Allina Health

Predictive Analytics in Action: Tackling Readmissions

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July 17, 2013

Agenda

- Background
- Lifecycle
- Current status
- Discussion

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Goals for today

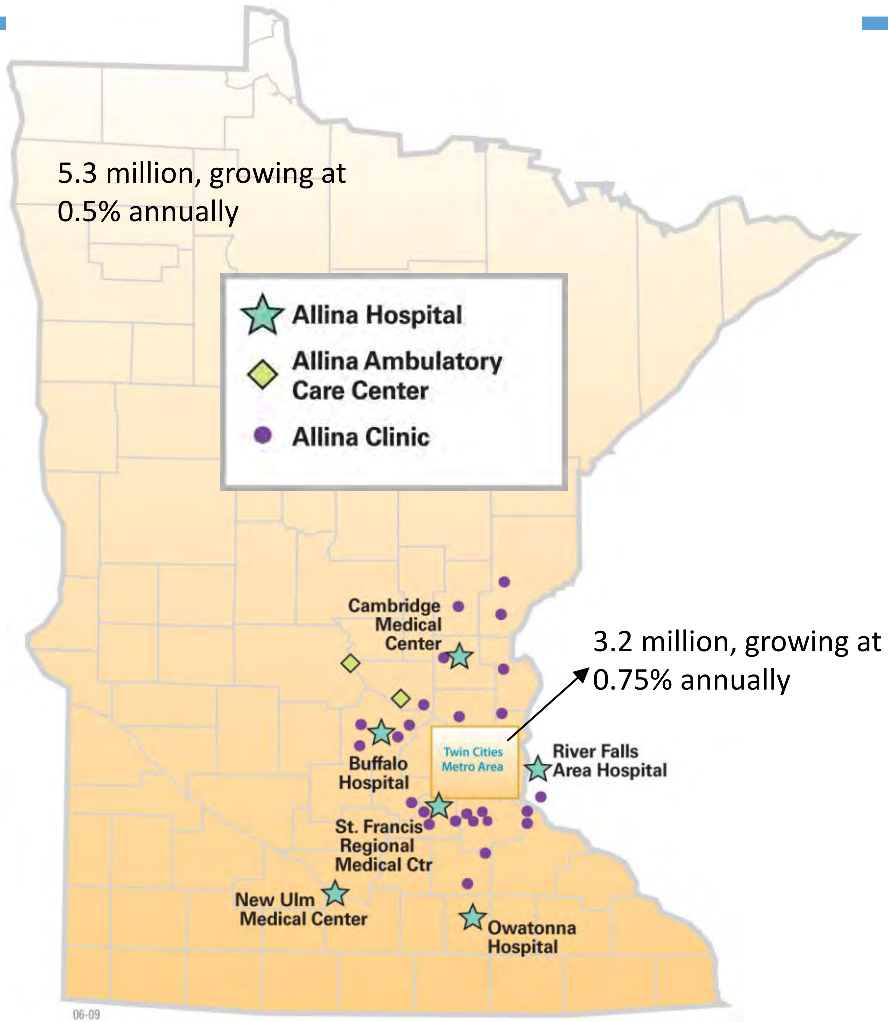
- Describe how Allina Health is using data warehousing, predictive analytics, innovative care and technology investment to reduce the number of potentially preventable readmissions within the system.
- Leave plenty of time for discussion
- Learn from you (through your questions and feedback)

About Allina Health

- Largest Healthcare System in the Twin Cities
- 11 hospitals
- 1,658 staffed beds

- 60 Allina Clinics, 22 hospital-based clinics
- 15 community pharmacies
- 4 ambulatory care centers
- Specialty Operations: Transportation,
  Pharmacy, Lab, Homecare/Hospice
- About 22,800 employees, including
  1,200+ employed physicians
- About 5,000 Community Physicians

- **Key statistics**
  - $3.2 billion in revenue
  - 120,000+ inpatient admissions
  - 1.0 million+ outpatient admissions



Allina's EHR: Excellian

One Patient. One Record.

