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The Future of Care Today

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Healthcare's Digital Future
Creating a Better Tomorrow

H+ HUMBER RIVER HOSPITAL

The Future of Care Today

Vision

Exceptional care

Healthier community

Mission

Working together to deliver innovative and compassionate healthcare in our community

Values

Compassion

Professionalism

Respect

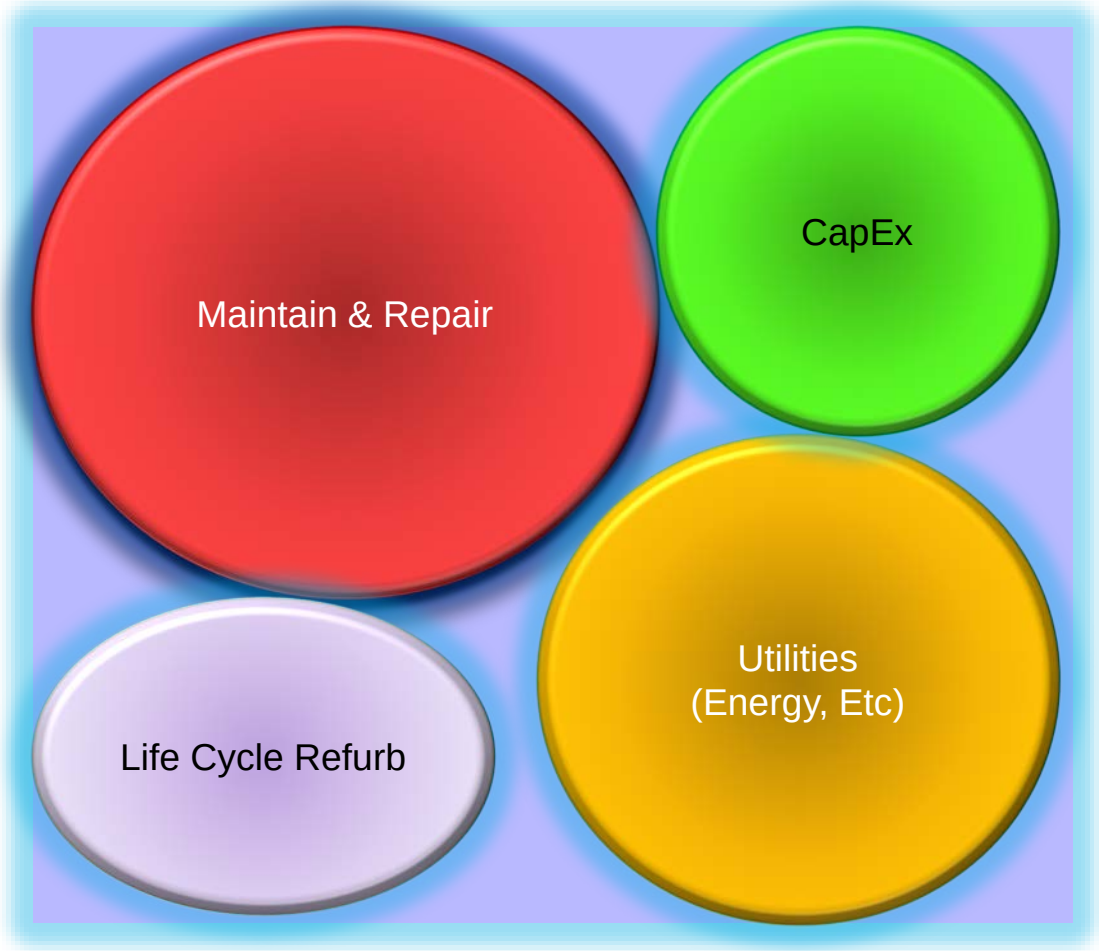
HRH Strategic Plan

About Humber River Hospital

- North West Toronto, Ontario
- Central LHIN
- Catchment Area of 850,000
- Diverse high-needs community
- Providing service on three sites
- Three outdated facilities within ten-mile radius

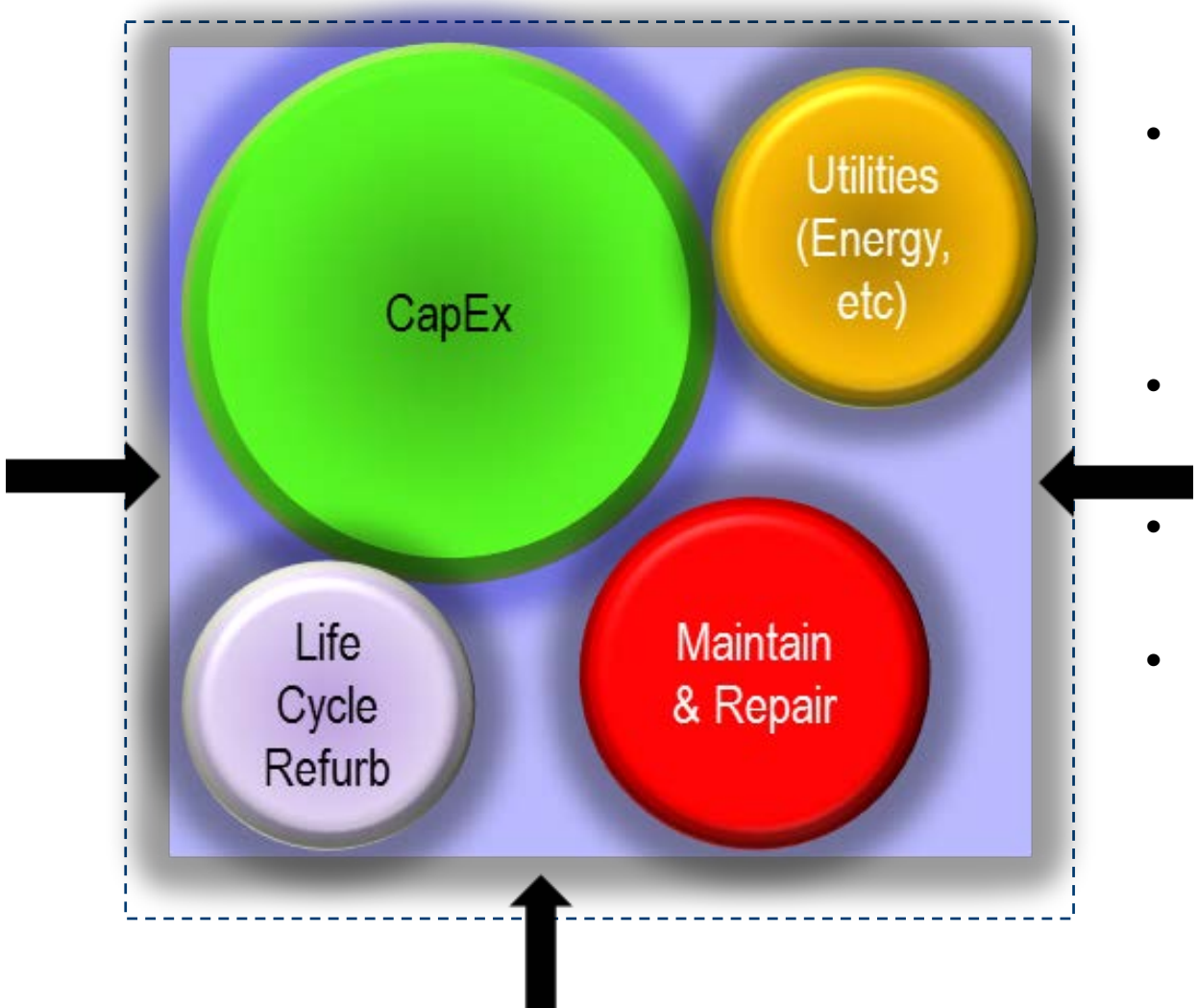
- New facility opened October 18, 2015
- 690 Physicians
- 2,900 Clinical staff
- 1,100 Ancillary staff
- 1,109 Volunteers

Value Proposition in Traditional Build



- All aspects of Facility costs should be considered
- Decisions in one cost category will impact the others
- Driving down construction costs can have an adverse impact on long term costs

Value Proposition in DBFM



- Long term “Whole of Life” costs instead of first cost construction
- Good decisions during design process consider Value for Money and best investment approach
- Results in lower whole-of-life facility cost (the “box” is smaller)
- Provides outcomes that are guaranteed
- Financing returns are vehicle for Sponsor to enforce the guarantees

CHALLENGE

Deliver enhanced care in a larger facility with more beds and increased patient visits with same operating budget… while creating staff engagement and high patient satisfaction

Humber River Hospital

Wilson Site – Opened October 2015

656 BEDS

Single patient rooms

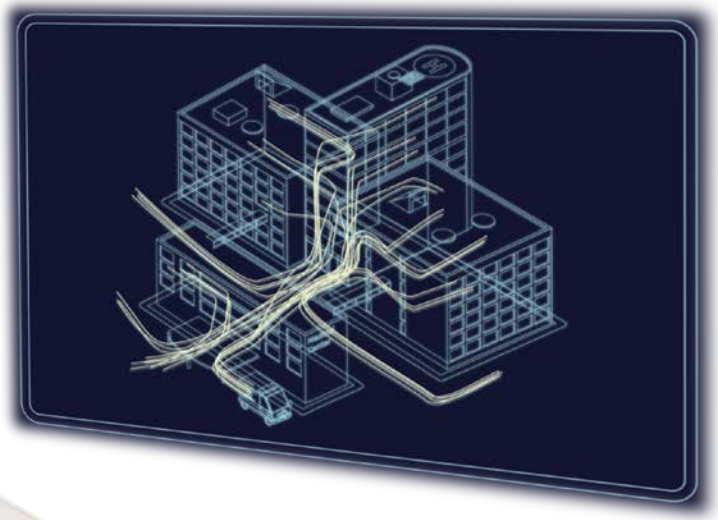
Humber River Hospital

Wilson Site – Opened October 2015

656 BEDS

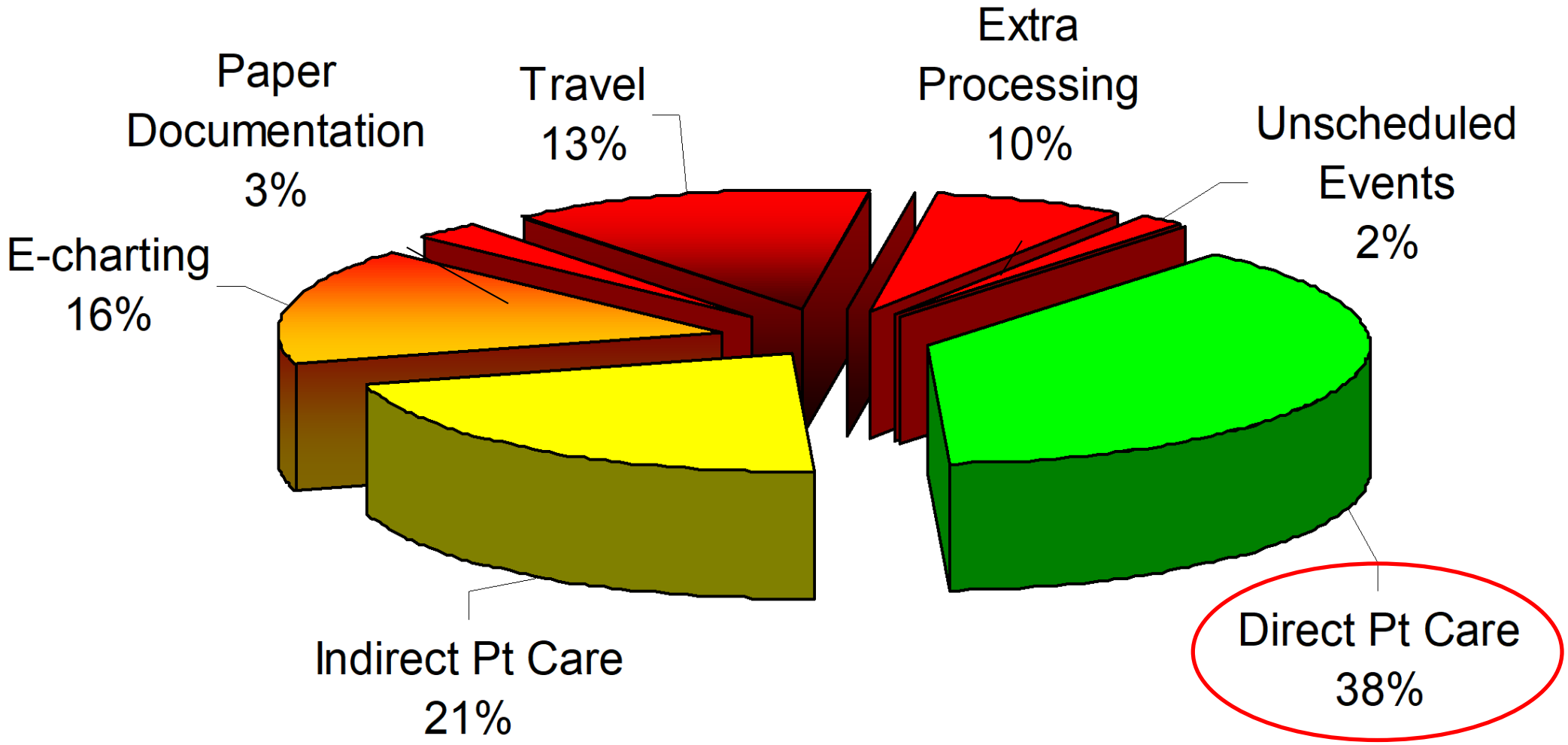
Bariatric Compliant Design

Test Future State Flow with Digital Twin



Current Process & Technology

Too little time with the patient . . .



Travel Distance = ‘Sneaker Time”

Building Area

Legacy Site:
86,000 SM

New Hospital
169,863 SM

12-Hour Shift

5.4 km

11.6 km

Many Ideas for how to respond to the data….

