Can we innovate our way into labor savings:
A view from the operator/innovator

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What Can Be Done?

Innovation

Goals to Achieve

Hard savings

Actual FTEs that we can eliminate from the organization without compromising any functionality of the organization.

Sustainability as the true target

Soft savings

Improvements that can be made to the workforce or the functions but may come in addition or instead of actual changes in FTE.

Language of cost savings

- Changing Ratios
- LOS savings

- Value savings

Opportunity

- Over 800 people at HMH answer phones
- At a rate of $25 per hour (including benefits), we are talking about a workforce that costs over $41 million

Two examples of success

- Vaccine Hotline
- Main Operator Line

50% savings could have hard savings of $20 million

Impact of Syllable on HMH Workforce

Before Syllable
~70k-80k monthly calls

With Syllable (today)
~70k-80k monthly calls

Since implementation, Syllable automations have alleviated significant burden away from HMH operators

100%
Handled by operators

~17%
Handled by operators

~45%
Syllable transfers to department or doctor

~10%
Syllable filters (e.g., spam, robocalls)

~28%
No transfer request (e.g. silent hang up)

Currently at a 55–60% automation rate, which continues to grow with learned product enhancements

Illustrative; pre-Syllable

March, 2022

Why Would We Want to Implement Syllable?

Business Group	Service Level	ASA mm:ss	% Abandoned	% RONA	Calls Offered	% Overflow	Calls Outbound	Avg Agent FTE per Day	Avg Total Calls per Agent Hour	Avg Handle Time mm:ss	Calls Handled	Calls Abandoned	Calls Overflow	Agent RONA Events
⊟ HMH	52.84%	01:29	13.41%	9.31%										
	32.24%	03:24	21.16%	10.89%										
	54.46%	00:28	17.72%	11.83%										
	92.07%	00:13	3.65%	0.63%										
	91.26%	00:09	2.83%	0.26%										
	56.43%	01:37	9.21%	4.22%										
	0.00%		0.00%											
	43.48%	01:55	19.89%	12.14%										
	71.31%	00:44	11.35%	7.29%										
	0.00%		0.00%											
	68.33%	00:31	19.45%	26.26%										
	0.00%		0.00%	19.83%										
	61.54%	00:17	13.19%	17.58%										
	85.92%	00:13	8.07%	4.00%										
	83.50%	00:17	4.34%	0.81%										
	68.01%	00:56	9.67%	14.76%										
	34.56%	01:39	18.33%	2.90%										
	57.89%	00:36	9.46%	32.52%										
Total	**52.84%**	**01:29**	**13.41%**	**9.31%**	96521	7.67%	41786	105.86	6.05	03:02	74649	12948	7399	8982

November 2022 stats

- Average agents: ~ 106 FTE per day
- Average speed of answer : 1.5 mins
- Only ~53% of calls answered within 30 seconds
- Abandonment rate: ~ 13.4%
- Average call time: 3 mins

Would you rather have a bot answer your call or wait for someone to pick up the phone?

Does It Work? Yes, It Does!!!

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HMH received

1,125,455

calls

821,750
public line

303,705
internal line

56.3%

automation rate

60.2%

automation rate

What Does Work Best?

OPERATIONAL & TECHNICAL COMPLEXITY

COMPLEX

SIMPLE

Action Based

Cancel my appointment

Informational

What's the gift shop hours?
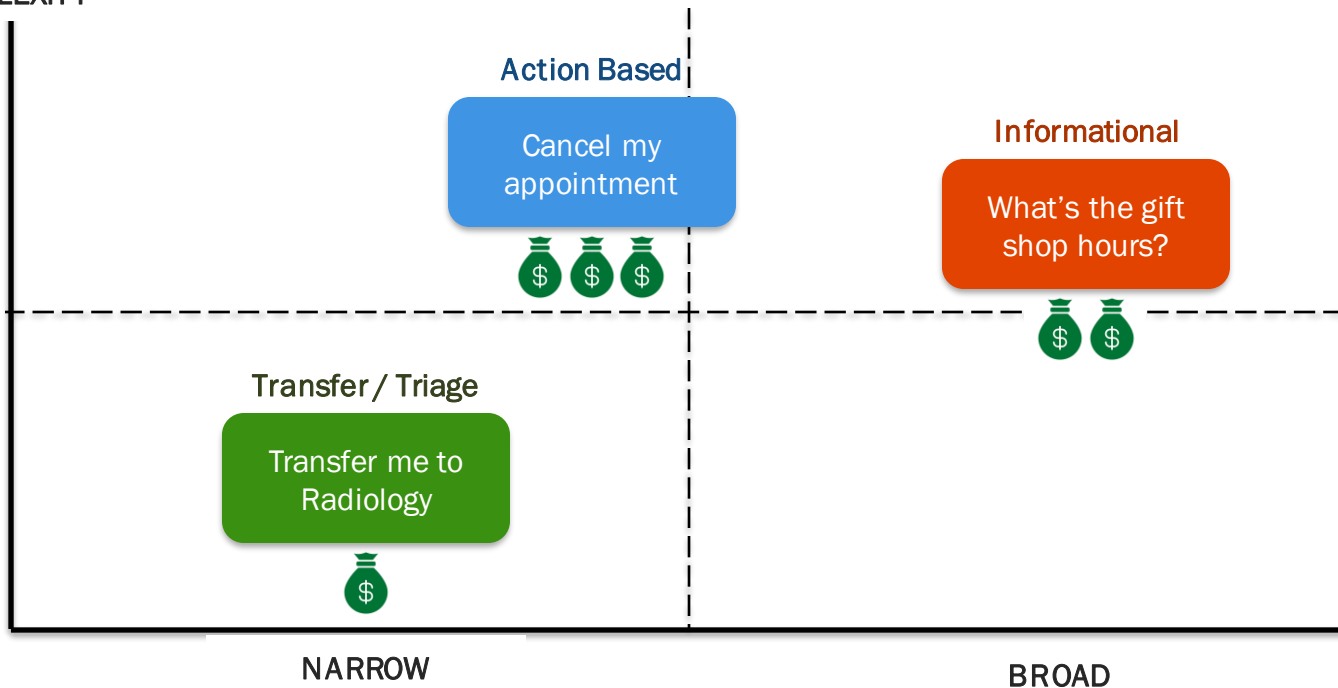
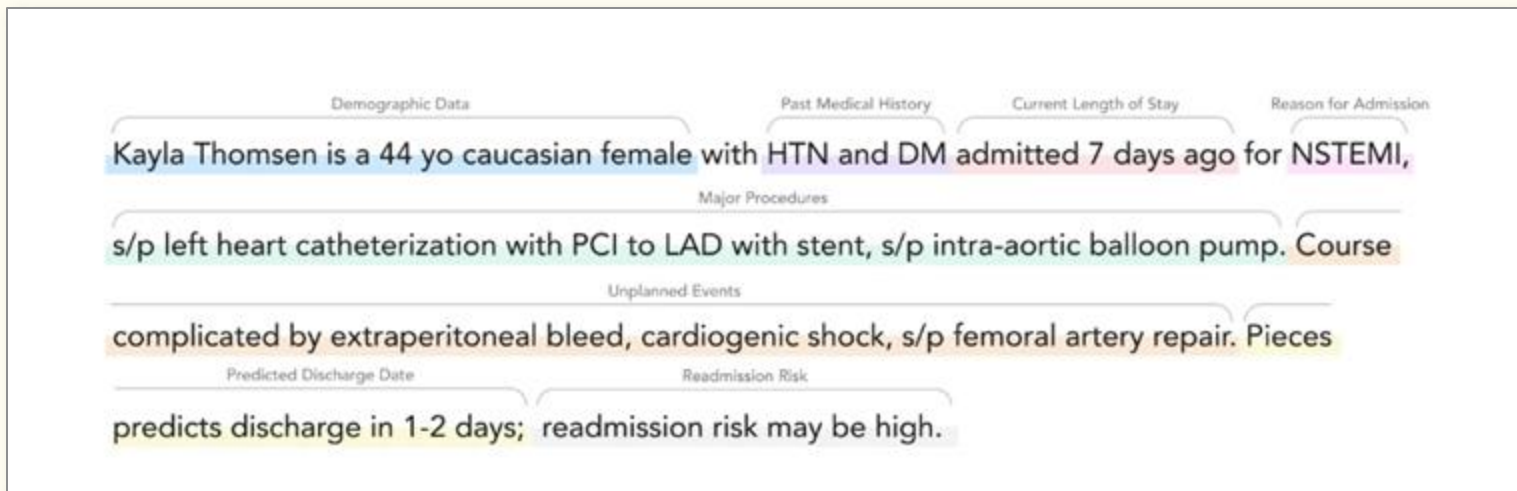**Transfer / Triage**

Transfer me to Radiology

NARROW

BROAD

CALLER INTENTS

Predictive Analytics

Patient Summary / Overview

Pieces Predict - Pieces Summary

The pieces summary takes structured and unstructured data from the patient chart and consolidates pages of information into one actionable sentence. Allowing physicians and care providers to quickly get up to speed on a patient.

Demographic Data | Past Medical History | Current Length of Stay | Reason for Admission

Kayla Thomsen is a 44 yo caucasian female with HTN and DM admitted 7 days ago for NSTEMI,

Major Procedures

s/p left heart catheterization with PCI to LAD with stent, s/p intra-aortic balloon pump. Course

Unplanned Events

complicated by extraperitoneal bleed, cardiogenic shock, s/p femoral artery repair. Pieces

Predicted Discharge Date | Readmission Risk

predicts discharge in 1-2 days; readmission risk may be high.

Pieces Predict Reads Notes in Epic

How We Are Different: Pieces surfaces social determinants directly from doctor's and nurse's notes for SDOH longitudinal care and interventions.