- First Hospitals and clinics implemented in 2004. All hospitals and clinics complete – Enterprise Applications
- Currently implementing Lab system
- 3 million patient records
- Storage Size: 1.9 terabytes – (adding 4 gig/day)
- 250,000 MyChart users, including e-Visits
- 30,000 Excellian users
- Received the 2007 HIMSS Davies Award for implementation
- Received Stage 6 (Hospital)on the EMR Assessment Model
- Attested for Meaningful Use Stage 1, Year 1 and 2

About the Data Warehouse

- Development
  - In-house, supplemented by outside expertise
  - Began in 2008, provided value to Allina within months
- Current Team
  - 10 x Data Architects (“Data Warehouse Generalists”)
  - 3 x BI Developers (“Data Visualization”)
  - 2 x BI Systems Admins (“Keeping the Lights On”)
  - 1 x Trainer
  - 1 x Manager
- Utilization
  - > 150 active “power” users/month
  - > 500 ad-hoc user queries/day

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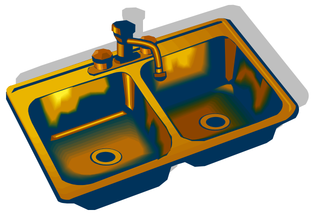
EDW Data Content

From Epic

- Patient Demographics and Identifiers
- Surgical Supplies/Implants
- Financial transactions (charges, payments, adj., etc.)
- Results (labs, etc.)
- Encounters and Vitals
- Admissions, Discharges, Transfers
- OR Cases and OR Log
- Ordered Procedures and Medications
- Administered Medications (MAR)
- Medical, Social HX, Problem List
- Flowsheets (subset),Questionnaires
- *(lots more…)*

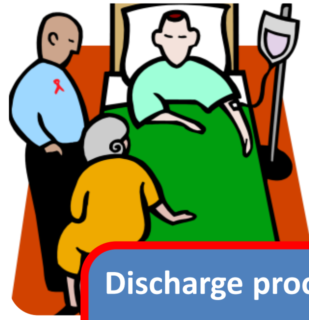
Other Data Sources

- Pioneer ACO Claims
- HDM (3M Coding)
- Cost Accounting
- Tumor Registry
- Lumedx Apollo (CV Registries)
- Avatar (Patient Satisfaction)
- Premis
- Payroll
- Core Measures



Why are hospital and ED transitions important?

Hospital & ED
- Identify new illness
- Disease progression
- Scheduled intervention
- Treat
- Stabilize for discharge



Discharge process
- Identify resources
- Hand-offs
- Transition of care
- Communicate new issues
- Discharge instructions

Ambulatory Care
- Early follow-up appointments
- Follow through of hospital/ED plan
- Disease management

↓ Length of Stay
↓ Readmissions

↓ ED Visits
↓ Readmissions
↓ Admissions

Improve Quality, Patient Experience & Reduce Total Cost of Care

Project Drivers

- Increased readmission focus, statewide and nationally
- Analysis of potential gaps in the way our systems are currently hard-wired to transition patients out of the acute care setting
- Gaps:
  - Information sharing among providers for continuity of care
  - Identification of patients – who is in need of additional help and services?
  - Significant process variation across conditions

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Initial Rollout (“Phase 1”)

- Simple dashboard
- No predictive score
- Combination of “quasi real time” and historical data
- Agile development – simplest, easiest to build design which is still useful
- No big up, up-front design
- Lots of “shopping” to potential customers