Andy Day from GE Healthcare, one of the world's leading lean process design firms, with Humber staff.

Sneakers and Post-it notes!

426 Ideas in response to Work Flow Mapping

At the same time, new opportunities are emerging

- Patients are more connected to knowledge and are more demanding consumers

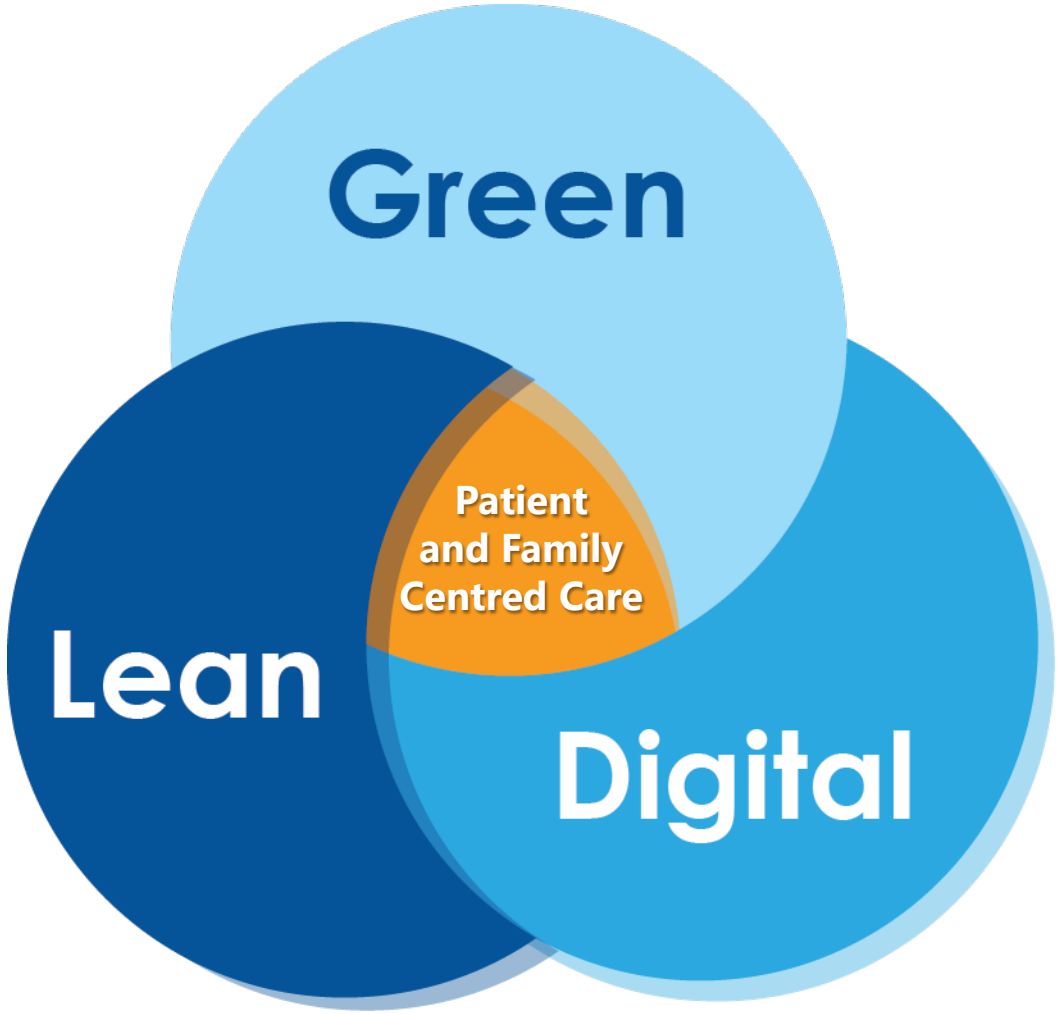
- The world of IoT is creating useful devices

- Virtual care is emerging as effective and practical

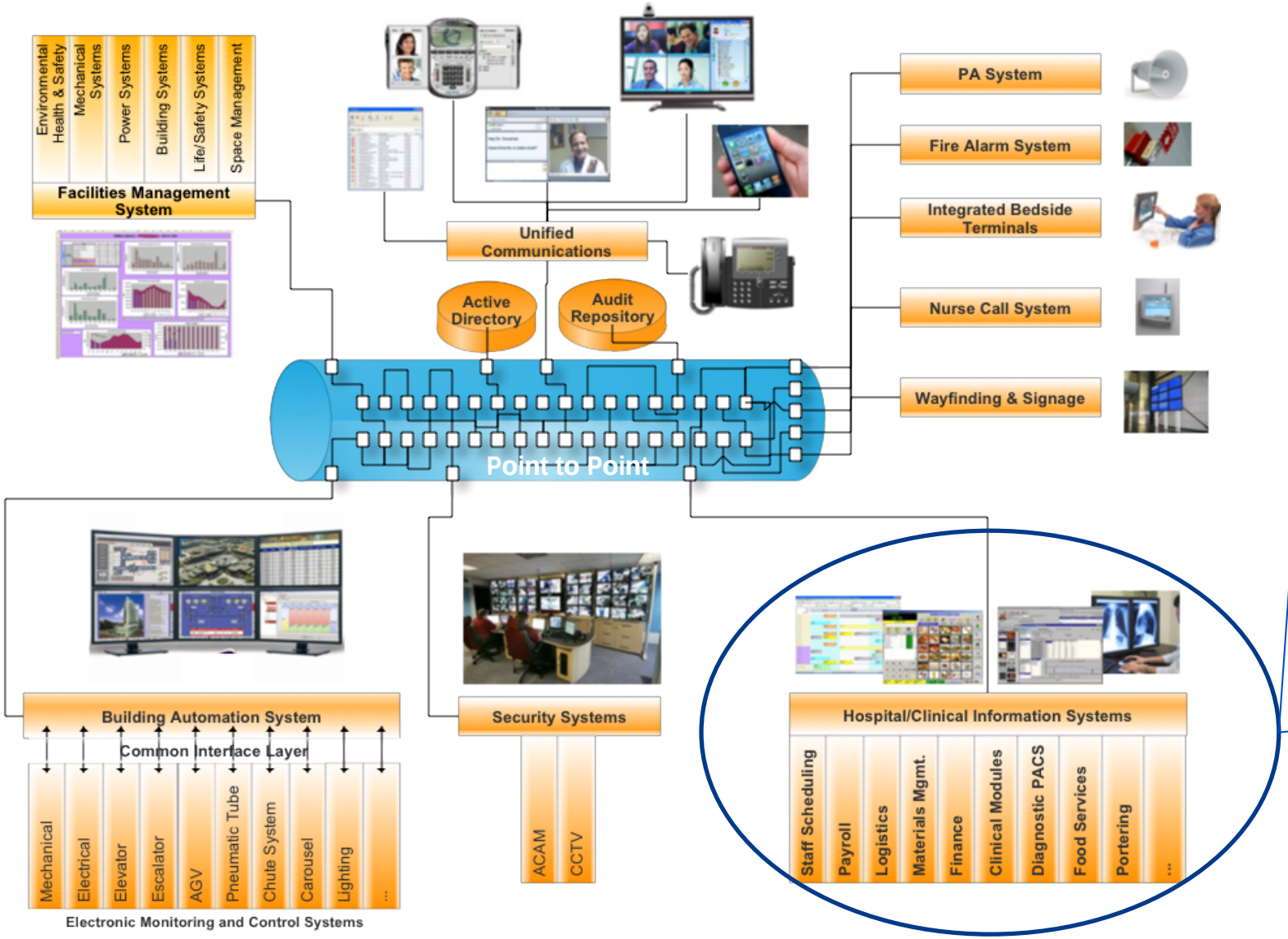
- Artificial intelligence is arriving

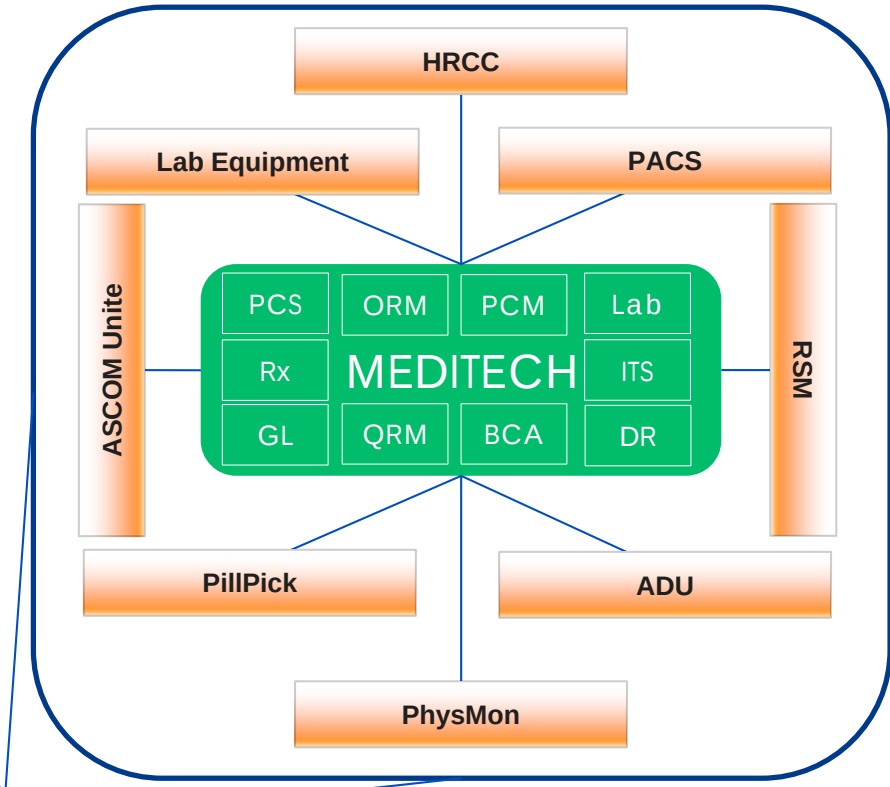
HUMBER RIVER HOSPITAL

Built for High Reliability



Conceptual Architecture





HRH Digital Vision

› Digital Information

› Mobile Connected

› Patient Empowerment

› System Automation

Key Architecture Objectives

- **Information is readily available** by many simultaneously, contributing to collaboration and sharing of knowledge
- **Information is actionable** contributing to workflow automation and better decision making
- **All systems are IP based**: charting, biomed, diagnostics, robotics, building, etc.

Digital Information

Mobile and Connected

Mission Critical

Interoperability

Key Architecture Objectives

Digital Information

- **People** can:
  - Access and create relevant information anytime, anywhere!
  - Communicate and collaborate with other people instantly, conveniently and respectfully!
- **Systems** connect with people to drive performance, quality and safety

Mobile and Connected

Mission Critical

Interoperability

Key Architecture Objectives

› Digital Information

› Mobile and Connected

- **All systems** must be operational 100% of the time
- **Information** must be available for at least 7 years
- **People** must be able to deliver care 100% of the time

› Mission Critical

› Interoperability

Key Architecture Objectives

› Digital Information

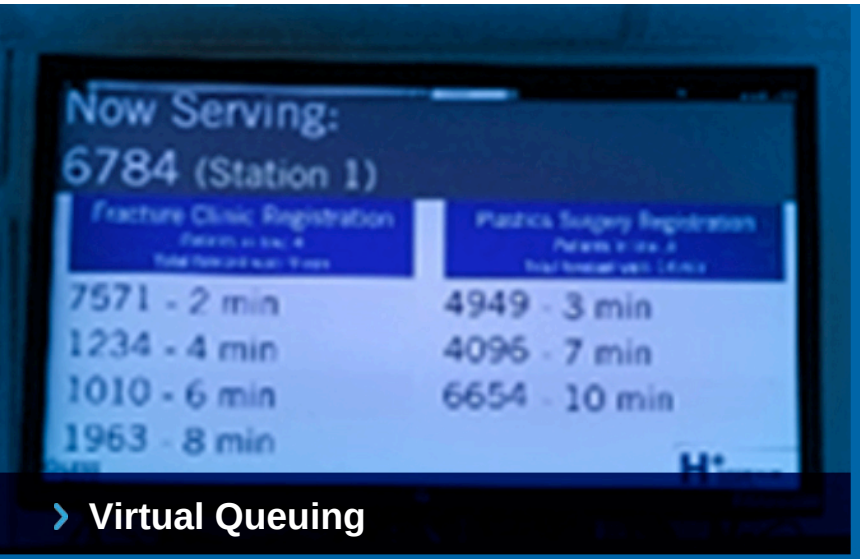
› Mobile and Connected

› Mission Critical

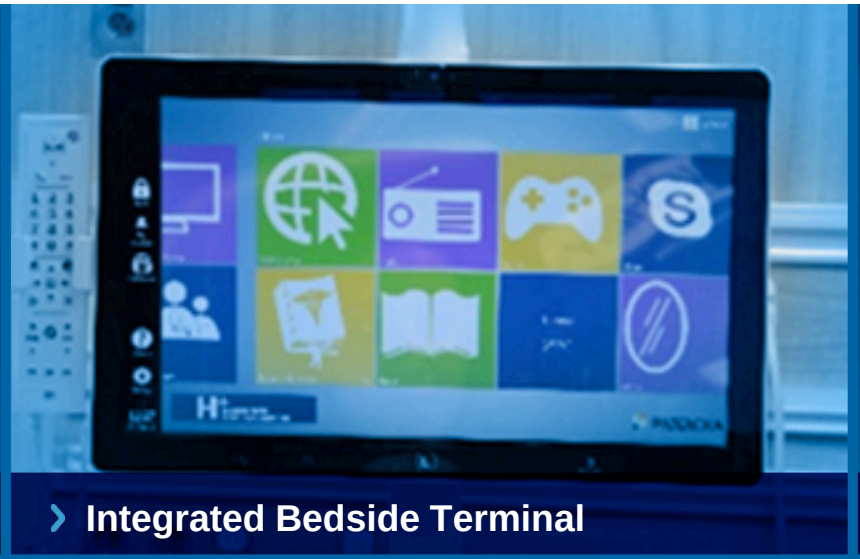
- **Systems must work together** in order to deliver a more effective business outcome
- **Systems must allow for the exchange of information** to:
  - Drive action
  - Inform people

