Predictive Analytics to Drive Quality and Efficiency Gains Under Bundled Payment Models

Sixth National Bundled Payment Summit

Andy Schuetz, Ph.D.
Sr. Data Scientist, Sutter Health

Brian Alexander, MBA
Chief Administrative Officer, Novato Community Hospital, Sutter Health

Buzz Stewart, Ph.D.
VP, Chief Research Officer, Sutter Health

Shawn Dastmalchi, Ph.D.
CEO, Ark.One

Sutter Health at a Glance

24 Hospitals

190,054 Discharges / year
483, 649 Home health visits
11,121,733 Outpatient visits

11 Hospitals under CJR
1 hospital under BPCI

Model 2: LEJR, sepsis, pneumonia

Sutter Health

Growing Body of Experience

BPCI Model 2 – Novato Community Hospital

- Started in January 2014 with 30-day LEJR episodes
  - Approximately 100 Medicare cases per year
  - 3 community SNFs
  - Upside only gainsharing with Orthopedic Surgeons

CJR – 11 Hospitals, spanning two MSAs

- A range of hospital sizes, physician relationships, and post acute partner environments
  - Evolving strategy for supporting best practices

Sutter Health

Challenges and Opportunities

- Independent orthopedists, many in solo private practice
- Episodic cost variability across physicians with individualized protocols
- Variable utilization of post-acute services and providers
- Bundled payments can be a tool to improve quality through MD engagement and financial alignment

Sutter Health

Managing Insurance Risk

- Over a given population, episodic payments must be greater than the combined costs of outcomes
  — Reduce the incidence of high cost outcomes
  — Reduce the median episode costs

- Decreasing the variability of episodic costs has a greater financial return than reducing the costs of the median episode (80/20 rule)

- Quality is measured as a rate of catastrophic events

Sutter Health

Variation Reduction Drives Predictability

- Difficult to make significant traction due to differences in MD training, comfort, expectations, etc.

- All variation is not created equal, but care pathways are complex and it's difficult to identify causal factors

- Perception that standardization devalues the art and clinical judgment of medicine

Sutter Health

Foundation for Long-term Success

How do I most rapidly and sustainably reduce episodic variation?

Solution:

- **Identify meaningful sources of variation**

- **Deliver targeted actions**

- **Continuous monitoring**

Sutter Health

METHODS

Approach Overview

- Suite of predictive models that identify specific person-place-time processes and actors associated with variability in outcomes
- *Direct process redesign efforts for greatest impact*

Optimize SNF Utilization	**Optimize Hospital Length of Stay**	**Minimize Hospital Readmissions**
Identify predictive patient attributes (like unmarried and female) and direct preoperative planning and patient education	Predictions based on patient attributes (like comorbidity status, and age) to direct inpatient interventions and process improvements	Identify and prioritize modifiable drivers of readmission in the first 30 days post acute, and over the remaining 31 to 90 days

Sutter Health

Analytic Methods

- Analyze a set of episodes (by DRG)
- Model explicit and surrogate features
- Identify meaningful, phase-specific features and interactions within and among phases
- Focus first on explained variation and dominant person, place, and time sources
- Elastic Net Regression – extremely fast penalized regression
  - Regularization path is computed scanning between the lasso and elasticnet
  - Shrinks the model, identifying important predictors, among numerous redundant predictors
  - Better predictive power than ordinary regression
- Models trained with cross validation, performance reported on 25% reserved as a test set