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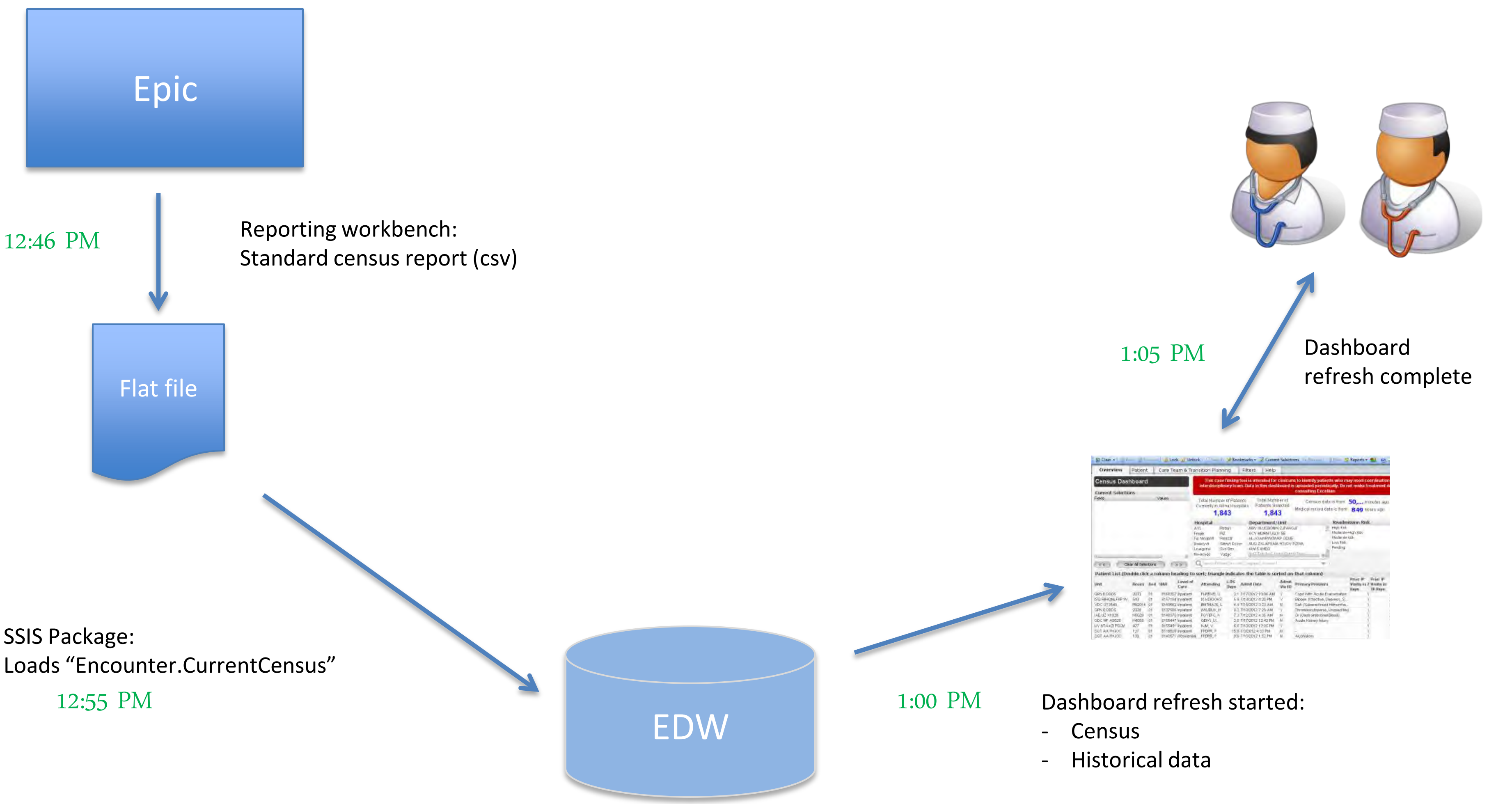
Phase 1 - Architecture and refresh



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Interest in predictive models

- Allina Health: Investing in predictive analytics
  - Better patient outcomes
  - At a lower cost, due to better resource allocation
- Data within the EDW was already well-vetted and used extensively for retrospective analyses
- Hypothesis: could we use the EDW in a proactive manner to improve patient care?

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Overview of Readmission Risk Model

- <u>Objective</u>:
  - Create a predictive model accessible for clinicians to identify patients who would benefit from a "Transition Conference" to identify resources for the next level of care
    - *Using a predictive model to identify and intervene with high risk patients can reduce hospital readmissions*
  - Assigns a readmission risk score for 30 day readmissions

- <u>Data & Methodology</u>:
  - Nearly 2 years of data (Jan 2010 – Nov 2011)
    - 180k inpatient discharges (Allina wide).
  - Expanded to discharges of '**All**' conditions
  - Hundreds of variables tested
  - Outcome by forwards and backwards stepwise multiple logistic regression.
    - 70% to train model, 30% to test. The train/test datasets were reassigned hundreds of times to determine confidence levels of final outcome statistics.