› Interoperability

Interoperability Devices in Use Every Day



› Virtual Queuing

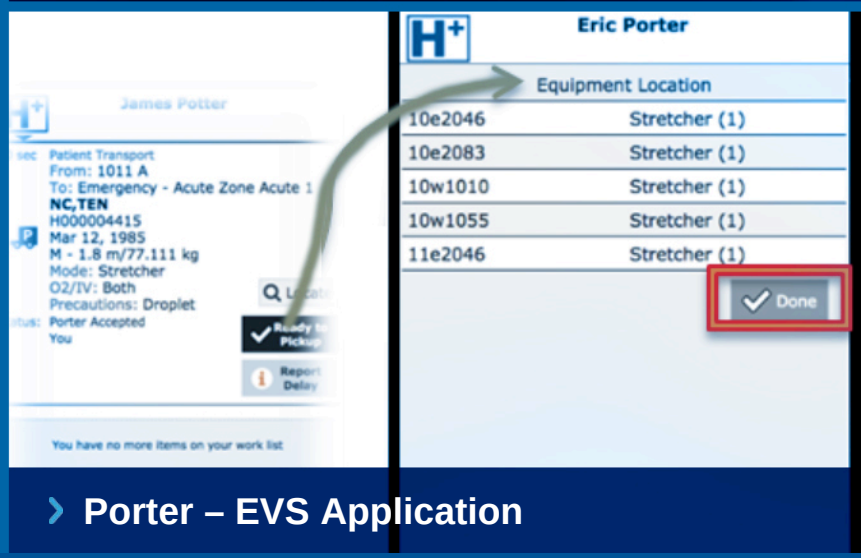


› Integrated Bedside Terminal

› Patient Flow in Surgery Steris RealView

› Room Sign Monitor

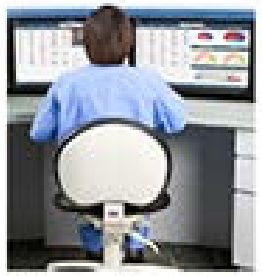
› Notification Manager



› Porter – EVS Application

Perioperative Workflow Management Software

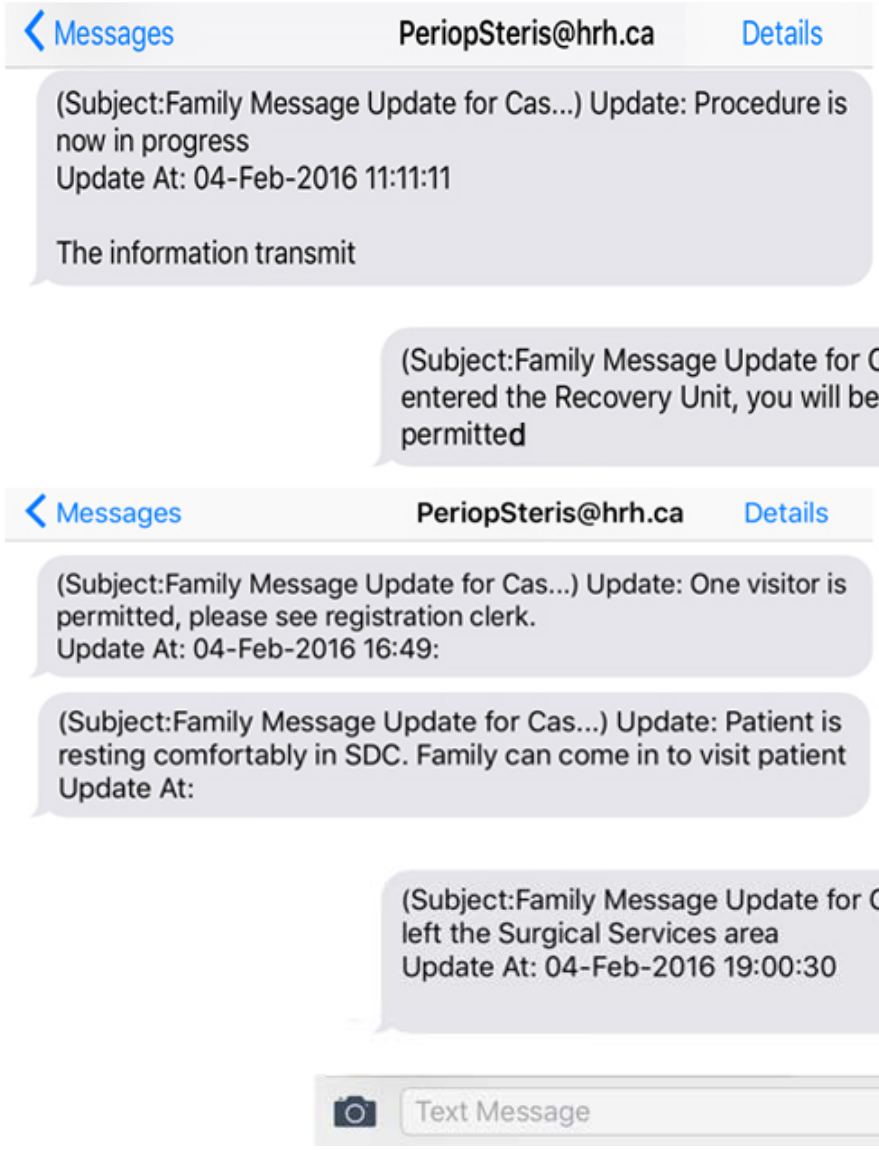
Real Time Communication of Important Events



OR Management and Control Desk Updates

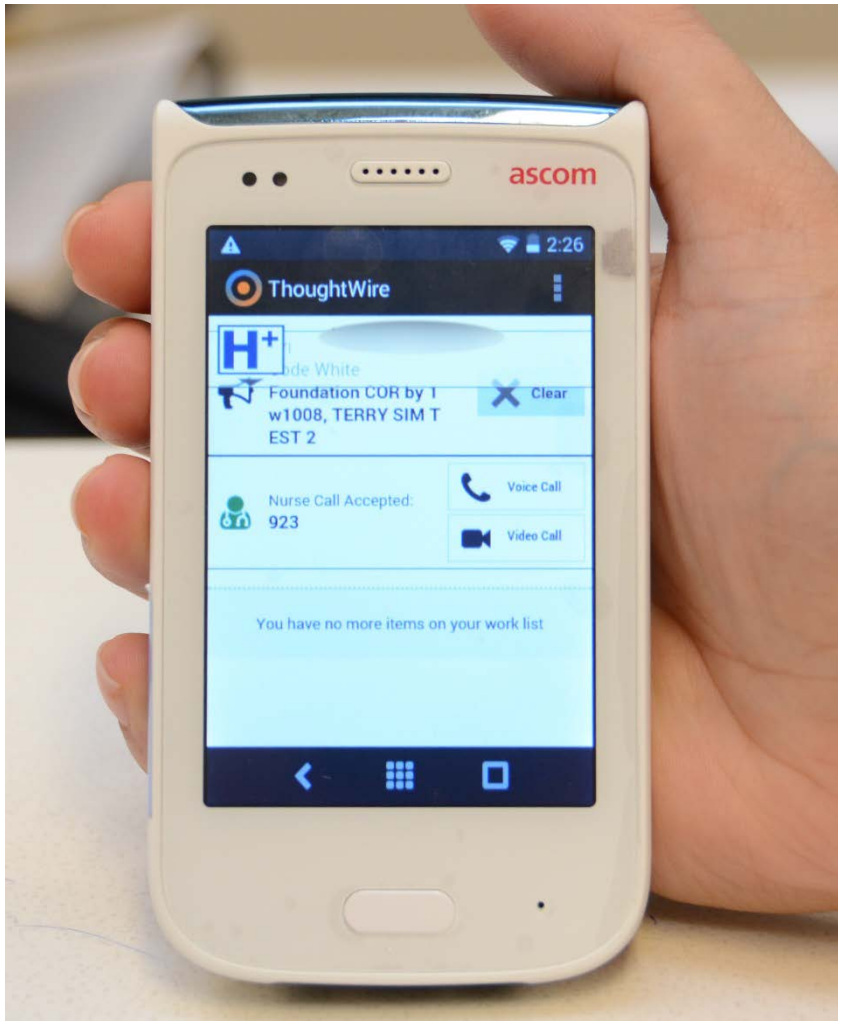
Physician Schedule, Auto Notifications

Patient Family Updates



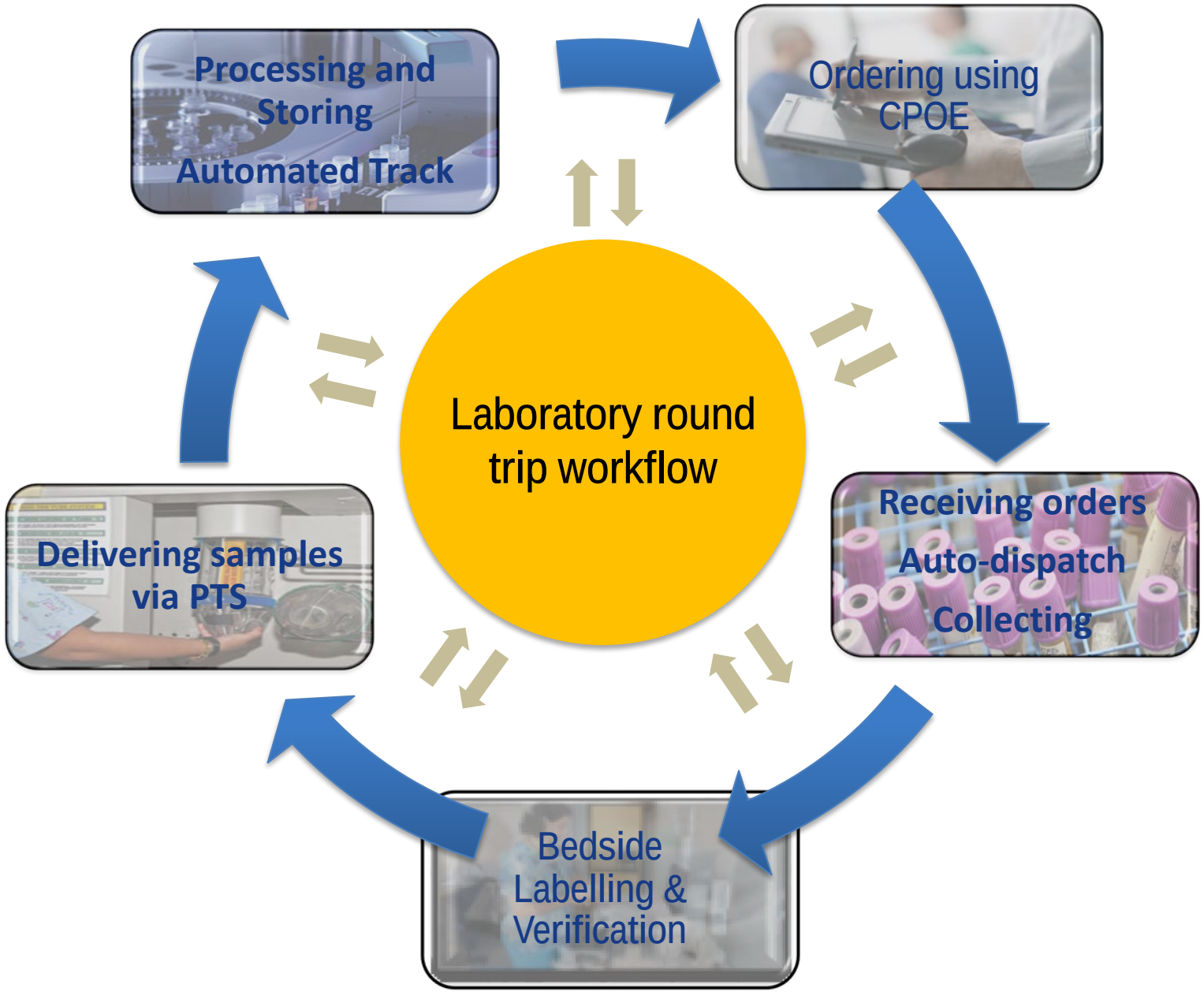
Being Connected – Systems to People

- **Connects patients with people**
  - Nurse assist
- **Connects systems with people**
  - Critical lab results
  - Rhythm Strips
  - Code blue/pink/white
  - Building system alarms
  - Special Purposes Alarms



Fridges / Freezers	Medical Gases	Dialysis RO
Isolation and Negative Pressure Rooms	Wandering Patients	Infant Abduction
Assets	Low Battery	

Automated Guided Vehicles to Support Supply Chain Automation


Laboratory round trip workflow
Ordering using CPOE
Receiving orders
Auto-dispatch
Collecting
Bedside Labelling & Verification
Delivering samples via PTS
Processing and Storing
Automated Track

Laboratory Automation

Laboratory Automation

HUMBER RIVER HOSPITAL

Pharmacy Automation

Real Time Locating System

We have deployed an RTLS that supports:

- Tracking of patients for:
  - Patient Wandering
  - Infant Abduction
  - ED Tracking
  - OR Management
- Code White or Duress
- Communicating who is in a patient room
- Tracking of staff for various productivity gains
- Tracking of assets to simplify searching

The RTLS provides:

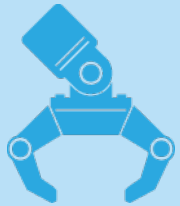
- 100% coverage
- Location to the nearest room

Results . . .