Pilot Overview

Active Pilot Site(s)

Enabled but not actively piloting

Not enabled for patient information

HMSL

HMWB

HMH

HMTW

HMW

HMCL

HMB

HMCCH

reLOS AI Patient List

Overview of Pieces Platforms

Pieces **Predict™**	Pieces **Connect™**

What the Platform does

Uses AI to predict outcomes so health care providers can intervene timely and efficiently	Connects with and manages patients who need community service

Advanced Technology Used

Impression Interface: Artificial Intelligence
ReLOS: Natural Language Processing

Targeted (System) Houston Methodist Goals

1. Reduce Length of Stay (LOS) for patients with
    identified discharge barriers
2. Better, and timely, capture of patient condition decline while in-house
3. Reduce Unplanned Readmissions (*future*)

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What is it?

- Access to 22 years of Medicare FFS and 4 years of Medicare Advantage data
- Leverages health data from 100 million Medicare beneficiaries
- Compares Houston Methodist to other Academic Medical Centers and like institutions
- Allows us to look beyond the walls of the hospital

- Extensive predictive analytics capabilities to facilitate actionability
- Provides illuminating data on inpatient and post-discharge mortalities
- Enhances our focus on post-discharge care

Leveraging Power of Data and Analytics with Physicians

HEALTH DATA ANALYTICS INSTITUTE

Cardiology/Cardiovascular Surgery

Improve performance on 30-day post-admission mortality

Orthopedics

Shared decision-making conversations with patients at high risk of mortality about appropriateness of elective procedure vs. other options

Pre-Op Optimization

Data-driven care planning assistance for multispecialty pre-op teams to identify and act upon potential ICU/hospital-related adverse events

HMCC ACO

Improve the efficiency of the discharge planning process for inpatient and outpatient care managers
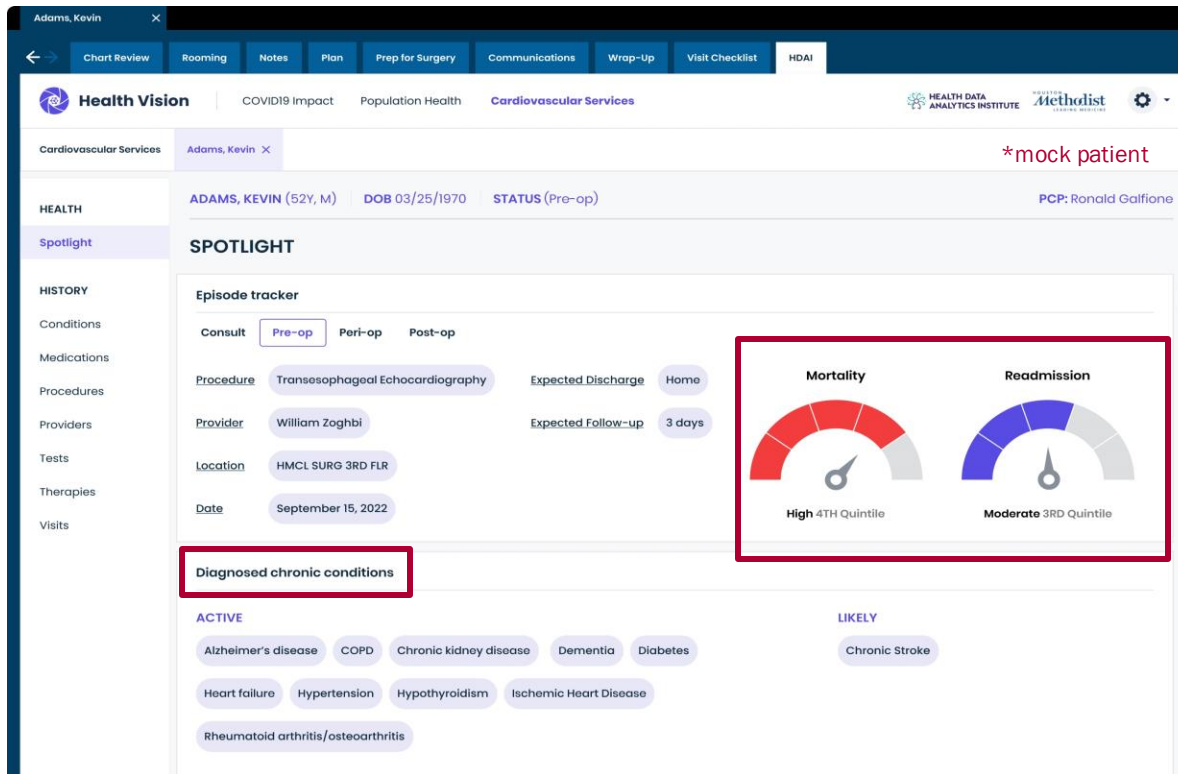
In-hospital and Post-discharge Mortality Ranking, 2019 – Q1 2021

Mortality	Circulatory Systems Service Line (MDC 5) (N =8,868)				
	Actual	Expected	Actual to Expected	Avg AE of Top 5 AMCs	Rank among AMCs
30 days post admission	5.0%	6.5%	0.76	0.64	16
In hospital	2.1%	3.0%	0.70	0.62	7
7 days post discharge	1.4%	1.8%	0.75	0.48	40
14 days post discharge	2.3%	2.8%	0.80	0.55	44
21 days post discharge	3.0%	3.8%	0.80	0.59	41
30 days post discharge	3.9%	4.8%	0.82	0.62	43

Note: Rank is among 102 AMCs, except for 7 days post discharge which is among 101 AMCs.

Mortality 30 days Post-Cardiovascular Admissions, 2019 – Q3 2021

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Proc CCS or DRG code		Admits	# Deaths	% of deaths	Actual	Twin	Actual to Expected	Avg AE of Top 5 AMCs*	Target Mortality Reduction	Target Mortality Reduction Per Year
	Procedural Admissions									
S_45	PTCA with or without stent placement	477	24	4.9%	5.0%	4.1%	1.22	0.35	17.2	6.2
S_48	Insertion; revision; replacement; removal of cardiac pacemaker or cardioverter/defibrillator	394	15	3.1%	3.8%	3.3%	1.17	0.39	9.9	3.6
G_216-221	Open Valves**	383	17	3.5%	4.4%	4.1%	1.08	0.39	10.9	4.0
	Medical Admissions									
G_282	Acute myocardial infarction, discharged alive	784	74	15.3%	9.4%	11.1%	0.85	0.40	39.2	14.3
G_293	Heart failure and shock	1,662	93	19.2%	5.6%	9.0%	0.62	0.55	10.7	3.9

Working Groups to address these 5 Clinical Scenarios

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Post-discharge Analysis by Location for all Cardiovascular Admissions

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	Years 2019- Q3 2021								
	N	# Deaths	Actual	Twin	Avg Twin of Top 5	Actual to Expected (AE)	Avg AE for Top 5	Target Mortality Reduction	Target Mortality Reduction Per Year
In hospital mortality	10,144	203	2.0%	3.0%	2.9%	0.68	0.65	5.2	1.9
1-21 days post discharge mortality									
Home	8470	101	1.2%	2.8%	2.7%	0.43	0.34	21.0	7.6
SNF	689	41	6.0%	6.4%	6.3%	0.93	0.56	16.6	6.1
Hospice	197	121	61.9%	15.6%	17.5%	3.98	2.90	-	-
Inpatient Rehab, Long Term Care, ICF	455	20	4.4%	5.6%	5.3%	0.78	0.38	10.3	3.8
Other Hospital	46	-	-	-	7.3%	0.69	0.88	-	-
Other	84	-	-	-	3.8%	0.27	0.16	-	-

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Note: Rank is among AMC hospitals. Includes transfers and patients leaving against medical advice.

SNF Analysis Summary in 2019-2021 Compared to AMCs

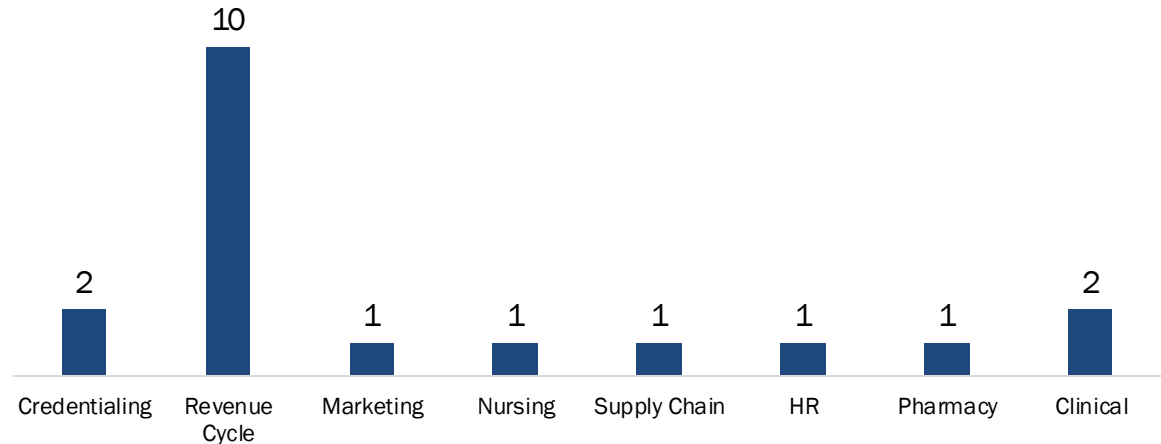|		Mortality 30 days after SNF admission				
HMH	# SNFs	SNF Admissions	# Deaths	Actual	Expected	Actual to Expected
All admissions	101	513	47	9.2%	11.3%	0.81
>= 11 admissions	12	307	20	6.5%	11.3%	0.57
< 11 admissions	89	206	27	13.1%	11.2%	1.17

Robotic Process Automation

Intelligent Automation has delivered 5 net new use cases with a potential to deliver two more before year end 2021. Our marketing efforts have helped increase our pipeline.