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Variables Considered

- **Demographic data**
  - Age
  - Gender
  - Home zip code
  - Marital status
  - PCP clinic
  - Financial Class
  - Language
  - Discharge destination
  - Admit source type
  - Hospital location
- **Clinical data**
  - **Encounter**
    - BMI
    - Weight
    - blood pressure
    - Pulse
    - Temperature
    - Depression (PHQ9)
    - Respiration
    - Etc.
  - **Inpatient values**
    - Nursing assessed functional status
    - Pulse oximetry values
    - Came through emergency department
    - Length of stay
    - Nursing DC assessments
    - Etc.
  - **Medications**
    - OP Medication Count
    - IP Medication Count
  - **Lab**
    - Cholesterol/Calcium
    - Red/white blood count
    - Creatinine/Hematocrit
    - Glucose levels/GFR
    - Hemoglobin/WBC/RBC
    - Other blood values
  - **44 Diagnosis Groupings**
    - If physician entered ICD9's are present in the last 12 months
    - Asthma
    - Cancer
    - CHF
    - Gastro Intestinal
    - COPD
    - Depression
    - Diabetes
    - Renal Disease
    - Respiratory failure
    - Septicemia
    - Etc.
  - **Historical Utilization**
    - Number of inpatients stays in the last 12 months
    - Number of emergency department visits in the last 12 months
    - Etc.

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Test of Change ("Phase 2")

- Minor, but significant, dashboard enhancement – added the risk score with color coding at the patient level
- Intervention - Transition Conferences
  1. Identify potential candidates from dashboard
  2. Schedule conference(s)
  3. Facilitate conference(s)

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Phase 2 - Architecture and refresh

Epic

12:46 PM

Reporting workbench:
Standard census report (csv)

CSV

SSIS Package:
Loads “Encounter.CurrentCensus”

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Daily:
Risk score
recalculation

EDW

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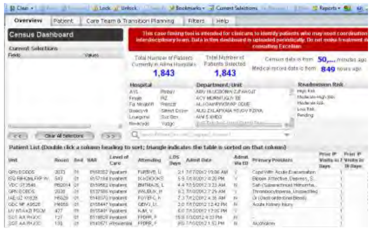

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Dashboard
refresh complete

Dashboard refreshed:
- Census
- Historical data
- Risk score

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Census Dashboard Demo

Wish us luck, it's a demo.