Old Inpatient Unit	**New** Inpatient Unit
34 Bed Unit	**32** Bed Unit
11,100 SF	**28,000** SF
1 Nurse to **5** Patients Staffing Ratio	**1** Nurse to **5** Patients Staffing Ratio
326.5 SF / Bed	**875.0** SF / Bed

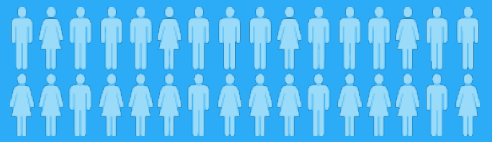
With a result of a 168% increase in SF/Bed with no increase in nursing staff

FTE Transport of Products – Reduction



84.2% Automation

164.8 km/day

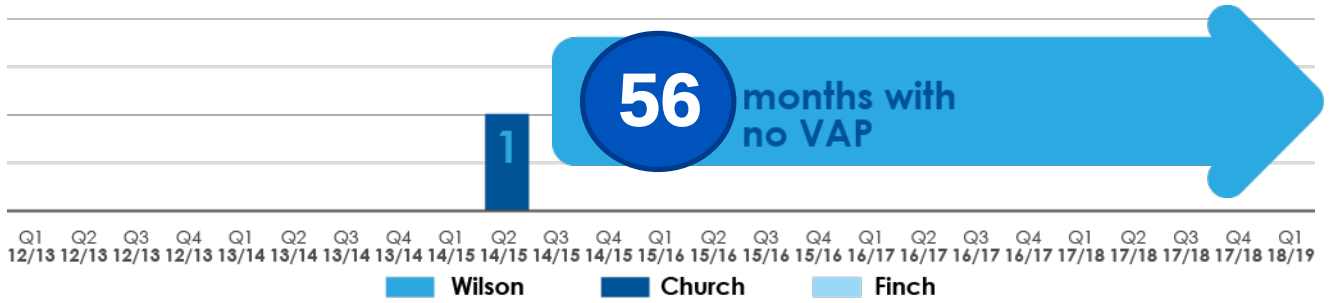


24.6 FTE

$2,500,000 Annual Savings

What Are We Most Proud of?

HRH Ventilator-Associated Pneumonia Rate Critical Care Units per 1000 ventilator days
2012 – YTD. Target – "0"

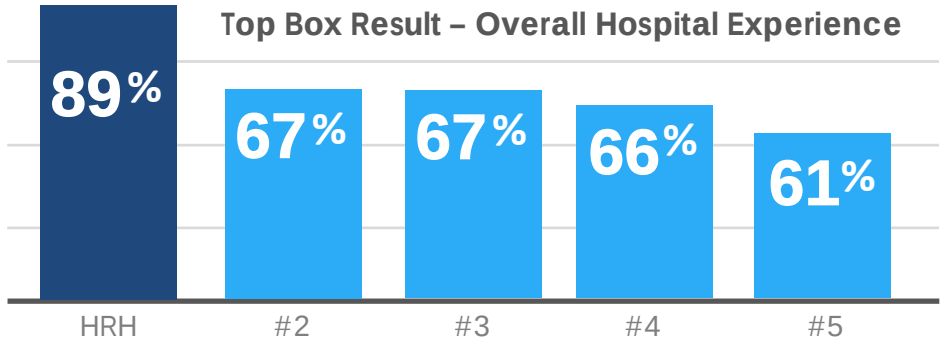


HRH Hospital-Acquired MRSA Bacteremia per 1000 patient days
Q1 2016/17 – YTD

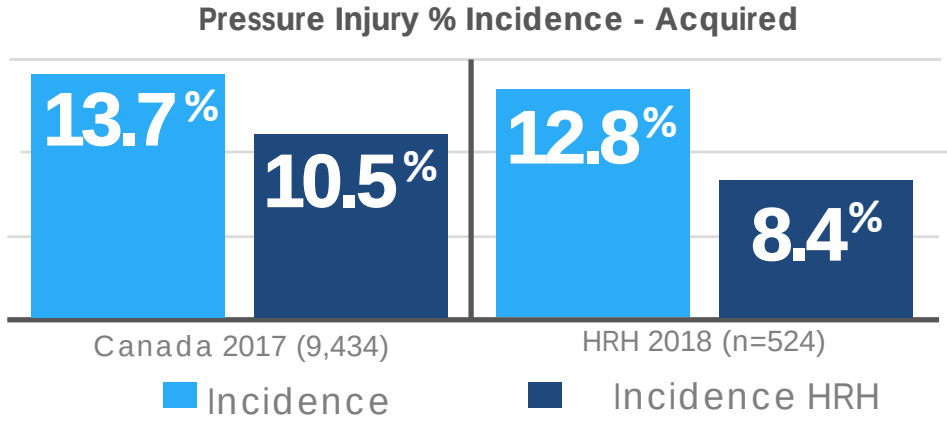
HRH Hospital-Acquired VRE Bacteremia Rate per 1000 patient days
Q12016/17 – YTD. Target – "0"