Development

- 5 Net new Process in Production
- 2 Additional Use Cases likely to be completed by YE21
- 16 Migrations for Enhancements to Existing Processes
- Expanded Surveillance Process to all Facilities
- Built out processes to support HM's vaccination efforts
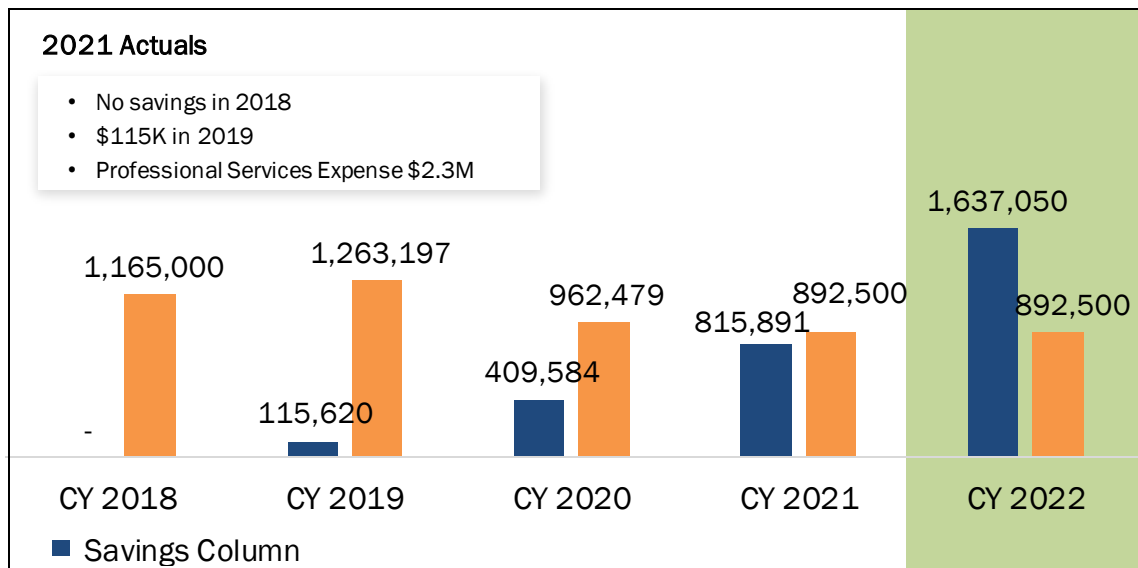
Target Outreach Efforts

Use Case Distribution

Credentialing	Revenue Cycle	Marketing	Nursing	Supply Chain	HR	Pharmacy	Clinical
2	10	1	1	1	1	1	2

Robotic Process Automation

BLUF: Trend shows savings continue to increase while expenses decline each year. $1.3M in Savings inception to 2021 and $4.2M in expenses.

Saving vs. Expense

2021 Actuals

- No savings in 2018
- $115K in 2019
- Professional Services Expense $2.3M

-	115,620	409,584	815,891	1,637,050
1,165,000	1,263,197	962,479	892,500	892,500
CY 2018	CY 2019	CY 2020	CY 2021	CY 2022

■ Savings Column

Savings vs. Expense Outlook
2021 Actuals – All in Cost
• $1.3M in savings Inception to 2021
• $4.2M in expenses Inception to 2021
• $2.3 in expenses were from Professional Fees
2022 Forecast – All in Cost
• Cumulative Savings: $3M
• Cumulative Expense: $5.2M
• Inception to 2022 – All cost: Net ($2.2M)
Net Savings
• $744K Net Savings forecast for 2022
• ($76K) Net Savings 2021 to Date

HMPO	
Achieve 50% online scheduling	
2,052,000	Total appointments scheduled manually in PO each year
1,026,000	50% reduction in appointments scheduled manually
5,130,000	Total manual work effort reduction (minutes)
41.11	Total projected work effort in FTEs
$ 2,466,346	Total annual labor cost avoidance

*Assumes 5 min AHT for Scheduling

In HMPO today, we make 13% of appointments on-line and do 45% of the appointments with e-check-in.

HMPO	
Increase echeck-in from 45% to 70%	
1,800,000	Total appointments in PO each year
450,000	Number of appointments impacted if 25% echeck-in rate realized
1,350,000	Total manual work effort reduction (minutes)
10.82	Total projected work effort in FTEs
$649,200	Total annual labor cost avoidance

*Assumes 3 average check

If we moved to 50-60% of appointments made on-line and 70% of appointments through e-check-in, we would need 40-50% less operators and less front desk people.

Cost Savings Estimate Based on Standardization: $3M+

Patient Appointment Reminder

Success
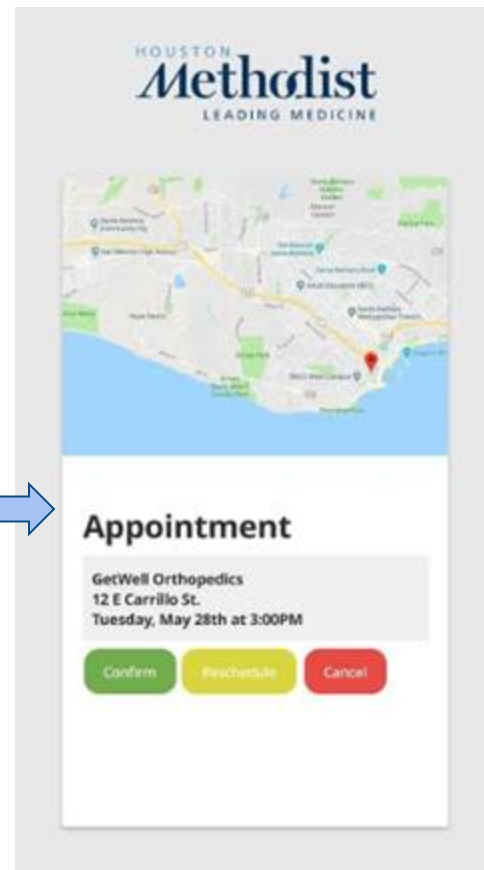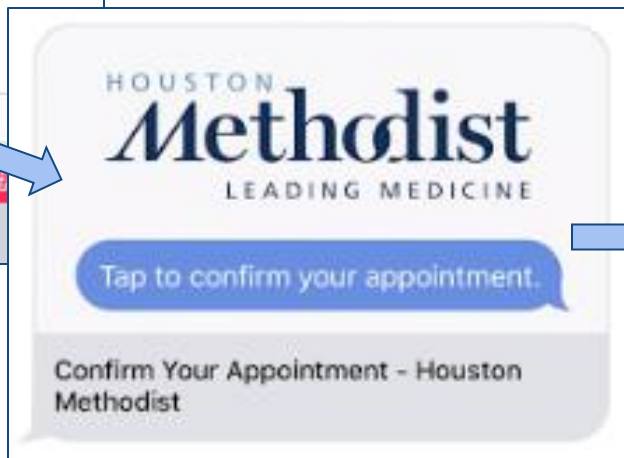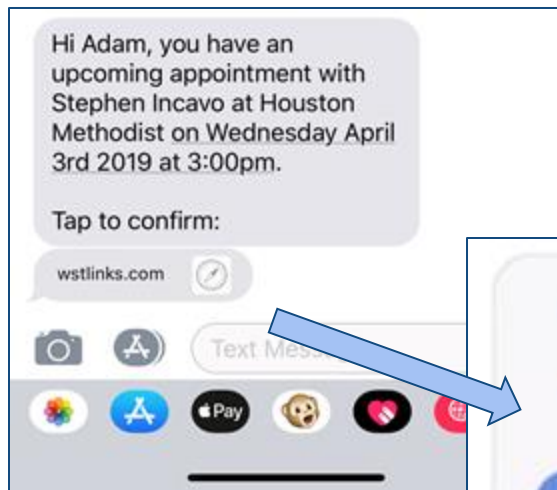
- We have seen the PO no show rates gradually decreasing year over year with the rate for our primary care appointments decreasing by 39% and specialty care appointments decreasing by 19% from 2018 to 2022

- The higher utilization rates led to a $1.4M revenue income in the first year alone:

	No Show Reduction Rate	Projected Monthly No Show Count Reduction	Annualized No Show Count Reduction	Average Clinic Reimbursement	Total Projected Net Practice Income
Primary Care	-18%	317	3,803	$130	$494,325
Specialty Care	-12%	474	5,688	$160	$910,021
Total		791	9,490		**$1,404,346**

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Orders-driven texting for PT/OT has resulted in:

