Viable

• Risk stratification applications based on Claims Data from PCPs
  • CCHCS PCPs Don’t Bill for Services
• Unique requirements for correctional setting

EXISTING RESOURCES

• E-Form Application
• Healthcare Data Warehouse – SQL
• In-House Talent (Clinical and Technical)
DEVELOPING THE IT WORKFLOW

HEALTHCARE DATAWAREHOUSE
Automated job runs to refresh data tables

Patient
Demographics

Claims

Health Records

Diagnostics

Q 12 HOURS

SOMS

CUSTODY
Notified of Clinical Risk changes automatically

eFORM APPLICATION
DEFINE RISK LEVELS & AVAILABLE SOURCES
- High Risk + Inpatient/Specialized Care Needs
- High Risk Outpatient
- Medium Risk Outpatient
- Low Risk Outpatient

DEFINE HIGH RISK FACTORS
- Chronic Medical Conditions & Degree of Control
- Hospitalizations/Emergency Dept. Encounters
- Age
- Medications

DEFINE RULES FOR EACH FACTOR
- 4 or more conditions; >1 problem prone condition
- Advanced Age- >65
- Polypharmacy (12+ Medications)
- 2+ Hospital/3+ ED Encounters

DEFINE DATA ELEMENTS & DATA SOURCES FOR FACTORS
- Problem List Entries
- Custody Demographic Information
- Pharmacy and Diagnostic Information Systems
- Claims Data
**High Risk - Priority 1**  
Patients who are High Risk Priority 1 trigger at least two (2) risk factors from the criteria found in the table below.

**High Risk - Priority 2**  
Patients who are High Risk Priority 2 trigger only one (1) risk factor from the criteria found in the table below.

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
<th>Data Source</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Risk Diagnosis/Condition</td>
<td>Patients identified as having a diagnosis classified as High Risk. These diagnoses or combination of conditions are deemed High Risk due to current or future adverse health events. <em>(Each condition meeting “High Risk” criteria is considered one risk factor)</em> See Table 1 Individual Condition Specifications for details</td>
<td>PHP/MHTS/EHRs</td>
<td>Current</td>
</tr>
<tr>
<td>Multiple Higher Level of Care Events - Medical</td>
<td>Patients with two (2) or more community hospital Inpatient admissions. <em>(Excluding admissions for acute/trauma related issues)</em> See Table 2 for excluded diagnoses</td>
<td>CADDIS</td>
<td>365 Days (1 Year)</td>
</tr>
<tr>
<td>Prolonged Medical Bed Stay</td>
<td>Patients in CTC, OHU or SNF for more than 90 days (3 months) of the last 180 days (6 months).</td>
<td>PHP/EHRs</td>
<td></td>
</tr>
<tr>
<td>Multiple Higher Level of Care Events - Mental Health</td>
<td>Patients with three (3) or more Mental Health Higher Level of Care admissions (MHCB, IPP, APP, PIP).</td>
<td>MHTS.net/EHRs</td>
<td>365 Days (1 Year)</td>
</tr>
<tr>
<td>Polypharmacy</td>
<td>Patients prescribed thirteen (13) or more medications. See Table 3 for excluded prescriptions</td>
<td>Guardian/EHRs</td>
<td>Current</td>
</tr>
<tr>
<td>High Risk Specialty Consultations</td>
<td>Patients with three (3) or more appointments with a “High Risk” specialist(s), <em>(e.g., oncologist, vascular surgeon)</em> See Table 4 High Risk Specialty Consultations for details</td>
<td>TPA Claims</td>
<td>365 Days (1 Year)</td>
</tr>
<tr>
<td>Advanced Age</td>
<td>Patients who are sixty-five (65) years of age or older.</td>
<td>SOMS</td>
<td>Current Age</td>
</tr>
<tr>
<td>Multiple Medium Risk Diagnoses/Conditions</td>
<td>• 4 or more Medium Risk chronic conditions.</td>
<td>PHP/MHTS/EHRs</td>
<td>Current</td>
</tr>
</tbody>
</table>
**Condition Specifications**

**Diabetes**

<table>
<thead>
<tr>
<th>Type of Info</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criteria used to identify patients with this condition.</td>
<td>Patients with any of the following:</td>
</tr>
<tr>
<td></td>
<td>A. A prescription for a diabetic medication within the last 730 days (2 years).</td>
</tr>
<tr>
<td></td>
<td>1. Excludes patients with prescriptions for only rapid or short acting insulin.</td>
</tr>
<tr>
<td></td>
<td>See Table 1</td>
</tr>
<tr>
<td></td>
<td>2. Excludes patients identified by Metformin only with an active PHP or EHRs diagnosis of the following: See Table 2 and 3</td>
</tr>
<tr>
<td></td>
<td>i. Polycystic Ovary</td>
</tr>
<tr>
<td></td>
<td>ii. Familial Hypertriglyceridemia</td>
</tr>
<tr>
<td></td>
<td>iii. Dysmetabolic syndrome</td>
</tr>
<tr>
<td></td>
<td>iv. Other Abnormal Glucose</td>
</tr>
<tr>
<td></td>
<td>B. Any patient with two (2) HbA1C results* greater than 6.5. See Table 4</td>
</tr>
<tr>
<td></td>
<td>C. An active PHP or EHRs diagnosis related to Diabetes. See</td>
</tr>
</tbody>
</table>

*Quest Lab look back period: 2009-present. Foundation Lab look...