Humber River Hospital Results

Best hospital experience CLHIN



HRH % incidence of Pressure Injury is lower than Canadian % incidence

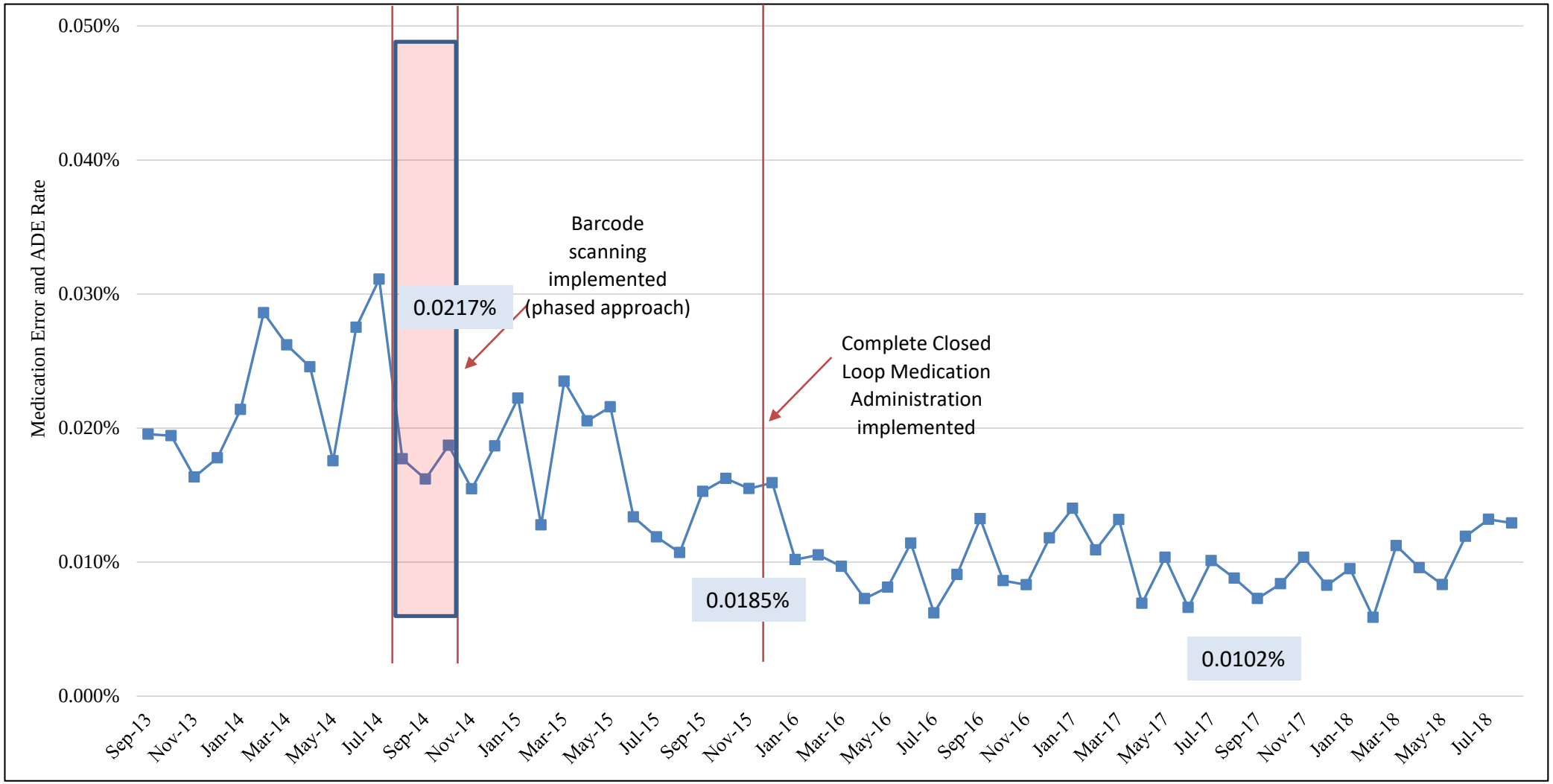


3.3M Doses of medication administered in 17/18

Medication error rate was **0.007%**

Comparison rate of 2.5% - 3.5% in the literature

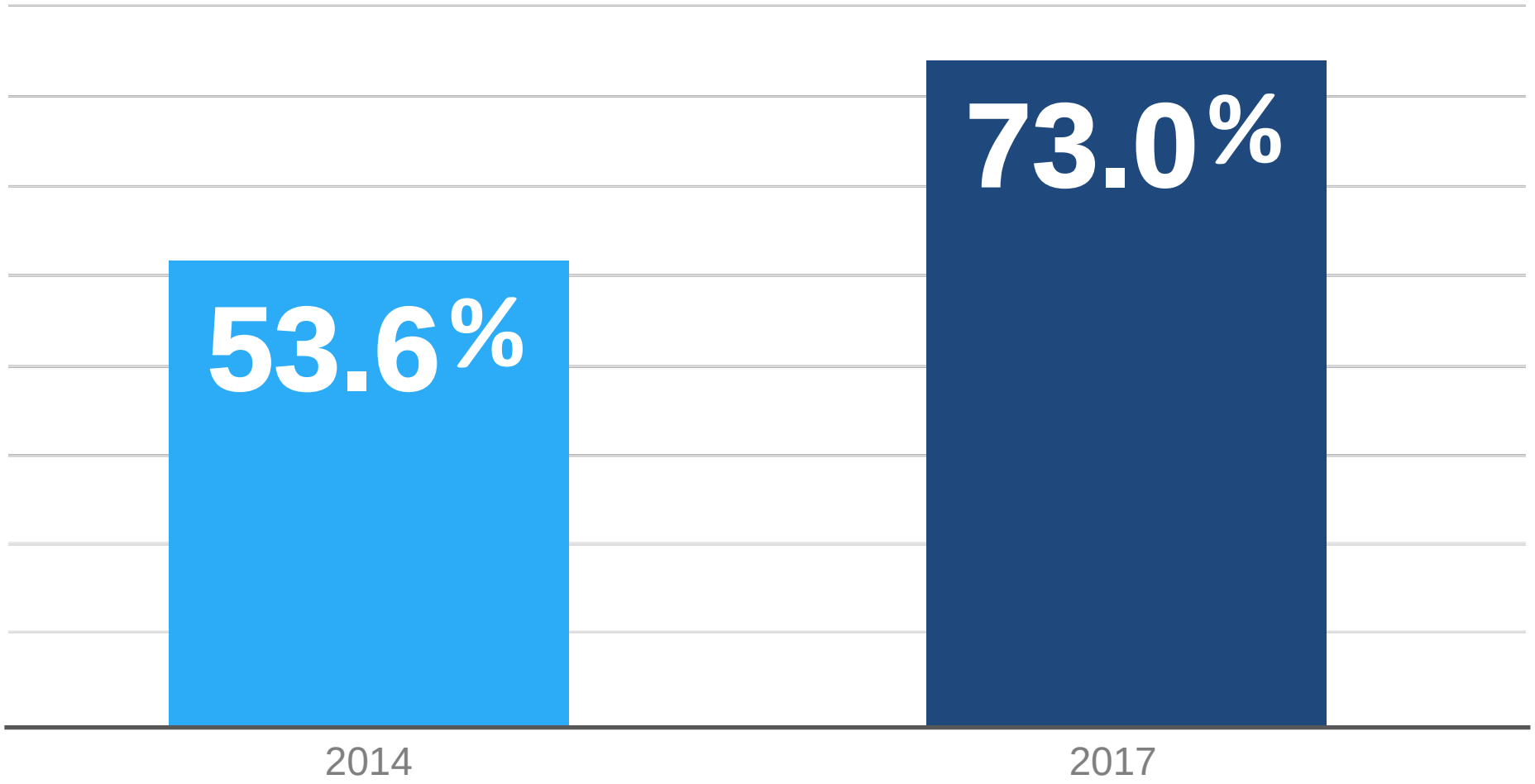
Research Results



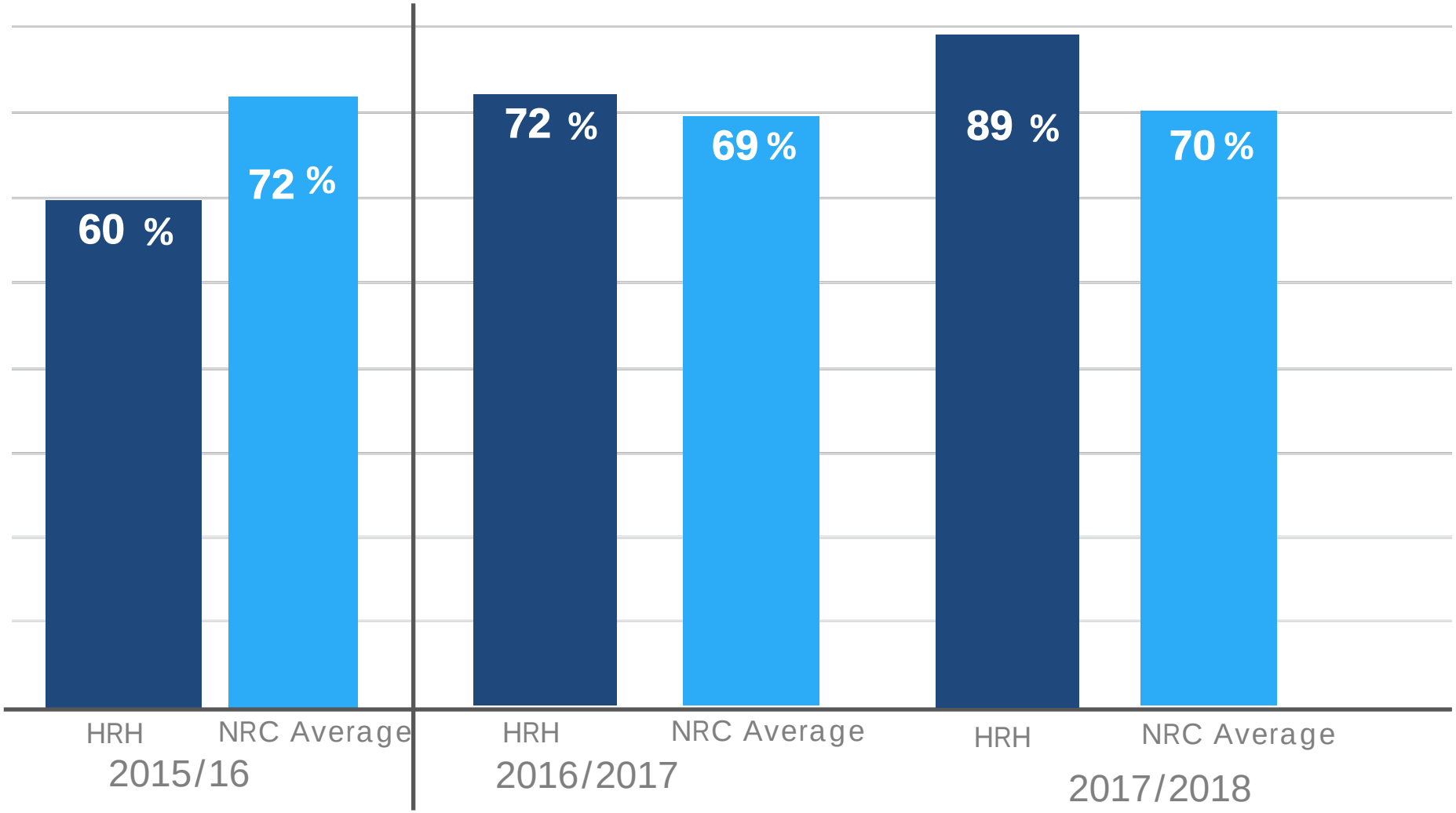
HRH Outcomes

- 2017/18 – 3.3 million doses of medications administered, and a 0.007% error rate
- Innovative Leading Practice for a “Closed Loop Medication System” by the Health Standards Organization (HSO)
- Innovative Leading Practice for a “Using Robotic Admixture to Improve Patient Safety and Reduce Wait Times” by the Health Standards Organization (HSO)
- Innovative Leading Practice for a “Barcode Verification for Medication Preparation and Traceability Using In-house Developed System ” by the Health Standards Organization (HSO)

Humber River Hospital Employee Engagement



Humber River Hospital Patient Satisfaction 2015/16 – 2018/19

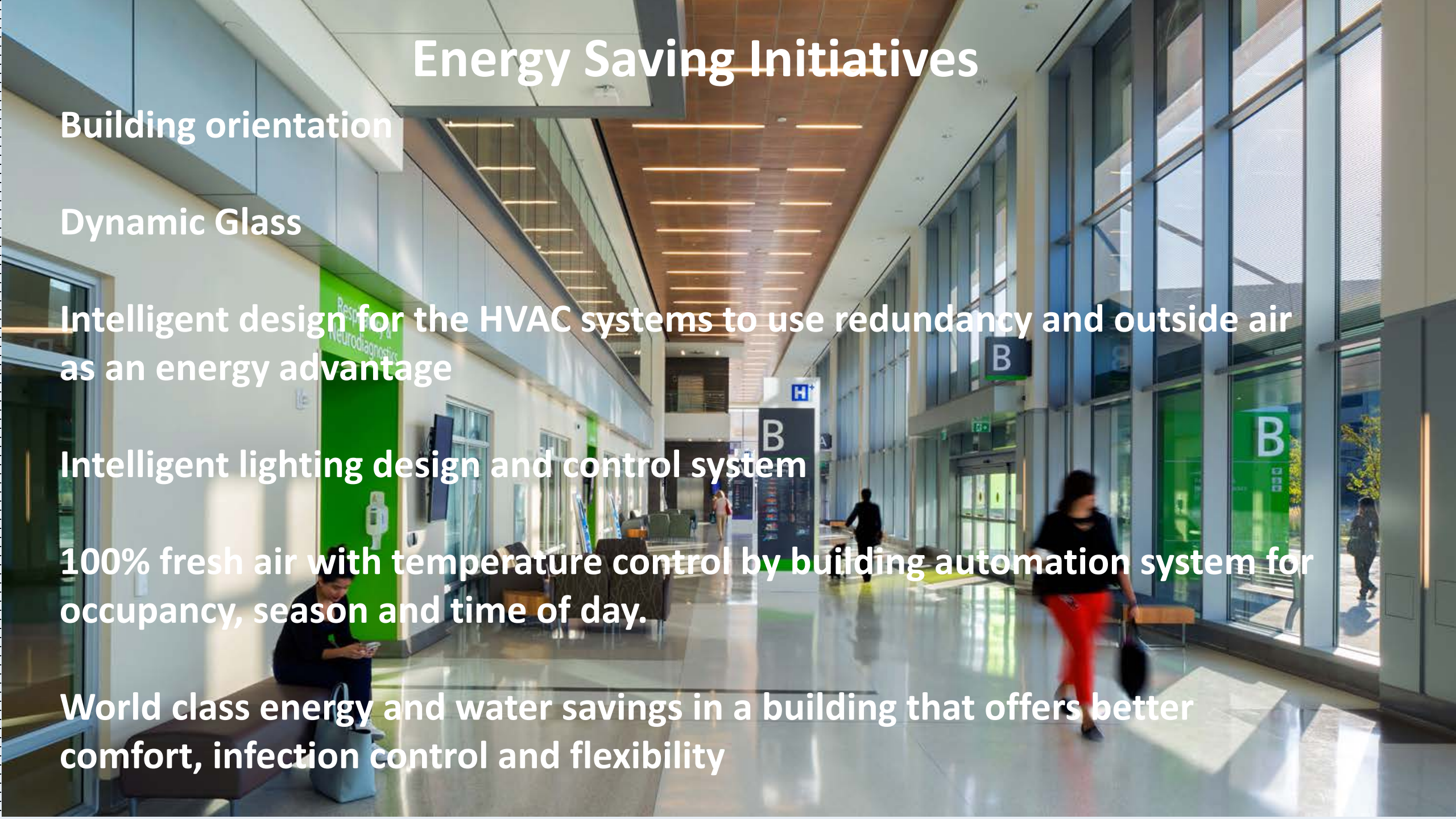


Initial Award – Prior to Appeal

99.9% compliance with 2800 standards

100% compliance with 30 ROPs

Energy Saving Initiatives



Building orientation

Dynamic Glass

Intelligent design for the HVAC systems to use redundancy and outside air as an energy advantage

Intelligent lighting design and control system

100% fresh air with temperature control by building automation system for occupancy, season and time of day.

World class energy and water savings in a building that offers better comfort, infection control and flexibility

Results . . .

Energy

Cost

$223,124,436

over 30 years

$7,437,481

Average cost / year

Savings

$89,249,777

41.8%

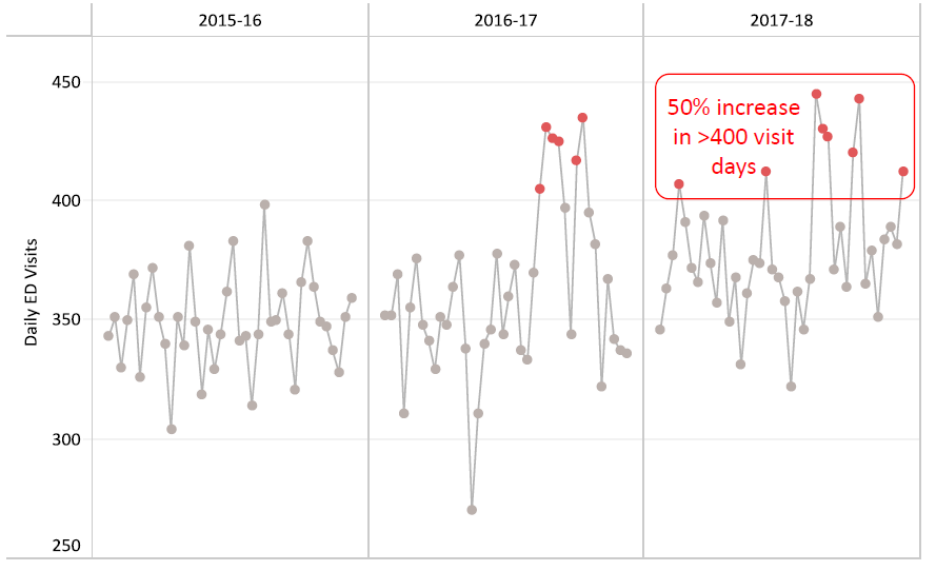
over 30 years

Reduction

$2,974,992

Average savings / year

Humber River Hospital | Daily ED Visits December 1st to January 9th



Program	Physical Beds Available	2016 "Beds Used"	Target (2016) Occ.	Y4 Beds Needed	Y4 Beds Needed w/ Improvement	Y4 Beds Needed w/ Improv. & Surg Smoothing
Medicine	331	331	93%	375 (-44)	335 (-4)	335 (-4)
Surgery	128	110	90%	125 (+3)	116 (+12)	109 (+19)
ICU	48	42	85%	48 (0)	45 (+3)	45 (+3)
Mental Health	64	58	91%	63 (+1)	62 (+2)	62 (+2)
Mother & Child (excl. NICU)	64	48	85%	54 (+10)	54 (+10)	54 (+10)
Rehab	21	19	90%	23 (-2)	22 (-1)	22 (-1)

Medicine projected to be 44 beds underwater by 2020 if trends continue

The Canadian Health System

QUALITY OF CARE: Readmissions

patients is readmitted within a month of leaving hospital

Readmissions to hospital cost more than

a year in Canada

Risk of returning to hospital

QUALITY OF CARE : Harm

Harm experienced in 1 of every 18 hospitalizations

SPENDING: Cost of Care Per Person

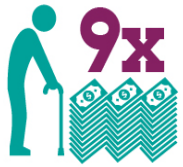
Total health spending (public + private) in Canada

in 2013

a year

Age-Adjusted Public Spending per Person

The average spending on someone age 80 and older is nearly



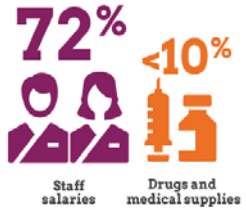
what it is for someone between the ages of 1 and 64

SPENDING: Cost of a Standard Hospital Stay

Hospital care costs about

a year in Canada . . . making it the **largest category** of health spending

Breakdown of the biggest costs of hospital stays



Range of the cost of a standard hospital stay between teaching hospitals

depending on the hospital's specialty

Annual HC spend/person USA = $10,345 CAN =$6,299

The Canadian Health System

66% of reported medical errors identified ineffective communication as root cause

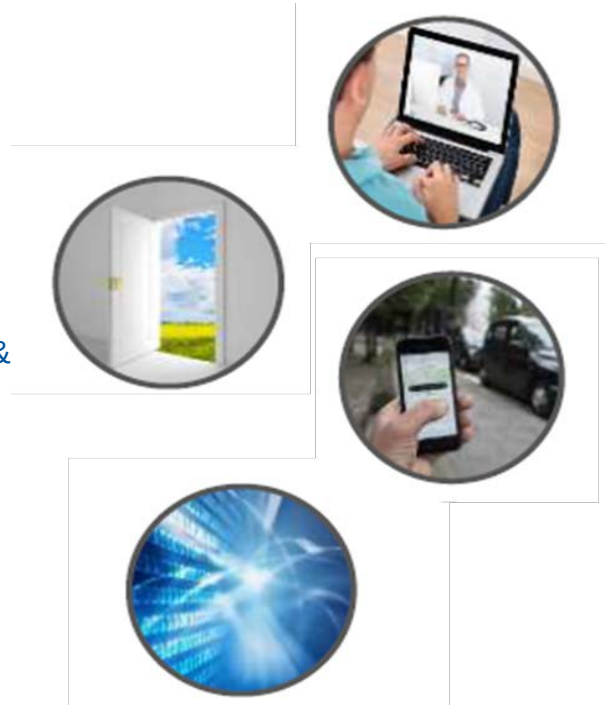
Ineffective communication has remained among **Top 3** root causes of sentinel events

Estimated **More than 25%** of hospital readmissions could be avoided with better communication among healthcare teams and between providers and patients

Over 25% of malpractice cases involving surgery were caused by a lack of thorough communication in some aspect of patient care