No Shows
Reduced

⬇ 25%

Referral
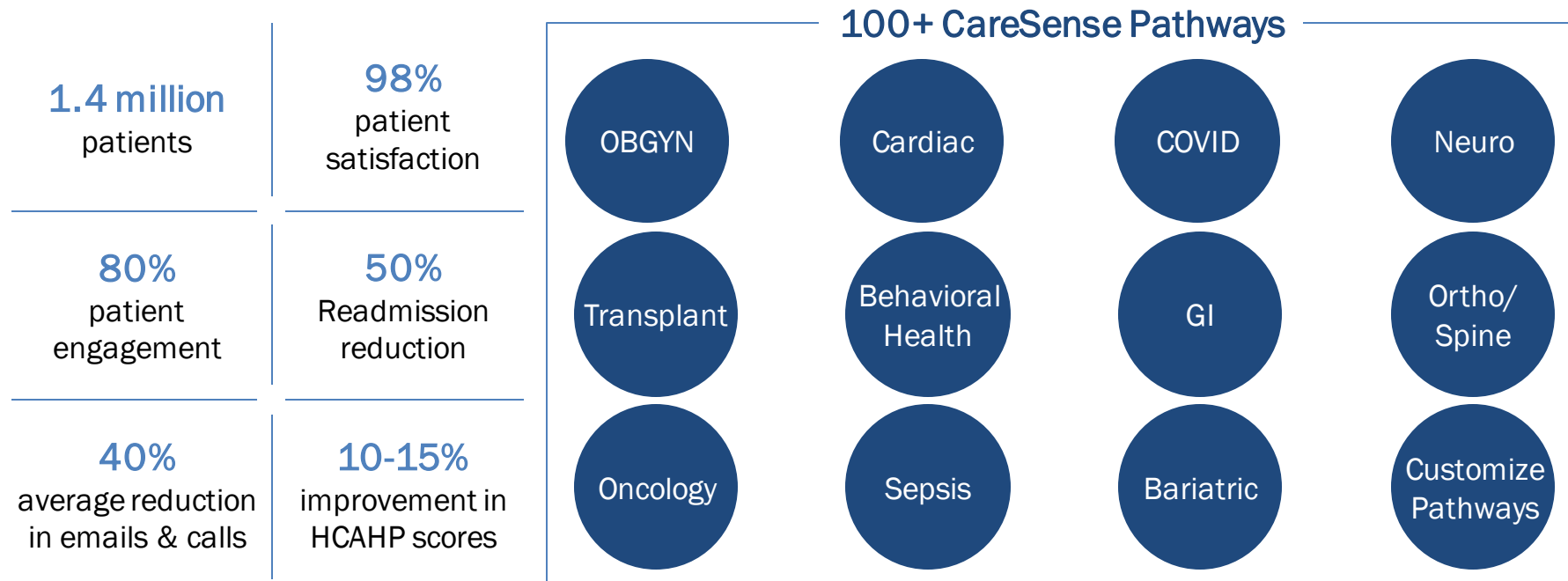Conversion
Increased

⬆ 7.3%

*over $1M annualized revenue increase

What is NLP?

Natural language is a *fancy term for how people speak*. NLP for short, is a technique used to allow computers to comprehend and appropriately respond to natural human language.

IVR vs. NLP

- IVR (Press 1, Press 2, etc.) – suitable for use cases where user is limited to four to five options.

- NLP transfer / triage doesn't limit the intent to the phone keypad, could transfer hundreds of unique departments, phone numbers.

Care Pathways

100+ CareSense Pathways

1.4 million patients

98% patient satisfaction

80% patient engagement

50% Readmission reduction

40% average reduction in emails & calls

10-15% improvement in HCAHP scores

OBGYN

Cardiac

COVID

Neuro

Transplant

Behavioral Health

GI

Ortho/ Spine

Oncology

Sepsis

Bariatric

Customize Pathways

Cost Savings Estimate Based on Standardization: $4.1M Per Service Line

Bariatrics (Obesity) Pathway

# of Patients on Pathways	CareSense Length of Stay	Non-CareSense Length of Stay
816	1.38	1.53

	# of Patients	30-Day In-Patient Readmissions	30-Day Emergency Readmissions	30-Day Observations Readmissions
CareSense	n=816	3.06% n=25	5.51% n=45	2.57% n=21
Non-CareSense	n=386	3.87% n=15	6.19% n=24	1.29% n=5

Spine Pathway

# of Patients on Pathways	CareSense Length of Stay	Non-CareSense Length of Stay
102	2.29	3.69

	# of Patients	30-Day In-Patient Readmissions	30-Day Emergency Readmissions	30-Day Observations Readmissions
CareSense	n=102	3.92% n=4	1.96% n=2	1.96% n=2
Non-CareSense	n=506	4.65% n=26	3.58% n=20	0.89% n=5

CABG/Surgical Valve Pathway – <mark>Automated August 22, 2022</mark>

# of Patients on Pathways	CareSense Length of Stay	Non-CareSense Length of Stay
338	6.66	7.59

	# of Patients	30-Day In-Patient Readmissions	30-Day Emergency Readmissions	30-Day Observations Readmissions
CareSense	n=338	8.58% n=29	5.03% n=17	2.07% n=7
Non-CareSense	n=198	10.10% n=20	4.55% n=9	2.53% n=5

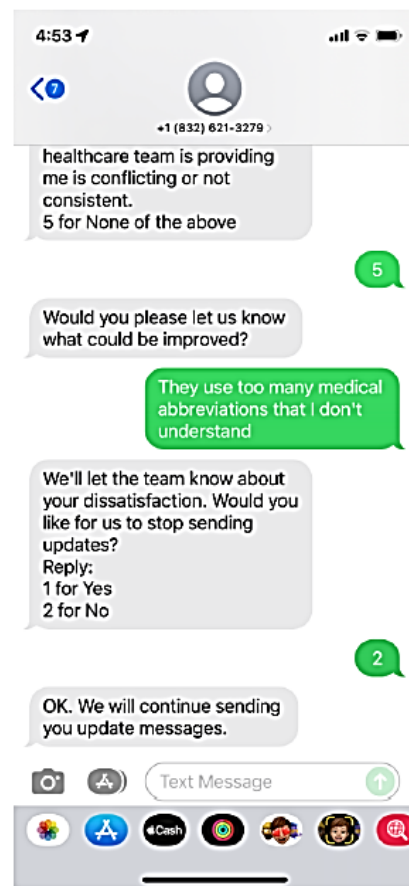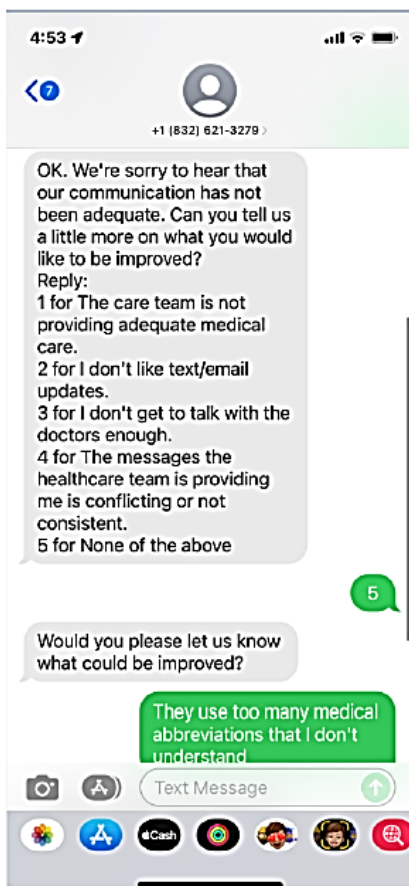## CHF Pathway – <mark>Automated March 28, 2022</mark>
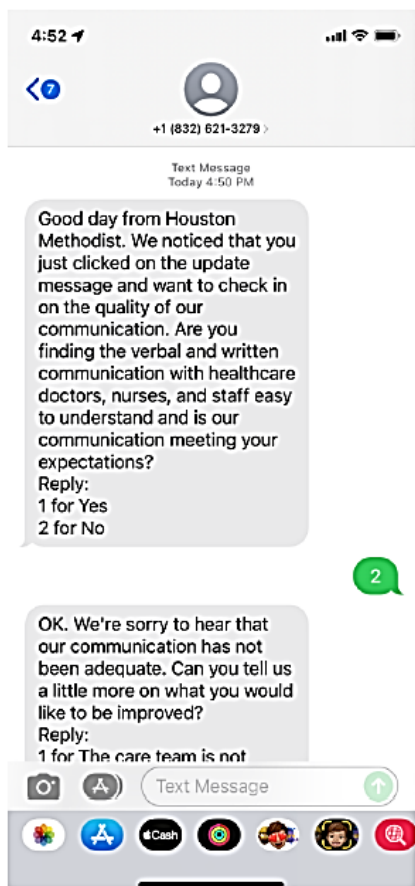
# of Patients on Pathways
1,362

	# of Patients	30-Day In-Patient Readmissions	30-Day Emergency Readmissions	30-Day Observations Readmissions
CareSense	n=1,362	9.12% n=131	6.12% n=88	3.90% n=56
Non-CareSense	n=4,593	14.06% n=827	7.41% n=436	6.24% n=367

Family & Care Partner Updates

80% opt-in rate

ED/ECC

In-Patient Stay

BPA fired; update written

Update sent within 1-hour

Update Sent

Family Indicates Dissatisfaction

Feedback sent to units

Real-Time Service Recovery

Route Alert to Team

Follow-Up

1-Day post-discharge call
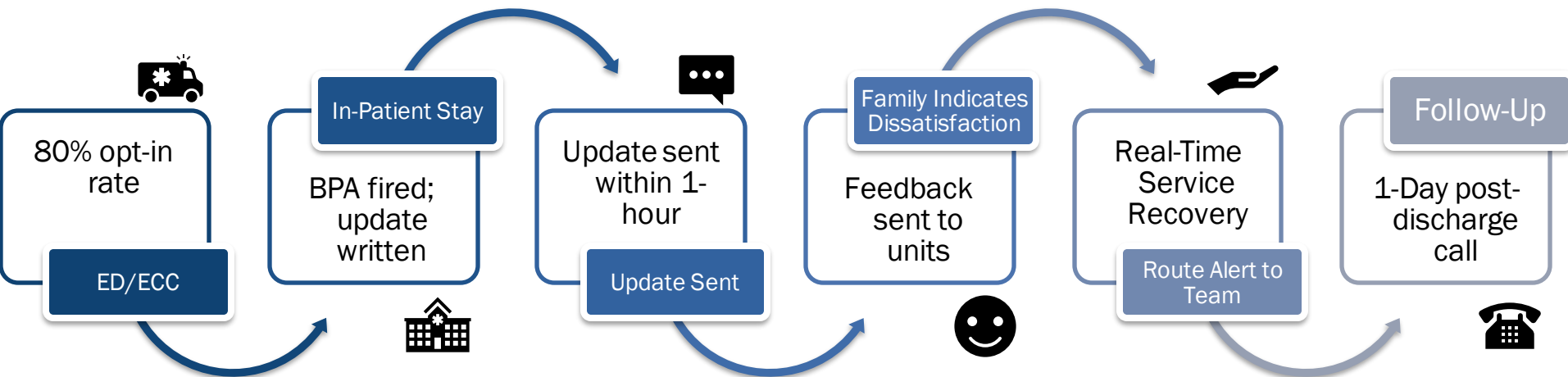
Follow-Up Satisfaction Survey