**Risk Classification:**

A. **High Risk**

1. All HbA1C measurements greater than or equal to 10.0 for the last 730 days (2 years) with a minimum of two (2) results.

2. All patients who have a high risk Diabetes PHP or EHRs diagnosis. See Table 2 and 3

B. **Medium Risk**

1. All patients who meet criteria from Diabetes definition and not classified as high or low risk.

C. **Low Risk**

1. Any patient who meet all the following items:
   i. Not currently on any type of insulin. See Table 1
   ii. All HbA1C measurements less than 7.7 for the last 365 days (1 year).
   iii. Patient has at least one (1) HbA1C measurement within the last 365 days (1 year).
PARTNERING BUSINESS OWNER WITH IT DEVELOPERS

PROGRAMMERS

CLINICAL SMEs
HOW IT SOLUTION WAS UTILIZED
### California Correctional Healthcare Services

#### Statewide Basic Institutions Summary

<table>
<thead>
<tr>
<th>Institution</th>
<th>ASP, CAC, CAL, CCC, OIC, CCI</th>
<th>Include: No Housing Exclusions, Custody</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>High Risk</th>
</tr>
</thead>
</table>

#### Statewide Movement Summary

<table>
<thead>
<tr>
<th>High Risk @ Basics (Beginning of Month)</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>New High Risk Arrivals</th>
<th>85</th>
<th>84</th>
<th>97</th>
<th>107</th>
<th>85</th>
<th>116</th>
<th>82</th>
<th>116</th>
<th>112</th>
<th>88</th>
<th>112</th>
<th>104</th>
</tr>
</thead>
<tbody>
<tr>
<td>Med Class Upgrades</td>
<td>313</td>
<td>252</td>
<td>358</td>
<td>284</td>
<td>321</td>
<td>306</td>
<td>269</td>
<td>386</td>
<td>335</td>
<td>324</td>
<td>333</td>
<td>315</td>
</tr>
<tr>
<td>Transfers from Intermediates</td>
<td>92</td>
<td>100</td>
<td>132</td>
<td>140</td>
<td>130</td>
<td>107</td>
<td>110</td>
<td>155</td>
<td>158</td>
<td>140</td>
<td>121</td>
<td>127</td>
</tr>
<tr>
<td>High Risk No Longer in Custody</td>
<td>54</td>
<td>65</td>
<td>88</td>
<td>80</td>
<td>65</td>
<td>84</td>
<td>74</td>
<td>70</td>
<td>61</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Med Class Downgrades</td>
<td>206</td>
<td>155</td>
<td>169</td>
<td>184</td>
<td>186</td>
<td>145</td>
<td>172</td>
<td>165</td>
<td>183</td>
<td>154</td>
<td>154</td>
<td>190</td>
</tr>
<tr>
<td>Transfers to Intermediates</td>
<td>285</td>
<td>297</td>
<td>323</td>
<td>267</td>
<td>313</td>
<td>303</td>
<td>304</td>
<td>333</td>
<td>319</td>
<td>377</td>
<td>296</td>
<td>304</td>
</tr>
<tr>
<td>High Risk @ Basics (End of Month)</td>
<td>3,450</td>
<td>3,369</td>
<td>3,396</td>
<td>3,413</td>
<td>3,376</td>
<td>3,391</td>
<td>3,286</td>
<td>3,390</td>
<td>3,455</td>
<td>3,442</td>
<td>3,488</td>
<td>3,479</td>
</tr>
</tbody>
</table>

#### Our Goal:
To ensure at least 90% of all high risk inmates are housed in designated Intermediate Institutions by December 2017.

- There were 3,667 high risk inmates in basic institutions as of January 2017. There were another 11,438 high risk inmates already housed at Intermediate institutions. Total High Risk Pool = 14,943
- Approximately 263 inmates must be moved per month to achieve this goal. (90% of 3,667 = 3,299 divided by 12 months = 263 per month)
- Note: There are 11,587 low risk inmates who occupy beds at Intermediate institutions.