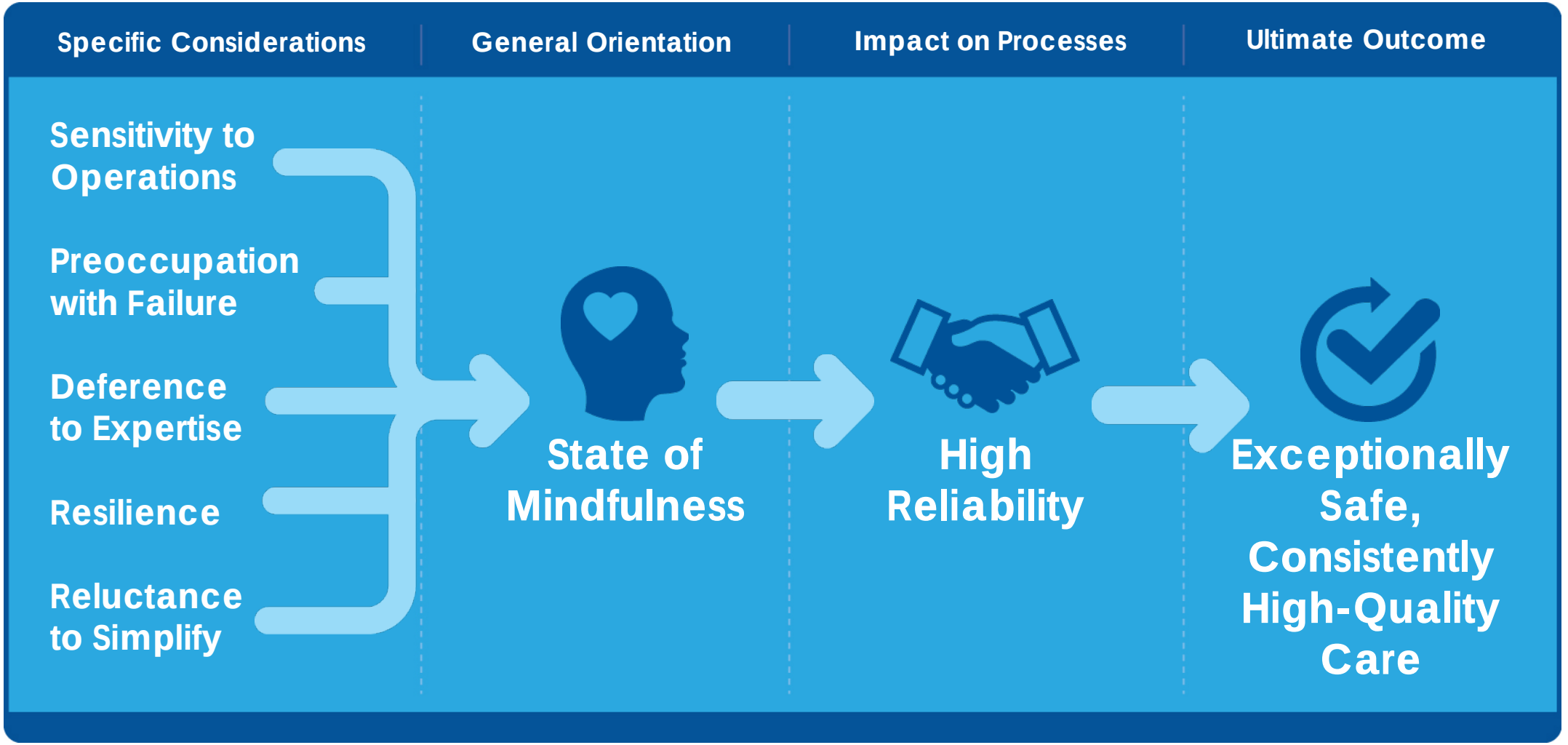
At the same time….new opportunities are emerging

- Patients are more connected to knowledge and are more demanding consumers
- The world of IoT is creating useful devices
- Virtual care is emerging as effective & practical
- Artificial intelligence is arriving



High Reliability Care Ultimate Outcome…

Exceptionally Safe, Consistently High-Quality Care



Command Centres are common in other industries

NASA's New Mission Control - 2014

Rio de Janeiro City Command Center

Toronto Transit Commission Nerve Centre

Humber’s multi-generational plan

2017
Gen 1

2019
Gen 2

2020
Gen 3

Patient Flow and Patient Care Logistics
bed base allocation, bed assignment, room cleaning, critical care capacity management, discharge planning, surgical scheduling and throughput, elevated risk of harm due to logistics intensity, etc.

Clinical Pathway and Reduce Never Events
Delays in Care, Early Warning Algorithms, QBP monitoring, etc.

Community Reach & Reduced Acute Utilization
Support health and wellness, virtual visits, home monitoring, communication and collaboration

High Reliability

Care Transformation

HUMBER RIVER HOSPITAL

Command Centre – Mission Control Concept

Centralized Decision-Makers

- Centre of gravity for hospital ops
- Right information to the right people
- Quick, efficient decision-making

Real-Time Intelligence

- Real-time actionable intelligence
- Custom analytics from existing systems
- Predictive algorithms

Action-Oriented

- Every data point drives action
- Serves as hub for op mechs
- Centre for learning and continuous development

Provides a second-level support to care-givers: orchestrate, synchronize, expedite and de-risk in real time

Provides predictive, at-a-glance intelligence

Ensures sustainable process change

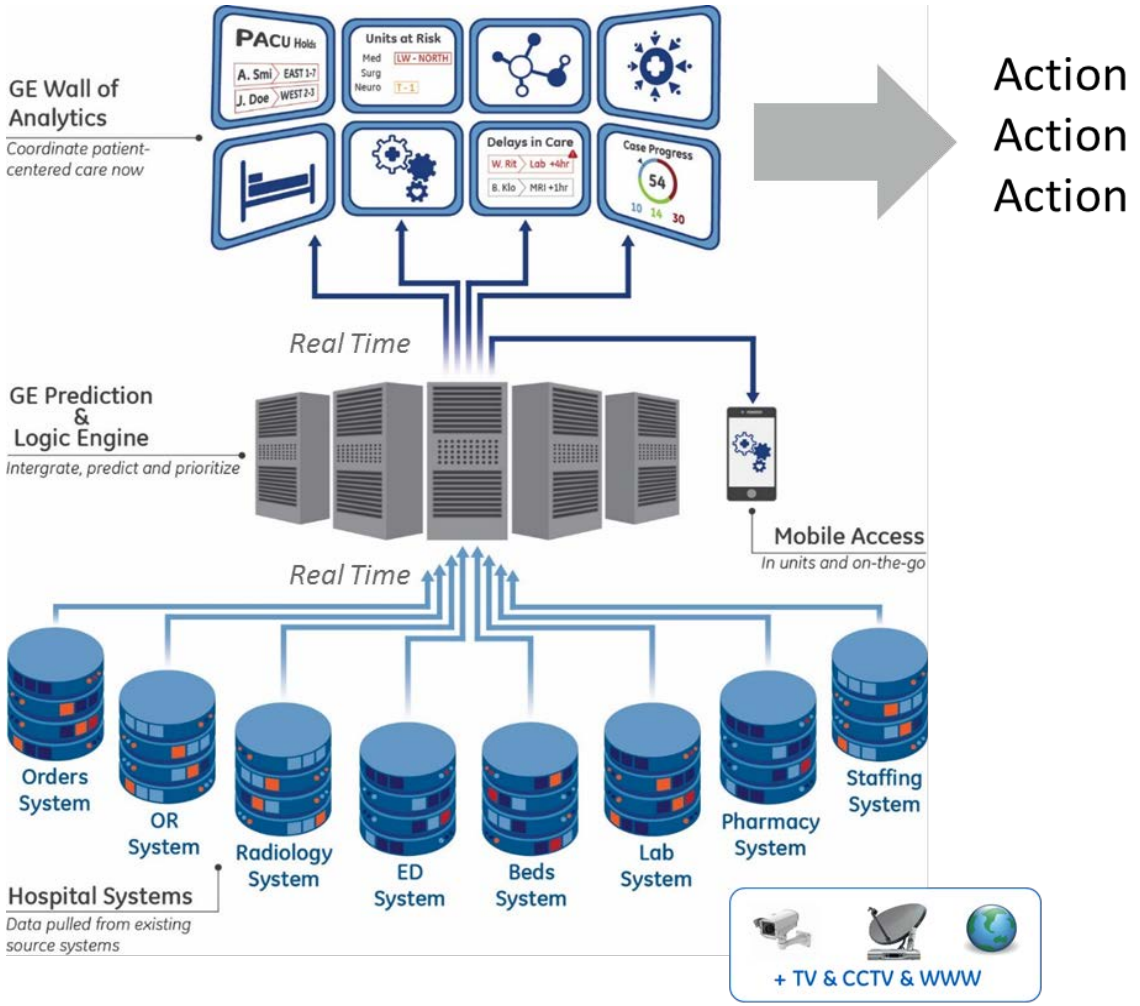
Command Centre

Data from any source system viewed on the Wall, mobile devices, desktop

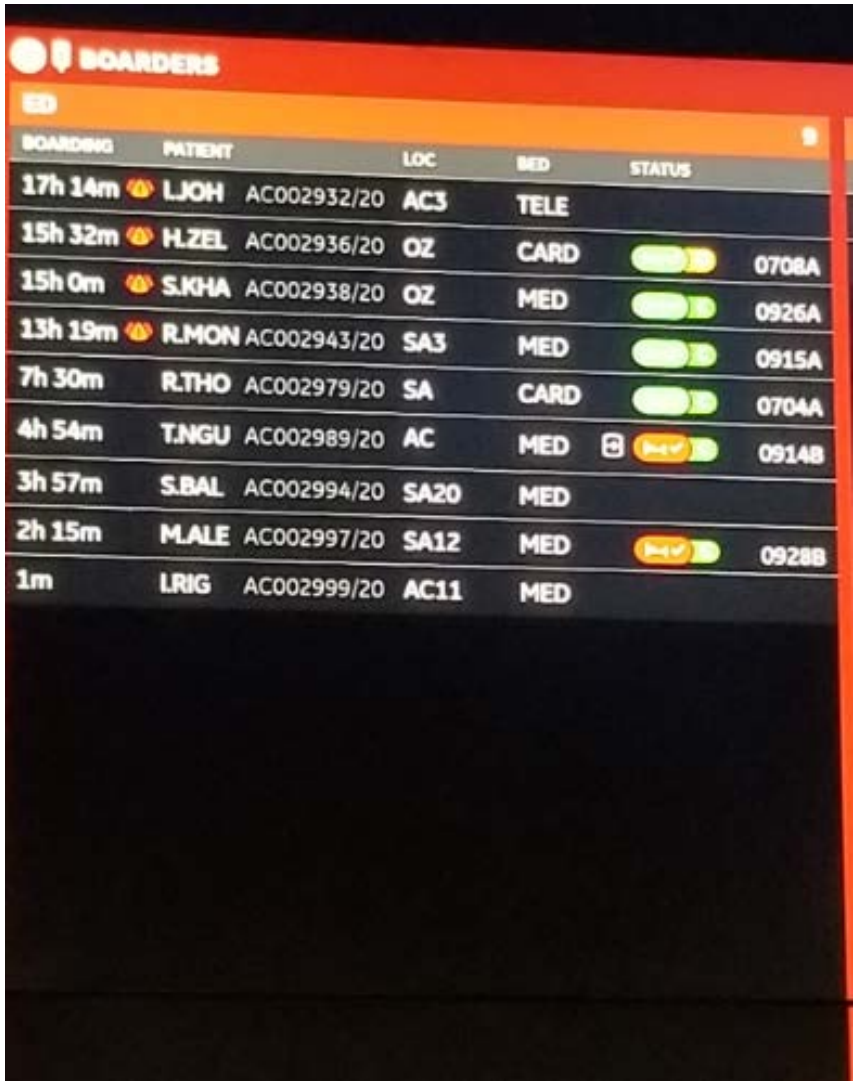
Real-time and predictive analytics powered by simulation, prediction, AI

Insights trigger defined procedures

Tiles and the Wall of Analytics™ are designed, specified, built, activated, monitored and maintained.



Emergency Department Patient Flow

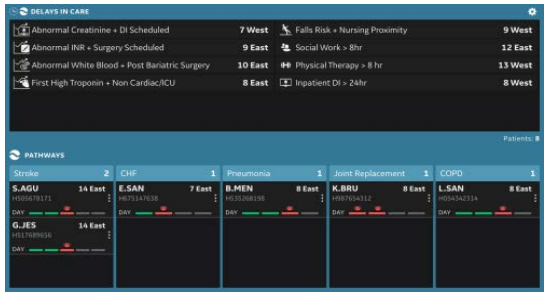


Command Centre

Support Services

Accelerating bed cleans by prioritizing jobs and predicting capacity pressures

Delays in Care

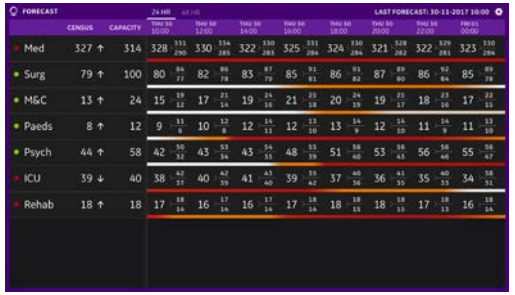


Increasing efficiency and safety by avoiding delays in clinical care activities

Medical Imaging

Reducing inpatient imaging wait times by maximizing throughput

Census Forecast



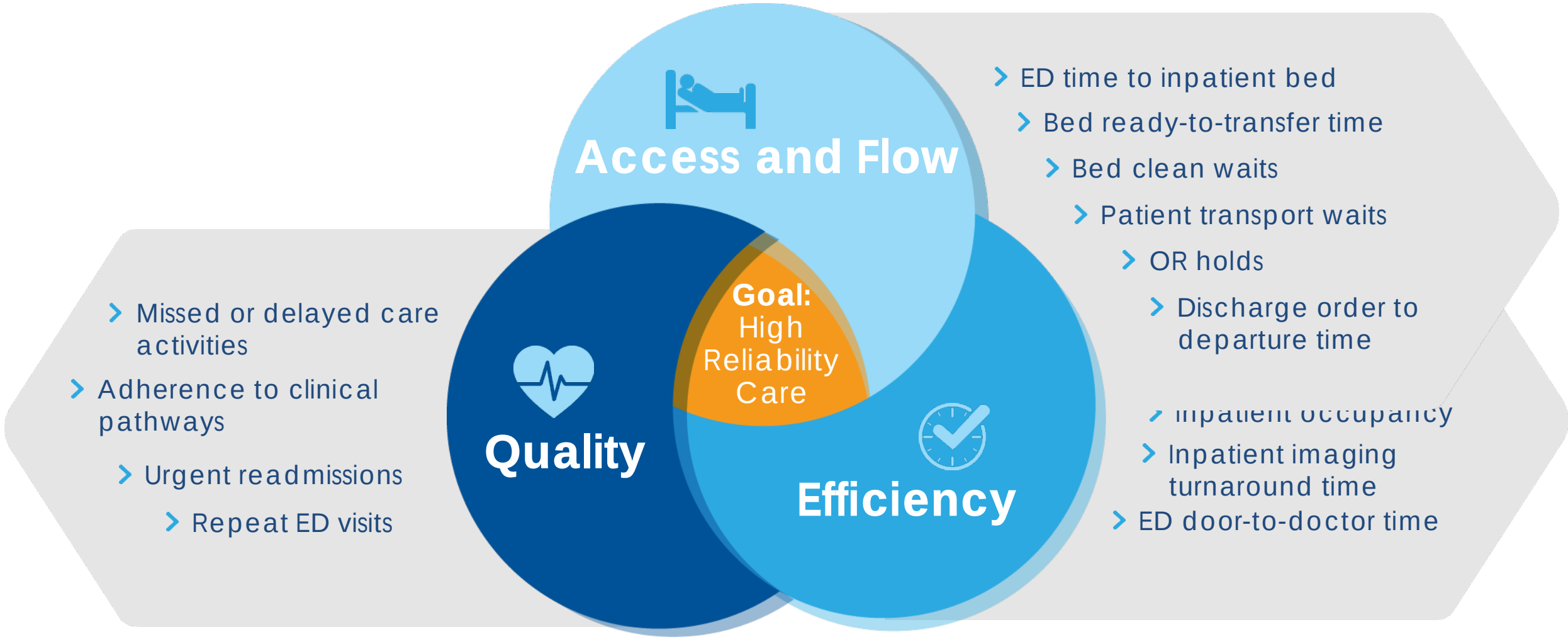
Planning for and avoiding high inpatient bed occupancy situations