HCAHPS Survey Data

Dimension	Encounters **With** Free Text Used And HCAHPS Survey Returned	Score	Encounters **Without** Free Text Used And HCAHPS Survey Returned	Score	*P-Value*
Overall Rating of Hospital		84.8%		76.3%	*0.038*
Communication with Nurses		82.8%		75.9%	*0.004*
Communication About Meds		65.1%		59.7%	*0.186*
Discharge Information		90.8%		81.8%	*0.004*
Care Transitions	112	53.4%	173	49.6%	*0.022*
Communication with Doctors		76.6%		72.1%	*0.306*
Cleanliness / Quietness		69.5%		64.9%	*0.041*
Would Recommend Hospital		85.7%		81.7%	*0.149*

Real Time Location Services (RTLS)
Track it, Measure it, Analyze it

Asset management
Through tracking, identify underutilization of assets to optimize inventory/ capital spend in all departments

Admitted patient tracking
Keep patients from eloping or being left in a hallway unattended (epic)

Track transport times
Improve operating room workflow by tracking transport and wait times (epic)

Monitor call response time
Optimize staffing levels by improving productivity and patient flow (epic)

Digital wayfinding
Improve patient satisfaction and decrease visit no shows by enabling turn by turn navigation (connexient)

Hand hygiene compliance
Improve handwashing compliance and reduce HAC

Environmental monitoring
Utilize environmental monitoring built into every tag to meet DNV & joint commission standards

Staff duress
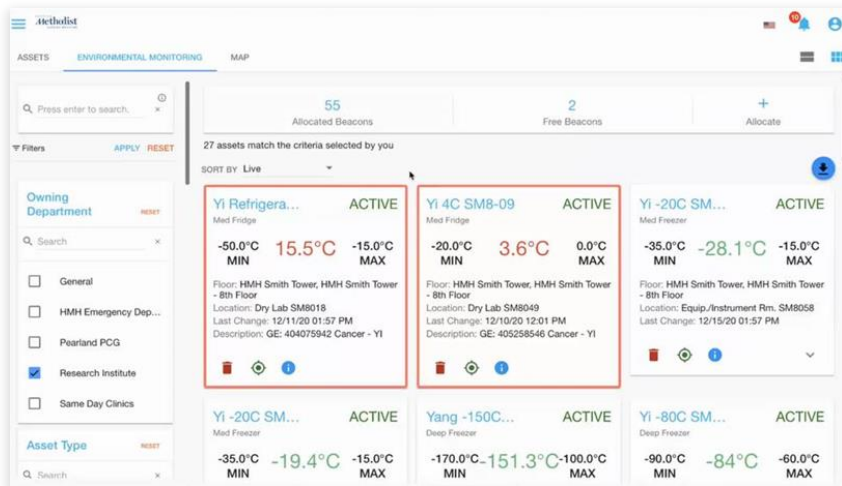Allow staff to trigger alarms if they are caught in an unsafe situation (workplace violence)

Gateway
Wall mounted, listener device

Beacons
Tracking device, multiple styles; this is what is 'tracked'.

Annual Cost Savings : $11.9M

Temperature Monitoring

Asset Tracking

Virtual Nurse: Setting a Baseline
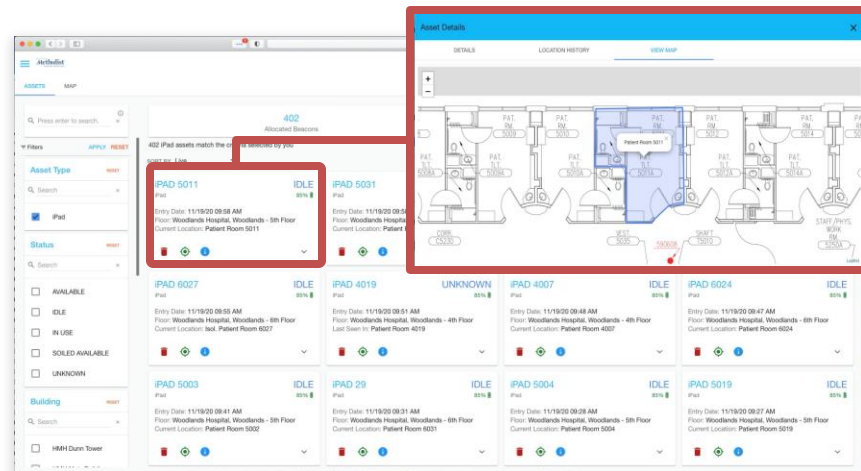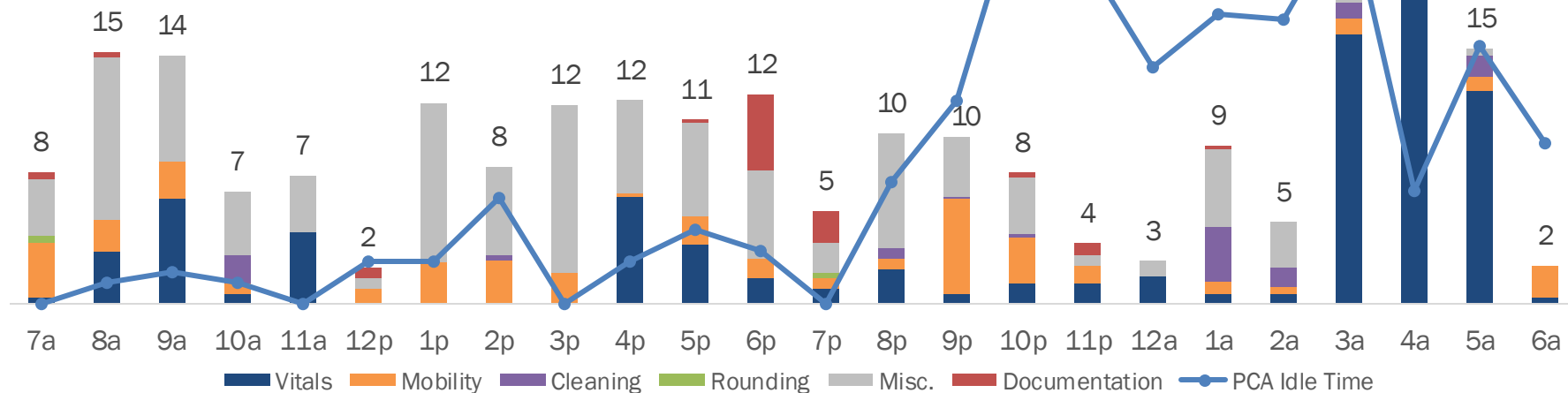

HMH Time Study

Approx. 10 min/hr performing non-nursing tasks
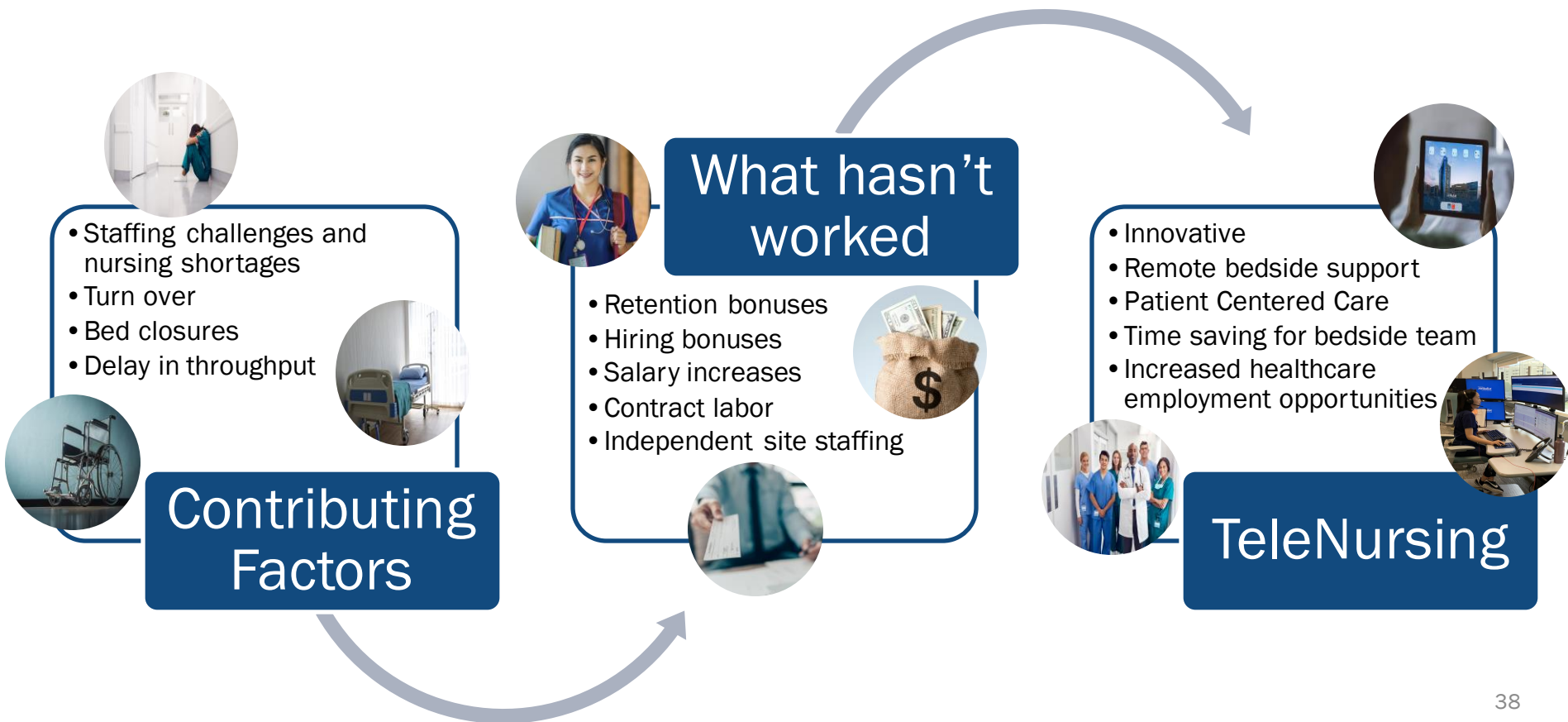Highest non-nursing activity occurs between 8-10am, 1-6pm, 8-10pm and 3-6am