Phases of an Episode
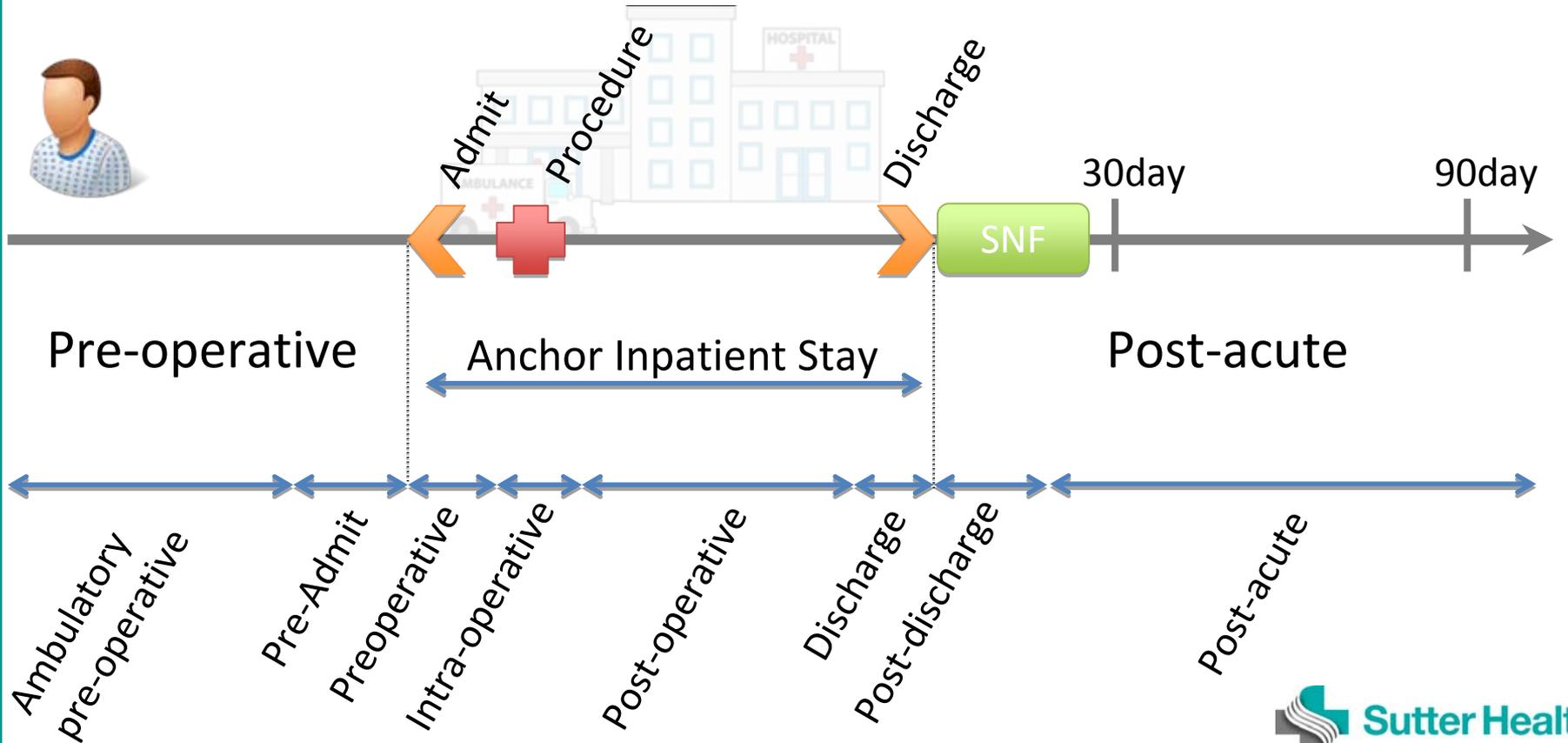
Dissecting a Patient's Episode Timeline