Drive to Sustainable High Reliability Care

Create 40 beds of equivalent capacity significantly improve quality & efficiency

Contribute $11M/year of margin

Command Centre: Targeted Impact and Metrics



Humber River Hospital Command Centre

Impact & Improvements

Baseline - Jan to Jun 2017 | Endline - January 2018

Humber’s multi-generational plan

2017
Gen 1

2019
Gen 2

2020
Gen 3

Patient Flow and Patient Care Logistics
bed base allocation, bed assignment, room cleaning, critical care capacity management, discharge planning, surgical scheduling and throughput, elevated risk of harm due to logistics intensity, etc.

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High Reliability

Care Transformation

HUMBER RIVER HOSPITAL

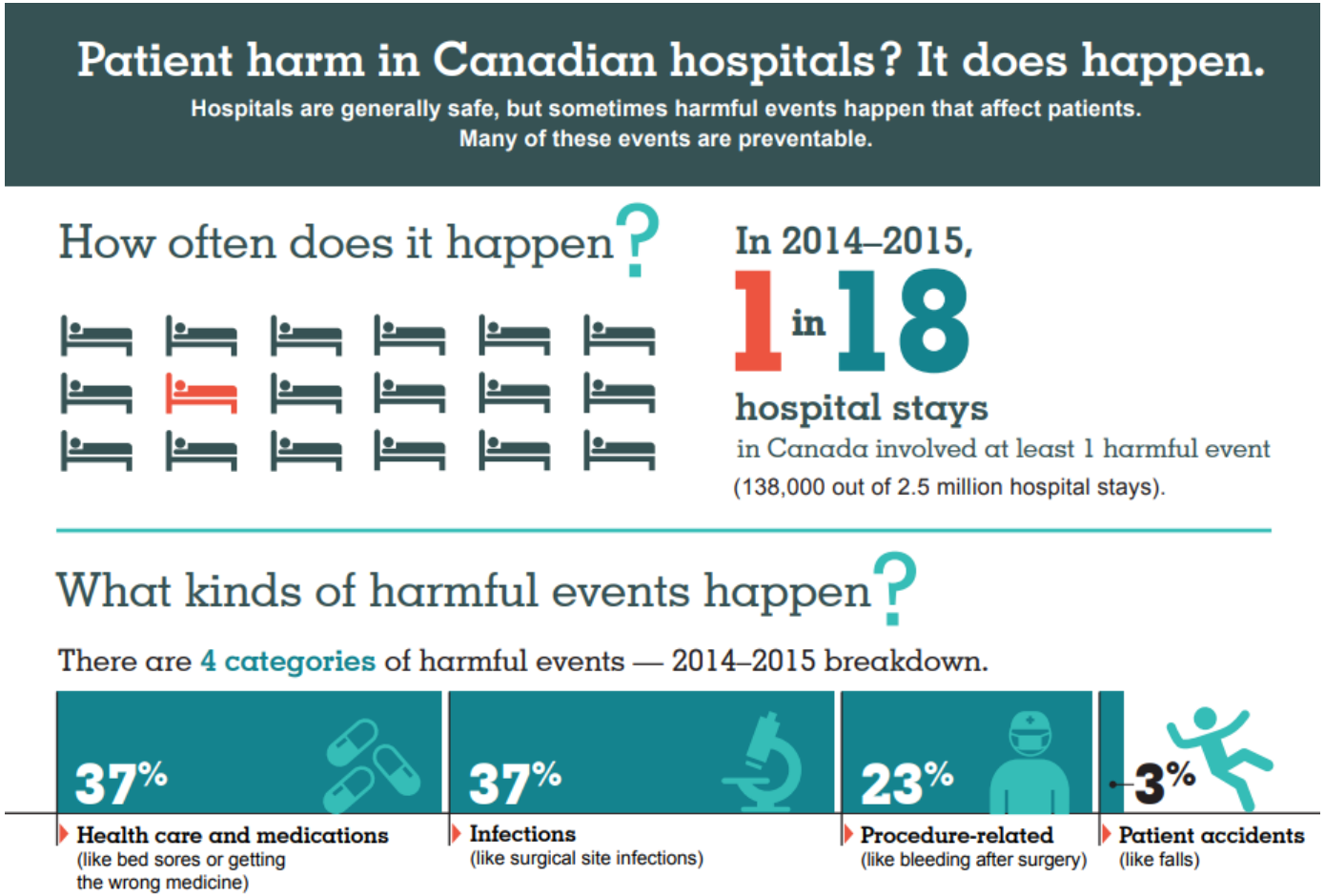
Hospital Harm

Harmful Event
An unintended outcome of care that may be prevented with evidence-informed practices and that is identified and treated in the same hospital stay.

cpsi icsp
Canadian Patient Safety Institute
Institut canadien pour la sécurité des patients

Canadian Institute for Health Information
Institut canadien d'information sur la santé

Source: Measuring Patient Harm in Canadian Hospitals (CPSI/CIHI)

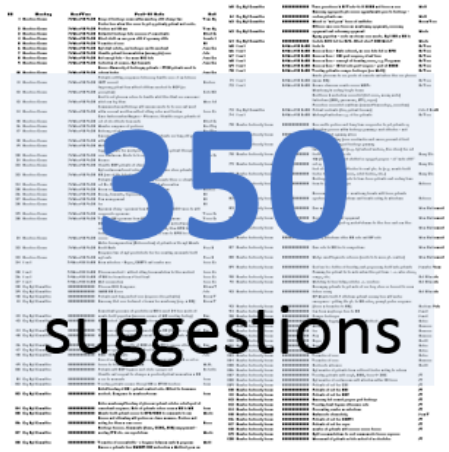


Command Centre

Multi-Generational Plan

Humber Command Centre

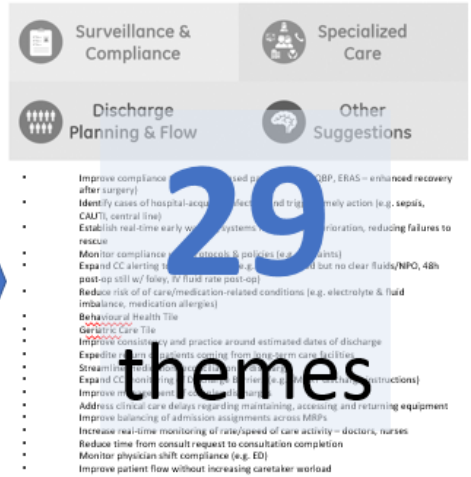
Generation 2



350 suggestions

Leadership Forum, MAC, Capacity Optimization, Directors Council, Pharmacy team meeting, CC team meeting, Meetings with 10+ domain experts

Triage & Affinitizing



29 themes

Filtering for Actionable Criteria

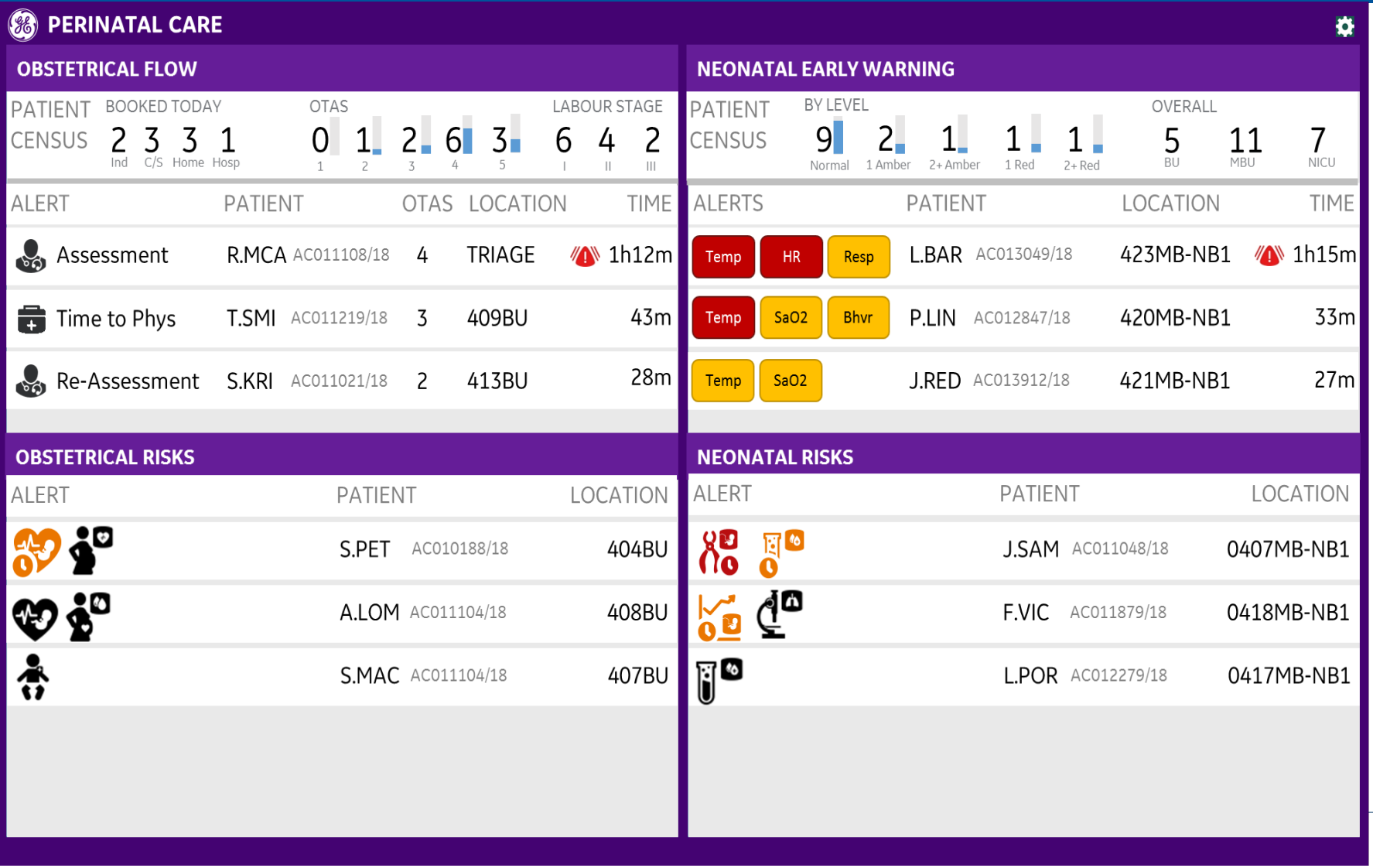
14 ideas

Relevance
Impact
Feasibility

Scoring for Shortlist

5 high-scoring concepts

1. Perinatal Tile



Features:

1. Main View

2. Obstetrical Flow Section

- 2.1 Patient Census by Delivery Type
- 2.2 Patient Census by OTAS Level
- 2.3 Patient Census by Labour Stage
- 2.4 OTAS Assessment Alert: Nursing
- 2.5 OTAS Assessment Alert: Physician

3. Obstetrical Risks Section

- 3.1 Fetal Heart Rate Alert
- 3.2 Pregnancy Induced Hypertension Alert
- 3.3 Shoulder Dystocia Risk Alert
- 3.4 Post Partum Hemorrhage Risk Alert
- 3.5 Early Warning (MEOWS) Alert
- 3.6 No Antenatal Record Alert