Legend: Vitals, Mobility, Cleaning, Rounding, Misc., Documentation, PCA Idle Time

PCA Idle Time does NOT include breaks

Virtual Nursing

Ratio Calculator

Floor	Ratio	Number of Beds	Worked HPPD	Paid HPPD	Worked RN FTEs	Paid RN FTEs
Med Surg	4.0	623	6.0	6.8	654.3	743.5
Med Surg	4.5	623	5.3	6.1	581.6	660.9
Med Surg	5.0	623	4.8	5.5	523.4	594.8

Financial Analysis

AHR for RN II*	$45.63
Location Differential (2.5%)	$1.14
Total AHR	$46.77
Annual $ @ 1.0 FTE	$97,283
1:5 at Night Only (82.6 FTEs)	$8,035,589
Add benefits cost (+20%)	$9,642,707
1:5 Day/Night (148.7 FTEs)	$14,466,006
Add benefits cost (+20%)	$17,359,207
* Based on 1,578 HMH RN II as of PP15	

Objective

Contributing Factors

- Staffing challenges and nursing shortages
- Turn over
- Bed closures
- Delay in throughput

What hasn't worked

- Retention bonuses
- Hiring bonuses
- Salary increases
- Contract labor
- Independent site staffing

TeleNursing

- Innovative
- Remote bedside support
- Patient Centered Care
- Time saving for bedside team
- Increased healthcare employment opportunities

Success

> 12,399 Admissions and Discharges completed

Remotely Supported >5K Bedside Nursing Hours

Average call time: 13:28 minutes

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256 · 629 · 910 · 1874 · 2739 · 2615 · 3376

| June | July | August | September | October | November | December |

■ Admissions   ■ Discharges   ——■—— Totals
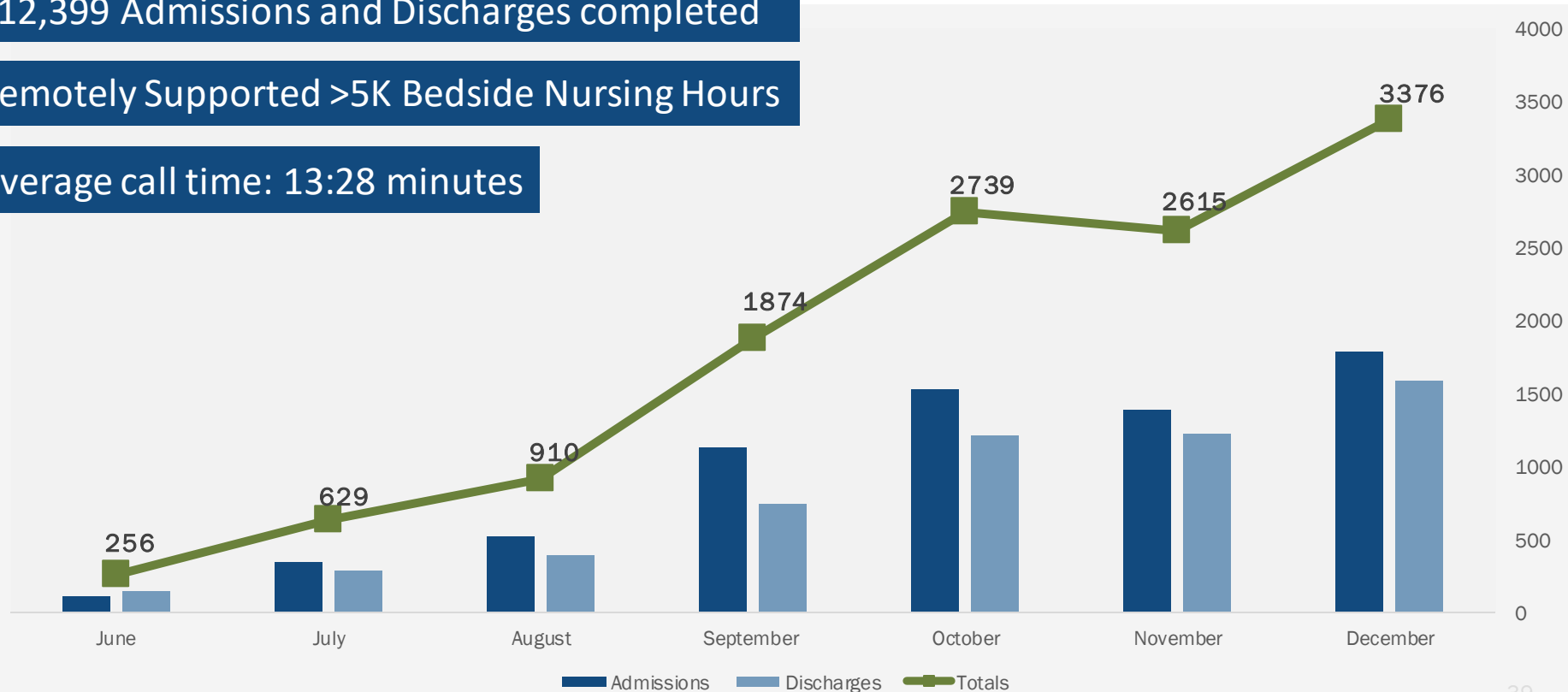
Success

⬆ **Better**
↔ **Flat/Neutral**
⬇ **worse**

* **Directly tied to use case**

	Metric	Outcome
Patient Experience	HCAHPS Scores - Overall Rating of Hospital*	⬆
	HCAHPS Score – Discharge*	⬆⬆
Throughput/LOS	Discharge before 2PM*	↔
	Average LOS*	⬆
	Discharge Order to Actual Discharge Time (Hours)*	⬆
Other Clinical	Malnutrition Screening*	⬆⬆
	Completion of EPIC admission profile*	⬆⬆
	CAUTIs/CLABSIs	↔
	Falls (w/injury)	⬇
Staffing	Overtime	⬇
	Turnover	↔
	Nursing Ratios*	⬆

Virtual Nursing Video
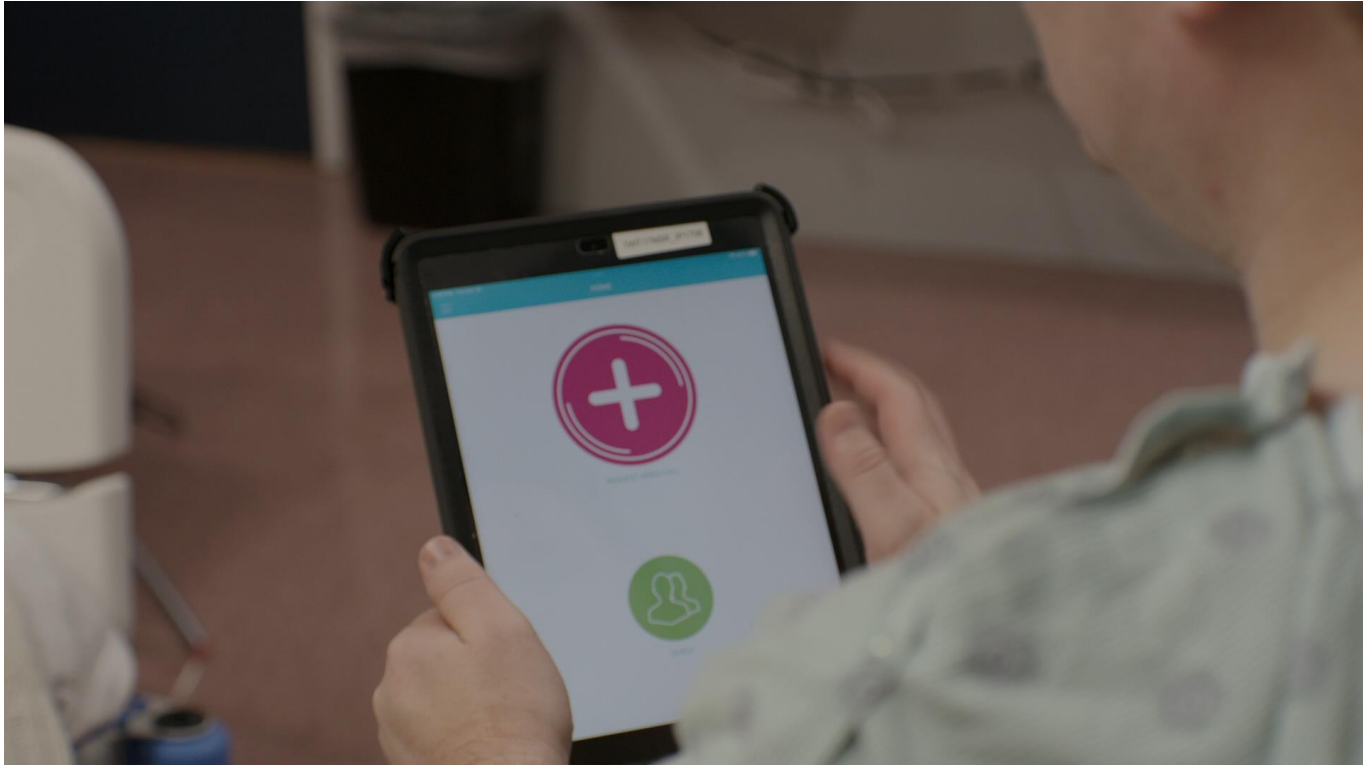
Remote Monitoring & Biosensors

Remote Monitoring & Biosensors

- 12-hour vitals on the hard side
- If staff complete vitals every four hours and documentation, it is roughly 12 hours per shift or one PCA per floor
- Either give this time back to help nurses with things like blood draws or cut out 15 per shift

Cost Savings Estimate Based on Standardization: $3.4M

From Google:

"Technology that enables devices to interact with and respond appropriately to the humans in that environment."