Pre-op

Scheduling

Education

Risk Optimization

SNF

30d

90d

Home Care

Missed Ambulatory visits

Readmission

Risk

Time

Sutter Health
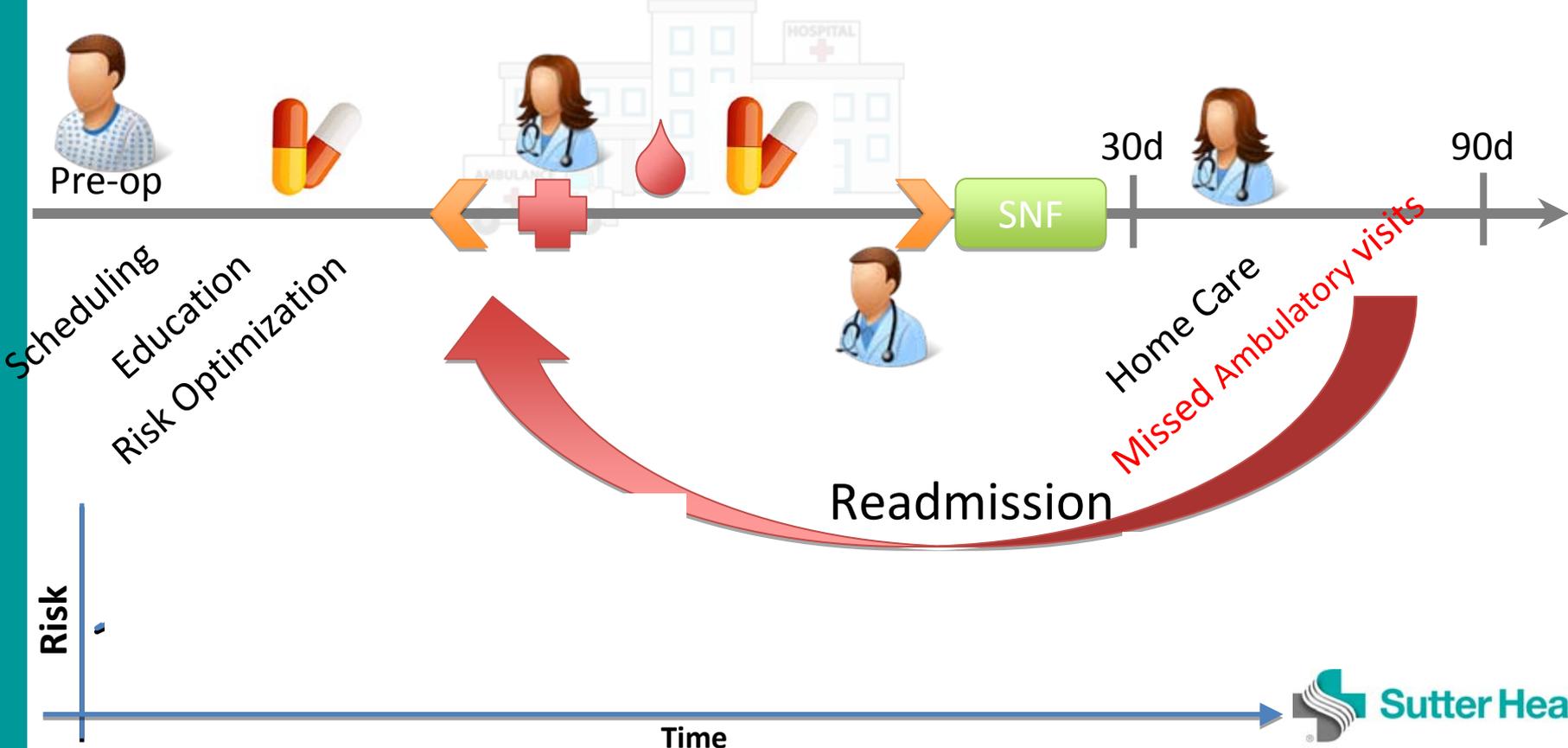
IDENTIFY SOURCES OF VARIATION

Identified 10's of Risk Factors per Hospital

Example - Optimizing SNF Utilization

🏠 Dashboard

HOSPITAL

Hospital Site A

DISEASE

lejr ▾

ANALYSIS

disp_snf ▾

ANALYSIS DATE

3 selected ▾

	Model Results	Care Redesign	**Cost Savings**

| Cost Driver ▲	Cost Driver Coefficient ⬍	Population Mean ⬍
(Intercept)	**-8.470**	1.000
Age (years)	0.061	69.394
Alcohol user	**-0.434**	0.750
BMI at least 40	0.343	0.039
Count of diagnoses not present at admit	0.010	0.475
Count of diagnoses present at admit	0.008	4.897
Count of prior ED and admissions	0.200	0.054
Female	0.010	0.569
Female & not married	**1.072**	0.245