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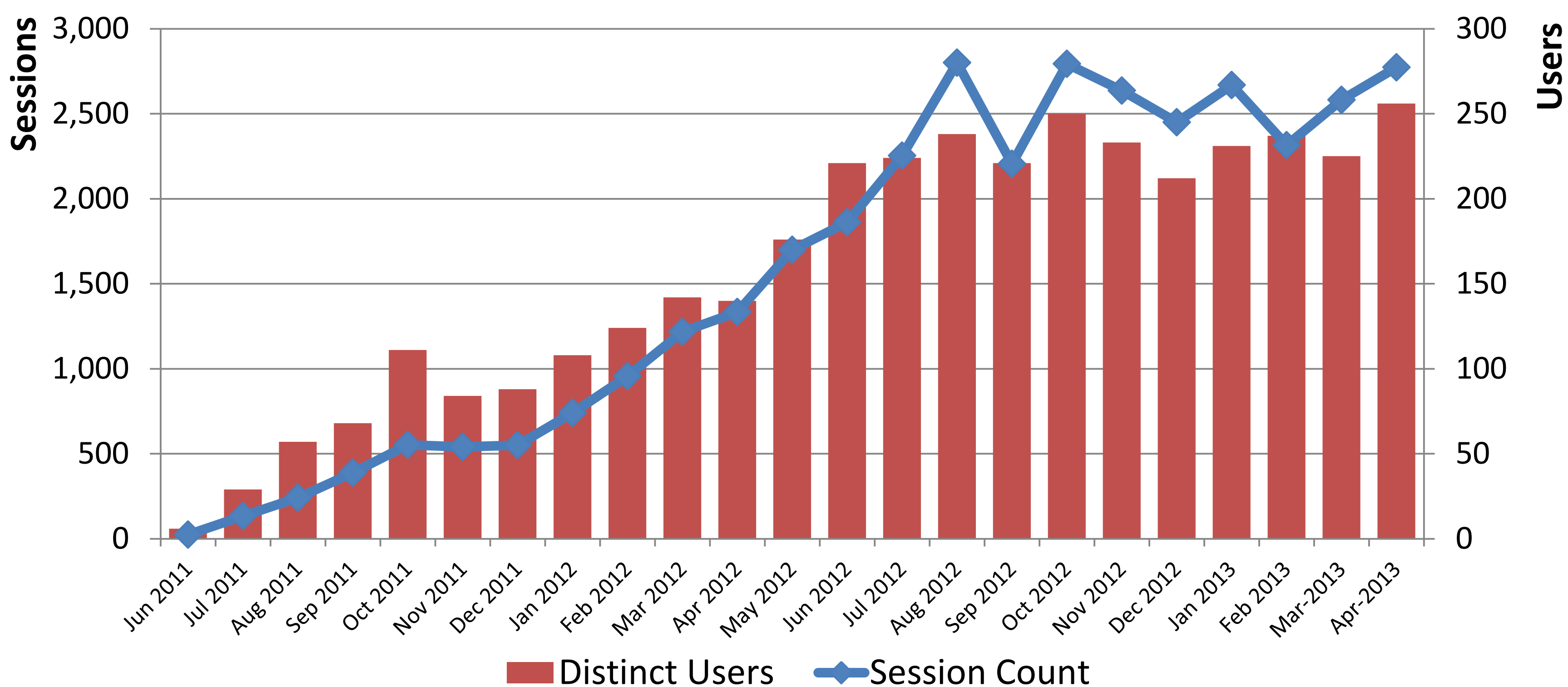
Dashboard Acceptance



Post-Testing the Readmission Predictive Model…

- May 1st 2013 (over a **year** after Jan 2012 auto-calculating start for all patients)
  - **675,000** Risk scores
  - **157,000** Unique patients
  - **8,300** Unique patients in the **high risk** category
- **97%** of patient's risk scores have *little or no change* during the stay
  - **75%** of patients will stay within the **same risk level**
  - **22%** of patients will fluctuate between **two** neighboring **risk levels**
- **3%** will fluctuate more significantly
  - Most increase due to major changes in patient status
  - Some due to data delays
- Validation suite was created to verify model accuracy changes over time and data input changes

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Comparisons to published models

- Initial Goals
  - c-stat of > **0.7 (moderate discrimination power)**
  - calibration error < **3%**

Model	LACE	CMS	Systematic Review*	Allina Health Readmission Predictive Model
Summary	4 variables: **L**=LOS, **A**=Acuity (was ED), **C**=comorbidity index, **E**=ED utilization	Claims based, many parameters	Varying depth and applicability	30 clinical and internal variables. Applies to all patients
C-stat	0.68	0.63 – 0.66	0.56 – 0.72	**0.73**

- *JAMA "Risk Prediction Models for Hospital Readmissions"
  - Oct 19th, 2011, Vol 306, No. 15, p 1688
- 26 Unique models reviewed
  - 14 on claims data.
  - 9 of those 14 had low discrimination ability (c-stat 0.55 – 0.65)
  - 7 with moderate discrimination available **during the stay** **(c-stat 0.56 – 0.72)**
  - 5 at hospital discharge (c-stat 0.68 – 0.83)
- Vary widely between the groups (one will work great with Asthma but not AMI…)