- Not a camera – instead, smart sensor
- No continuous recording – instead, logs only defined "events"
- No human or monitoring on the other end of the device. Sensor works on its own
- Identifies presence or absence of an event and notifies in real-time or after-the-fact

Care.ai M2 – Care Redesign Technology

Example: HMH Walter Tower 17

M2

R2

BioHub

R2

Alternate Option

Impactful Outcomes
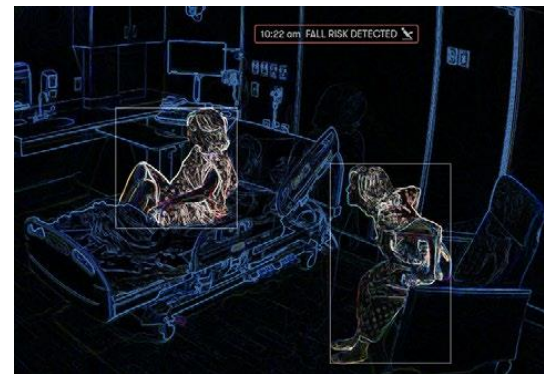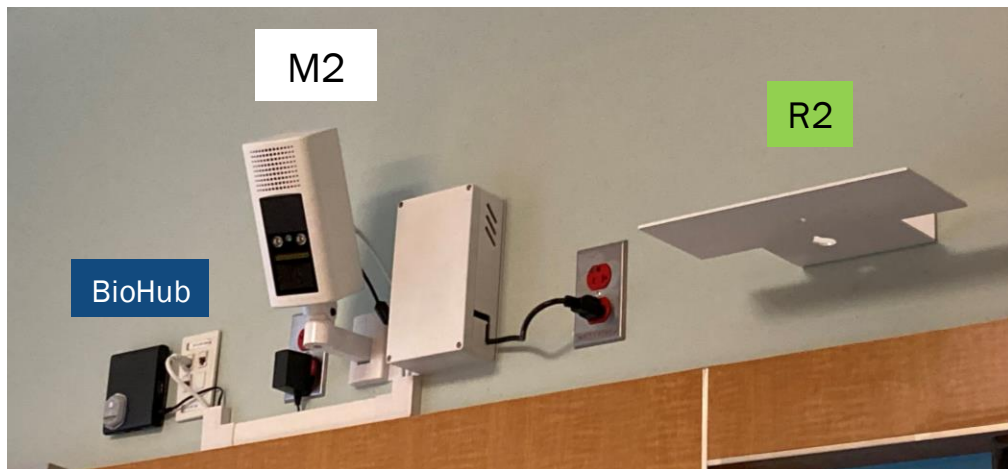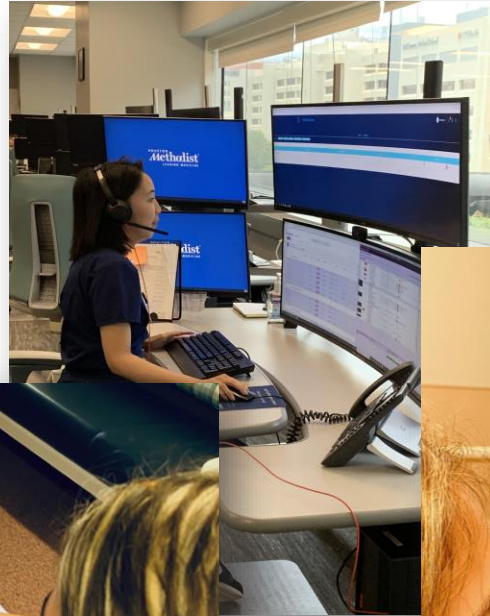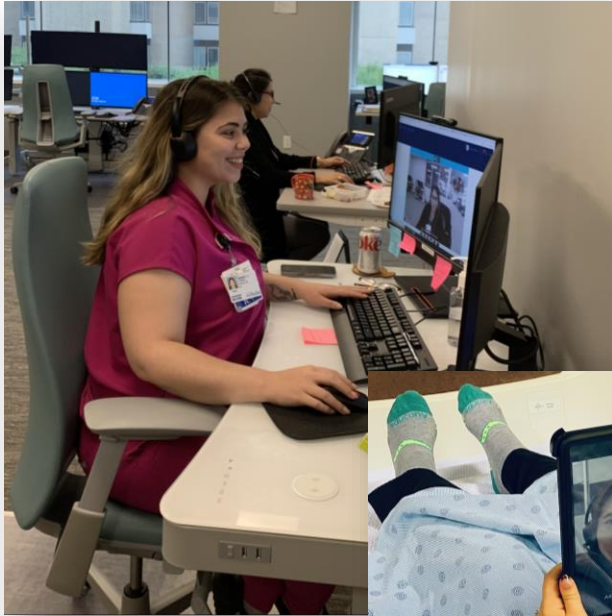
Data
- Performance
  - *HCAHPS, LOS, CAUTI, CLABSI*
- Utilization/Compliance
  - *Inpatient Texting*
- Satisfaction
  - *Call Light Response*
- Staffing
  - *Staff Retention*