> The odds ratio of unmarried females being discharged to SNF is 2.9

Sutter Health

Note: Sample data indicative of our findings

Example - Optimizing SNF Utilization

Dashboard

HOSPITAL

Hospital Site A

DISEASE

lejr ▾

ANALYSIS

disp_snf ▾

ANALYSIS DATE

3 selected ▾

	Model Results	Care Redesign	Cost Savings

Cost Driver ▲	Cost Driver Coefficient	Population Mean
(Intercept)	-8.470	1.000
Age (years)	0.061	69.394
Alcohol user		0.750
BMI at least 40		0.039
Count of diagnoses not present at admit		0.475
Length of stay (days)		2.681
Payer is Commercial		0.412
Payer is Medicare	0.049	0.588
phys_px_id_2556	-0.226	0.216
phys_px_id_3113	0.579	0.387
phys_px_id_3265	0.091	0.074

> Orthopedic Surgeon #3113 is associated with higher risk of SNF utilization, controlled for other factors, with odds ratio 1.8
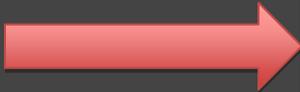
Note: Sample data indicative of our findings

TARGETED ACTIONS

Targeted Actions Mitigate Variation

Optimize SNF utilization with two actions:

1) Better support of unmarried females

- Pre-operative discharge planning
- Pre-operative home health visits
- "Pre-hab" clinic

2) Engage Physician 3113 with data and training on standardized practices

- Support his/her adoption of standardized practices

Project Financial Impact of these Two Actions

Model Results	Care Redesign	Cost Savings

Aggregate Predication Rate

Analysis ▲	Historical	Y1	Y2	Y3_5
disp_snf	0.159	0.112	0.107	0.105

Episode Cost Savings Per Case

Analysis ▲	Projected Cost	Y1	Y2	Y3_5
disp_snf	$(1,587)	$470	$512	$536

Sutter Health

19

Note: Sample data indicative of our findings

CONTINUOUS MONITORING

Continuous Monitoring

- Success requires on-going reduction of variation (in practice and utilization)

- We must know the effectiveness (e.g. ROI) of each program that we launch

- Actor performance varies over time
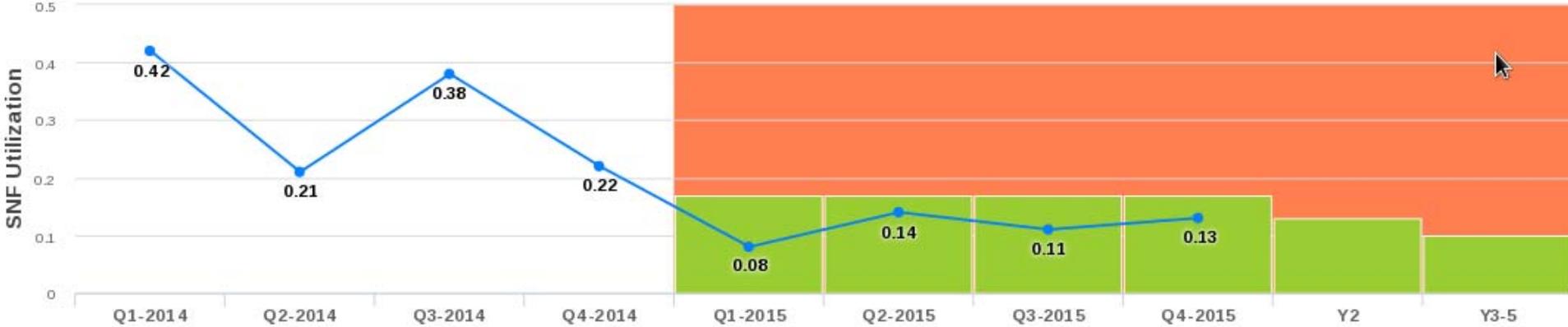
Monitoring in Practice

Disposition to SNF Disease : lejr Hospital : **Hospital A**

Note: Sample data indicative of our findings

Closing Remarks

- Bundled payment programs present opportunities, and some unique challenges that call for analytics

- Our analytic framework empowers hospital operators to
  - *Identify sources of variation*
  - *Deliver targeted actions*
  - *Continuously monitor*

- We look to target specific patients for support programs soon

- We will report results from a pilot later this year

Sutter Health