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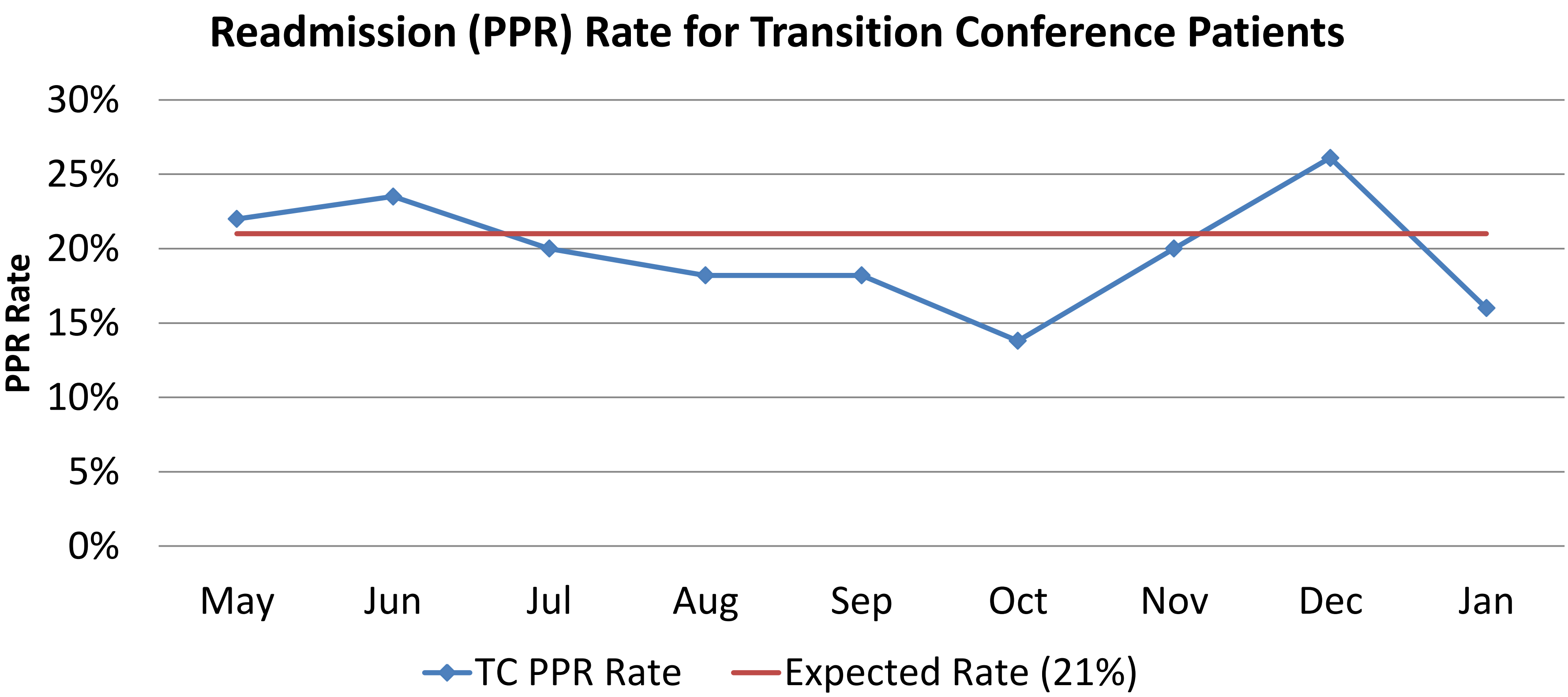
Why a transition conference?

- Patients and their families continue to experience readmissions
- Patient and caregiver engagement in discharge planning has been proven to decrease readmissions
- Using a predictive model within the EMR to identify and intervene with high risk patients can reduce hospital readmissions
- There are limited clinical resources; an efficient and systematic approach for complex discharge planning is needed
- Hospital payment is tied to readmissions
- New patient experience HCAPHS Care Transitions (CTM-3)

Readmission Rate Over Time



PPR = Potentially Preventable Readmissions by 3M™

Transition Conference Summary

- First 800 Transition Conferences for High Risk
  - **15% *reduction*** in PPRs
  - 10 Allina Health hospitals participated
- Impacts over 100 APR-DRGs
- More patients accepting post acute care
  - Ex. Home Health, SNF, Hospice, TCU

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Challenges/Conclusions

- Technical Challenges
  - EDW morning load completion time
  - EDW SLA
  - Licensing
- Conclusions
  - Users find the tool useful and helpful
  - Shifted focus from identification to better care coordination
  - Ambulatory Care management

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What questions or comments do you have?

Business card

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