#### Net High Risk Movement

<table>
<thead>
<tr>
<th>2016</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>57</td>
<td>61</td>
<td>27</td>
<td>17</td>
<td>37</td>
<td>15</td>
<td>90</td>
<td>34</td>
<td>509</td>
<td>593</td>
<td>763</td>
<td>1,037</td>
<td>1,549</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2016</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>763</td>
<td>282</td>
<td>303</td>
<td>340</td>
<td>384</td>
<td>434</td>
<td>509</td>
<td>593</td>
<td>763</td>
<td>1,037</td>
<td>1,549</td>
<td>3,139</td>
<td></td>
</tr>
</tbody>
</table>
IT SOLUTION FUNCTIONALITY CONT.
Provider conducts chart review to determine clinical risk.

Provider manually enters clinical risk into Medical Classification e-Form.

e-Form transmits information to SOMS; custody uses healthcare factors to appropriately house inmate.

When clinical status changed: Provider manually updates e-Form.
IT SOLUTION WITHIN THE WORKFLOW

Risk Level
Automatically Updated

Custody Staff reviews
Custody Registry

Correctional Counselor
reviews patient’s record

Correctional Counselor
determines appropriate housing

Custody moves patient
CCHCS HEALTHCARE DATA WAREHOUSE

- Metadata
- Raw Data
- Summary Data

ETL

EHRS
SOMS
LEGACY SYSTEMS
FLAT FILES

DATA WAREHOUSE

AD HOC ANALYSIS
REPORTING
DATA MINING
CHANGE MANAGEMENT STRATEGY

- Organizational memorandum from leadership
- Executive forums at all levels of the organization to communicate this change
- Refine existing policy and procedures
  - Define process workflows
  - Override process
- Decision support
  - Training materials
- Status reports post implementation to see progress upon initial implementation
  - Statewide high risk performance report
PROVIDING ACCESS TO END-USERS – LINKS FROM CDCR INTRANET TO QM TOOLS
POST IMPLEMENTATION PROCESS

18%

High Risk Placement
IMPROVEMENTS ACHIEVED

High Risk Rules Modified and Conversion to ICD-10
Statewide Hospital Readmissions

June 2013 – December 2017

All Hospital Readmissions
High Risk Hospital Readmissions

<table>
<thead>
<tr>
<th></th>
<th>June 2013</th>
<th>December 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Hospital</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td>High Risk</td>
<td>20%</td>
<td>16%</td>
</tr>
</tbody>
</table>
Statewide Potentially Avoidable Hospitalizations (per 1000)
June 2015 – December 2017

- All PAH
- High Risk PAH

<table>
<thead>
<tr>
<th>Time</th>
<th>All PAH</th>
<th>High Risk PAH</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 2015</td>
<td>10.8</td>
<td>70.9</td>
</tr>
<tr>
<td>December 2017</td>
<td>8.9</td>
<td>43.5</td>
</tr>
</tbody>
</table>
## ESTIMATED COST

### FIXED COSTS

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT Costs (Storage, Software)</td>
<td>$525,000/yr</td>
</tr>
<tr>
<td>DBA/DBD Contract</td>
<td>$125,000/yr</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$650,000/yr</strong></td>
</tr>
</tbody>
</table>

### DEVELOPMENT LABOR COSTS

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>QM Programmer</td>
<td>$90,000</td>
</tr>
<tr>
<td>Clinical SME</td>
<td>$62,500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$152,500</strong></td>
</tr>
</tbody>
</table>

### M&O LABOR COSTS

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>QM Programmer/yr</td>
<td>$10,000</td>
</tr>
<tr>
<td>Clinical SME/yr</td>
<td>$20,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$30,000</strong></td>
</tr>
</tbody>
</table>

*Note: Fixed costs are associated to HDW & all applications; not specific to this solution*
COST SAVINGS

ESTIMATED COSTS SAVED BY AUTOMATING RISK LEVEL

- 230 Clinical Risk Changes per day x 5 minutes clinician would spend reviewing patient’s chart
- 12 e-Forms per hour x $100 per hour (for P&S classification)
- $1900 in saved time per day
- $2.1 million saved over 3 years, and growing
Many models use the following variables:

- Age
- Gender
- Drugs
- Diagnoses

Some also use:

- Disability/functional status
- Procedures
- Insurance type
- Region
- Employment info
- Cost/use data

Not many (or none) use the following that we include:

- Lab values
- Provider specialty

None use as many factors as we do (for better or worse)
### Lessons Learned

- Data is an asset that should be managed and leveraged
- Risk Classification should not be static
  - Need process for resolving disputes
  - Rules should be reevaluated periodically
- With the right IT infrastructure a healthcare organization can start to do large scale improvement efforts
- Timeframe for goal overly ambitious
  - Competing placement factors
  - Patient population & individual clinical risk change over time
- Change management strategy may need to be revisited
  - Focus and engage with custody stakeholders more