Staff
- Better targeted education
- Improving work efficiencies
- More time to focus on patients
- Reducing time and resources dedicated to manual processes
- Reduce documentation burden
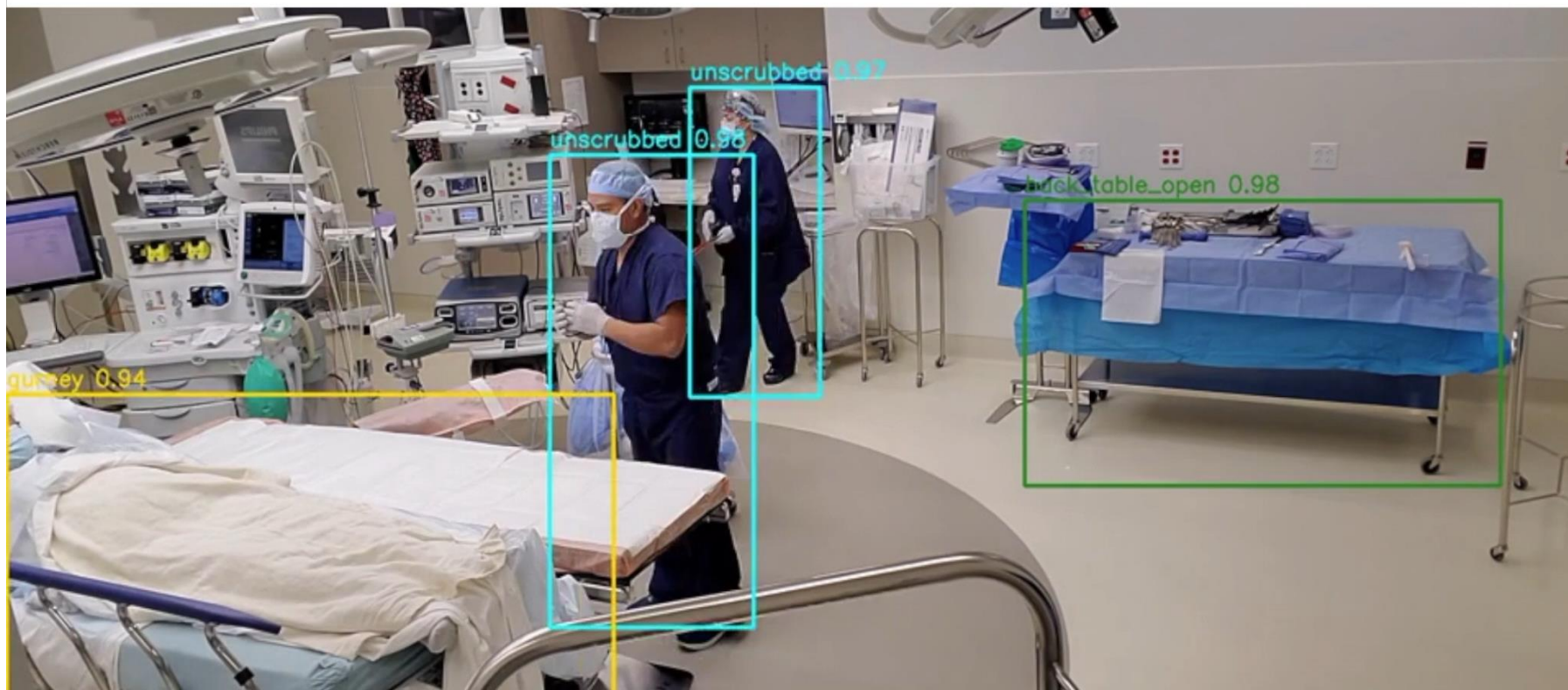- Less anecdotes, better reporting
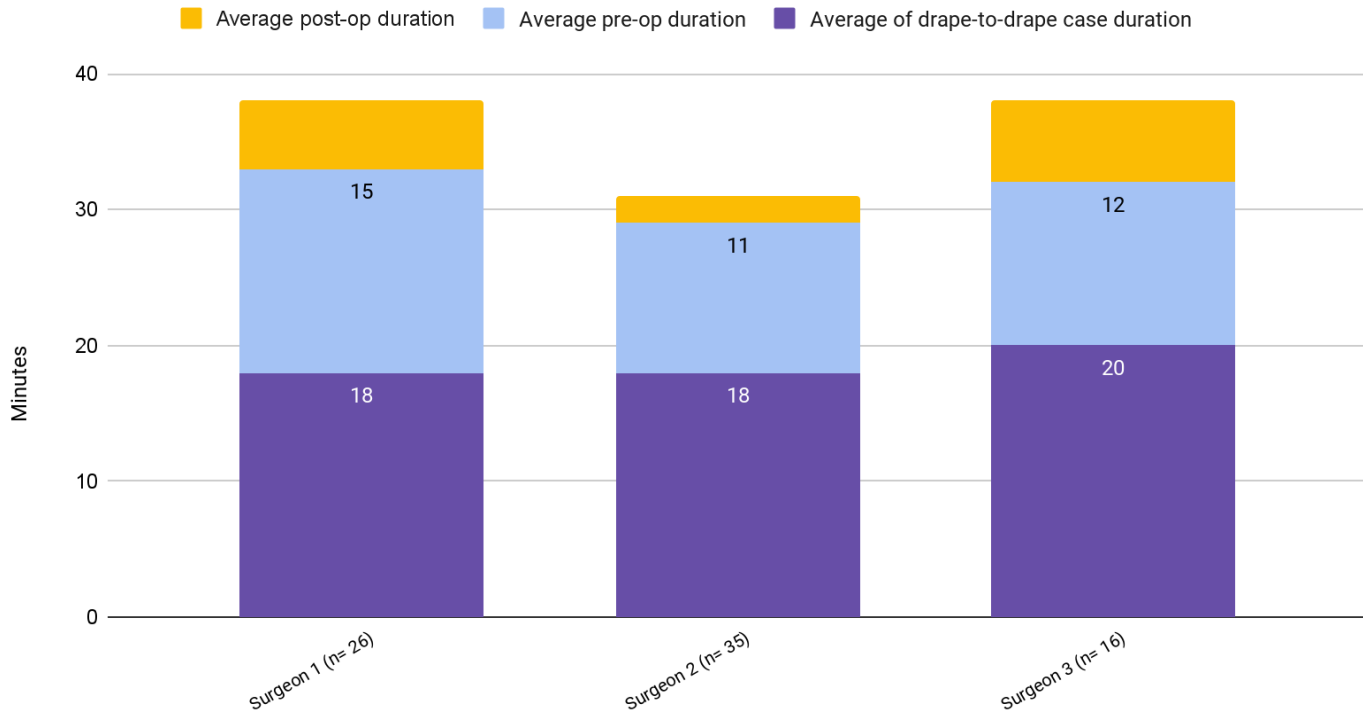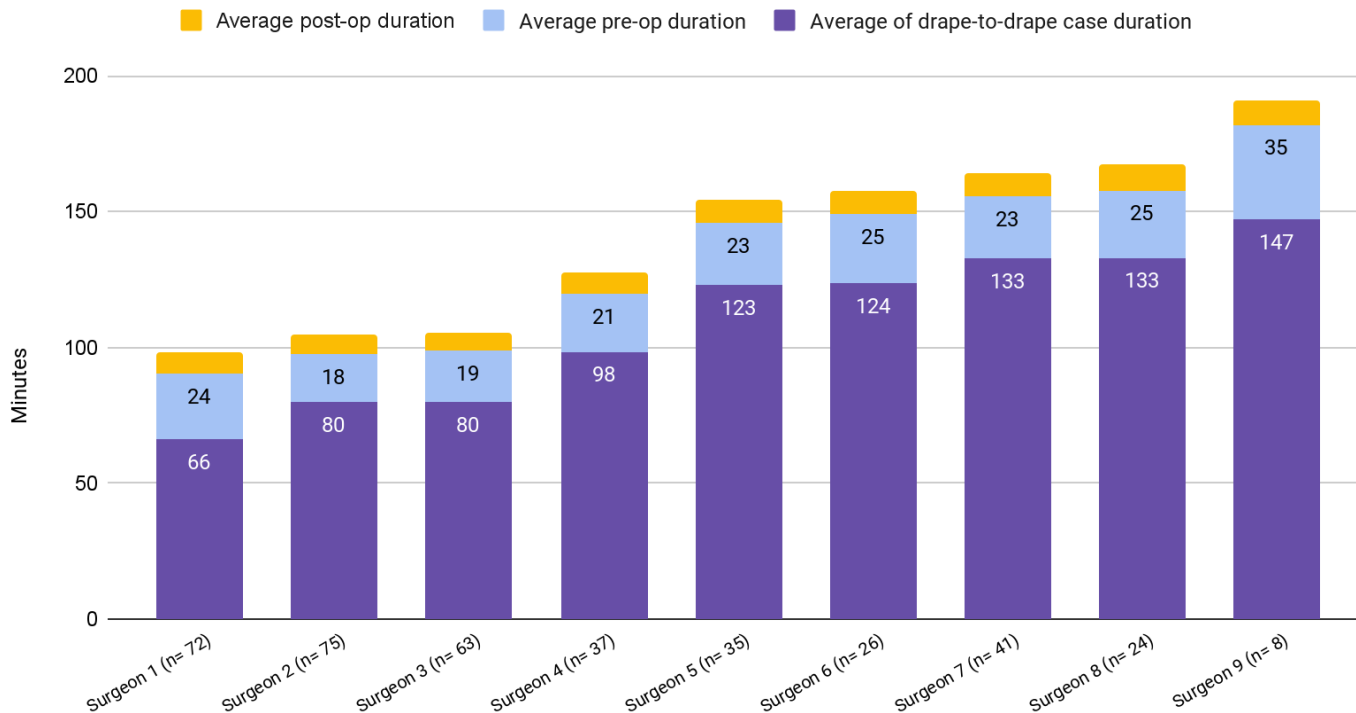
Apella Outcomes: Anesthesia

Trigger Finger Release (Sept 15 to present) - Case Duration Drape-to-Drape , Pre and Post-Op by Surgeon
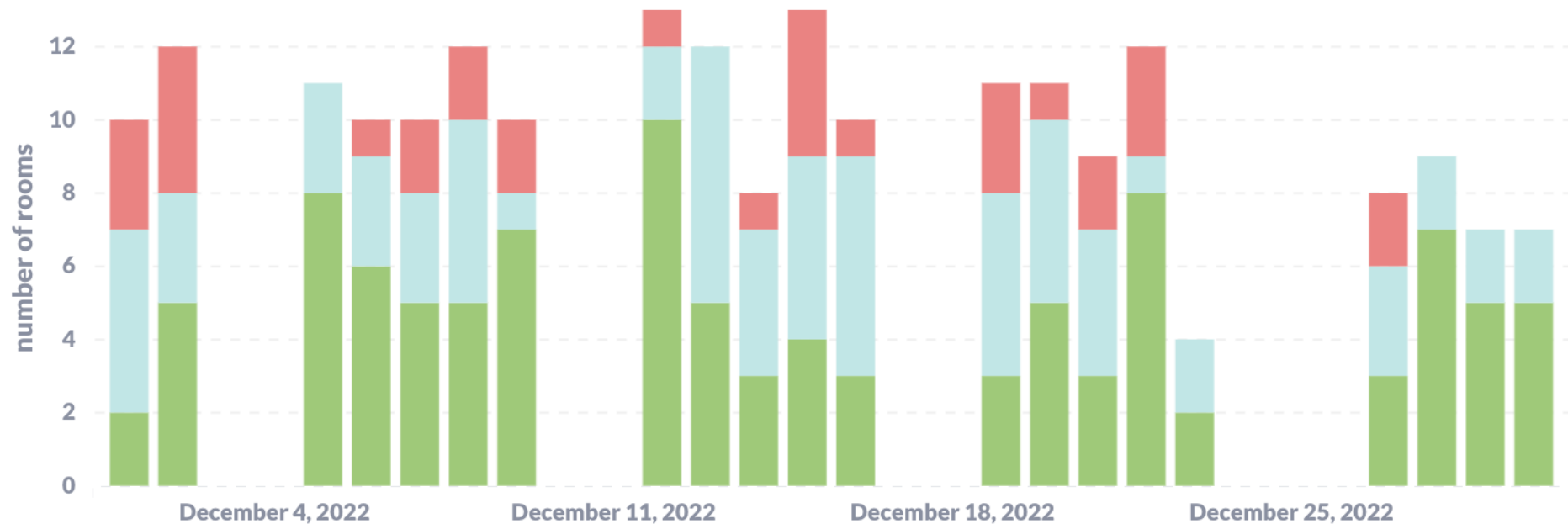
Apella Outcomes: TKR

Total Knee Replacement (Sept 15 to present) - Case Duration Drape-to-Drape , Pre and Post-Op by Surgeon

■ Average post-op duration ■ Average pre-op duration ■ Average of drape-to-drape case duration

Opportunity to add cases by day

● ended 3 or earlier (opportunity) ● ended between 3-5 ● ended after 5

Introducing ROBOEATZ

Features & Benefits

- Lower Labor Costs
- Less Time Managing Kitchen and Menu
- Open 24/7
- Reduce Waste
- Integrated into all major Order Delivery apps (Grub Hub, Skip the Dishes, Door Dash, Uber Eats)

REDUCE FOOD WASTE
Software monitors food quality, expiry dates & ingredient supply.

CAPACITY
Create 1,000+ meals before requiring additional ingredients.

SMART KITCHEN TECHNOLOGY
Predictive AI for dynamic pricing, inventory management, customer demand.

MOBILE APP
Mobile App for Consumer interface.

AUTO REPLENISH
Optimizes ingredient usage and replenishment.

SPEED
Creates meals in as little as 30 seconds.

HOT / COLD MENU
Caters to many concepts.

FOOD SAFETY
Contamination control Temperature regulation Smart storage and freshness tracking.

CUSTOMIZATION
Fully personalize meals based on dietary requirements.

HOUSTON

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