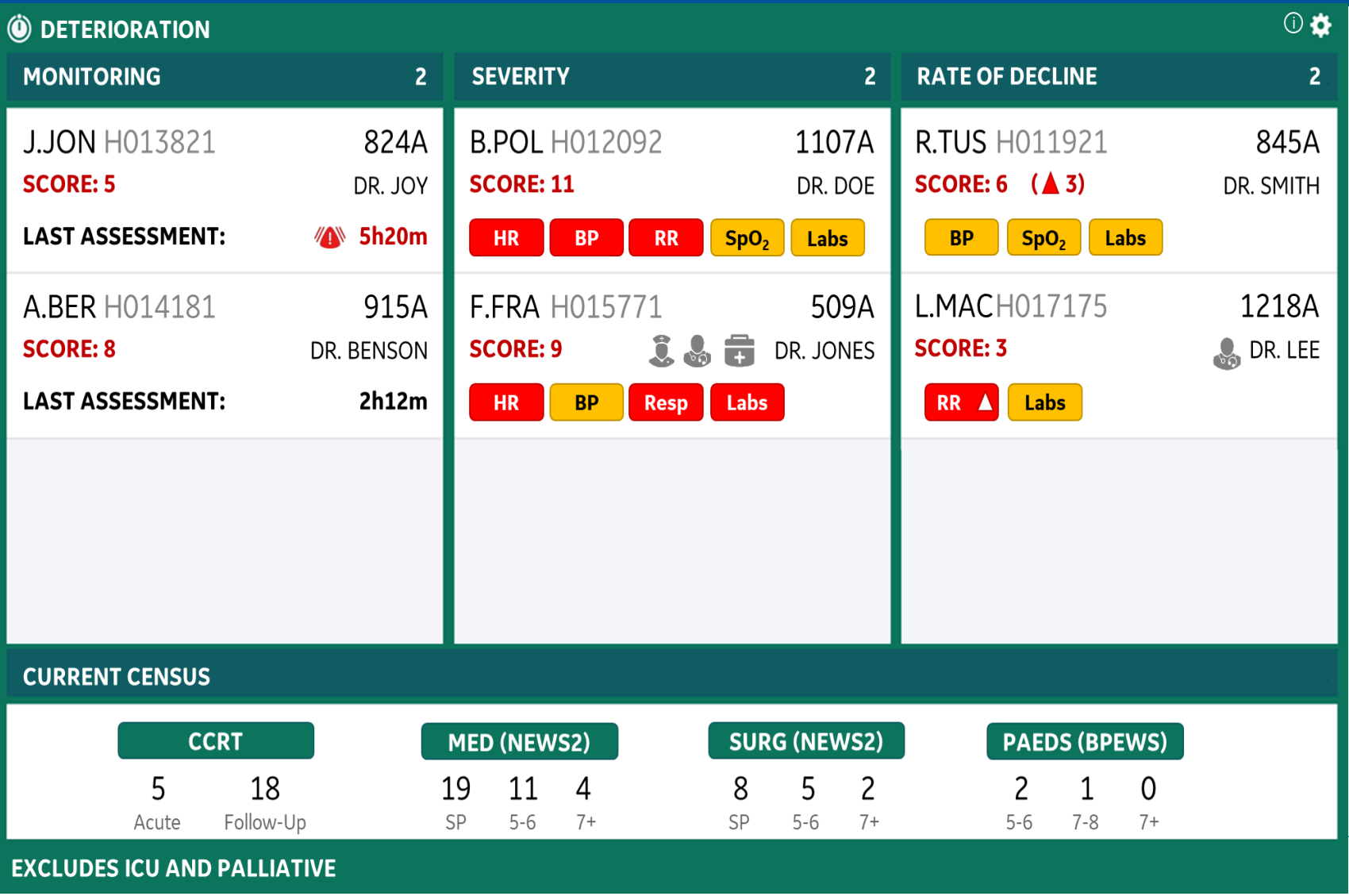
4. Neonatal Early Warning Section

- 4.1 Patient Census by NEWTT Level
- 4.2 Patient Census by Location
- 4.3 NEWTT Alerts

5. Neonatal Risks Section

- 5.1 Cord Bilirubin Alert
- 5.2 Total Serum Bilirubin Alert
- 5.3 Glucose Level Alert
- 5.4 Assisted Delivery Alert
- 5.5 RSV Screening Alert
- 5.6 Weight Loss Alert

2. Clinical Deterioration Tile



1. **Monitoring Alerts**
   - 2.1 NEWS2 Monitoring Delays
   - 2.2 BPEWS Monitoring Delays
2. **Severity Alerts**
   - 3.1 NEWS2 Severity Alerts
   - 3.2 BPEWS Severity Alerts
   - 3.3 Lab Result Alerts
3. **Rate of Decline Alerts**
   - 4.1 NEWS2 Decline Alert: Change
   - 4.2 BPEWS Decline Alerts: Change
   - 4.3 Lab Result Decline Alerts: Change
   - 4.4 BPEWS Decline Alerts: Threshold
   - 4.5 Lab Result Decline Alerts: Threshold
4. **Escalation Indicators**
   - 5.1 Nurse Indicator
   - 5.2 Physician Indicator
   - 5.3 CCRT Indicator
5. **Census Summary**
   - 6.1 CCRT Caseload
   - 6.2 Med NEWS2 Census
   - 6.3 Surg NEWS2 Census
   - 6.4 Paed BPEWS Census

3. Risk of Harm Tile

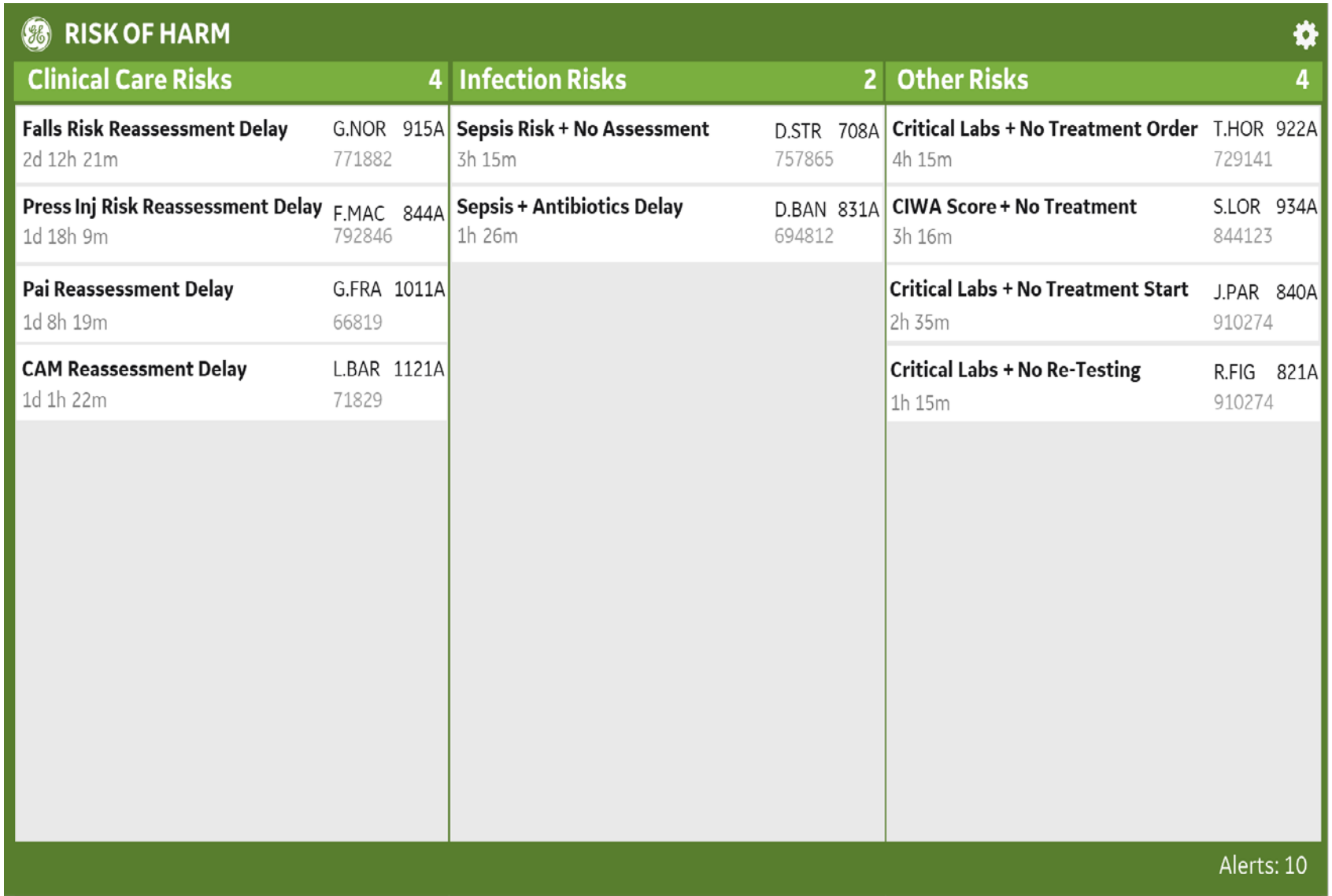
Infection Risks

Clinical Care Risks

Rare Clinical Events

Behavioural Health

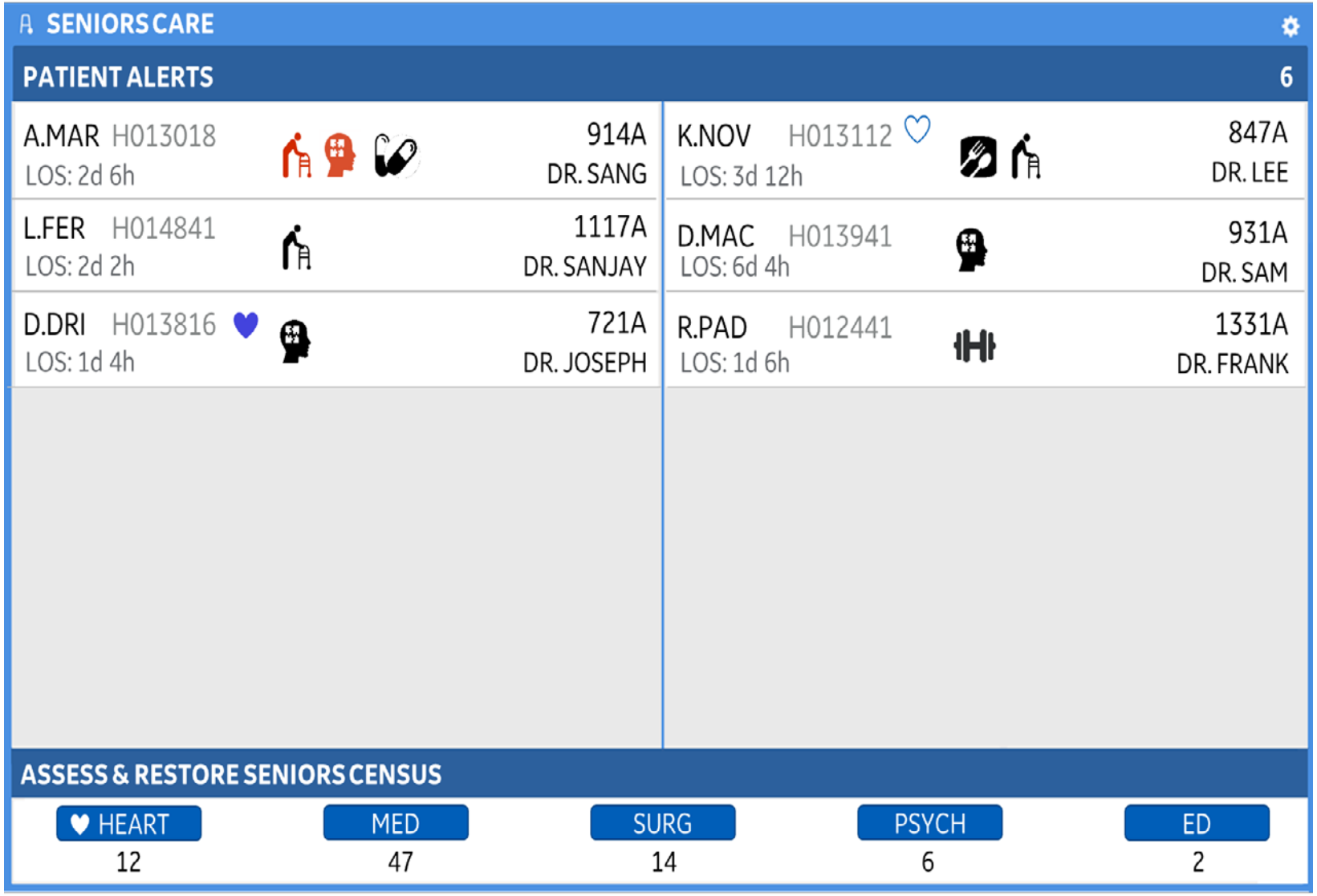
3. Risk of Harm Tile



12 features:

- Views
  - Main View
  - Interactive View
- Alerts:
  - Critical Labs & No Treatment Order
  - Critical Labs & Treatment Administered
  - Critical Labs & No Re-Test
  - Sepsis Recognition Delay
  - Sepsis Treatment Delay
  - Falls Risk Assessment Delay
  - Pressure Injuries Assessment
  - Pain Assessment
  - CAM Assessment
  - Alcohol Withdrawal /Treatment

4. Seniors Care Tile



14 features:

- Views
  - Main View
  - Interactive View
- Alerts:
  - Mobility Baseline Assessment Delay
  - Patient not Mobilized
  - Mobility Level Declining & No Assessment
  - Post Fall Assessment Delay
  - HEART eligible & No Referral Order
  - CAM Positive Patient & No Delirium Order
  - GI Assessment Delay
  - Nutrition Intake Assessment Delay
  - High Risk Medications Alert
- Census Indicators
  - HEART
  - Med/Surg/Psych
  - ED

Humber’s multi-generational plan

2017
Gen 1

2019
Gen 2

2020
Gen 3

Patient Flow and Patient Care Logistics
bed base allocation, bed assignment, room cleaning, critical care capacity management, discharge planning, surgical scheduling and throughput, elevated risk of harm due to logistics intensity, etc.

Clinical Pathway and Reduce Never Events
Delays in Care, Early Warning Algorithms, QBP monitoring, etc.

Community Reach & Reduced Acute Utilization
Support health and wellness, virtual visits, home monitoring, communication and collaboration

High Reliability

Care Transformation

HUMBER RIVER HOSPITAL

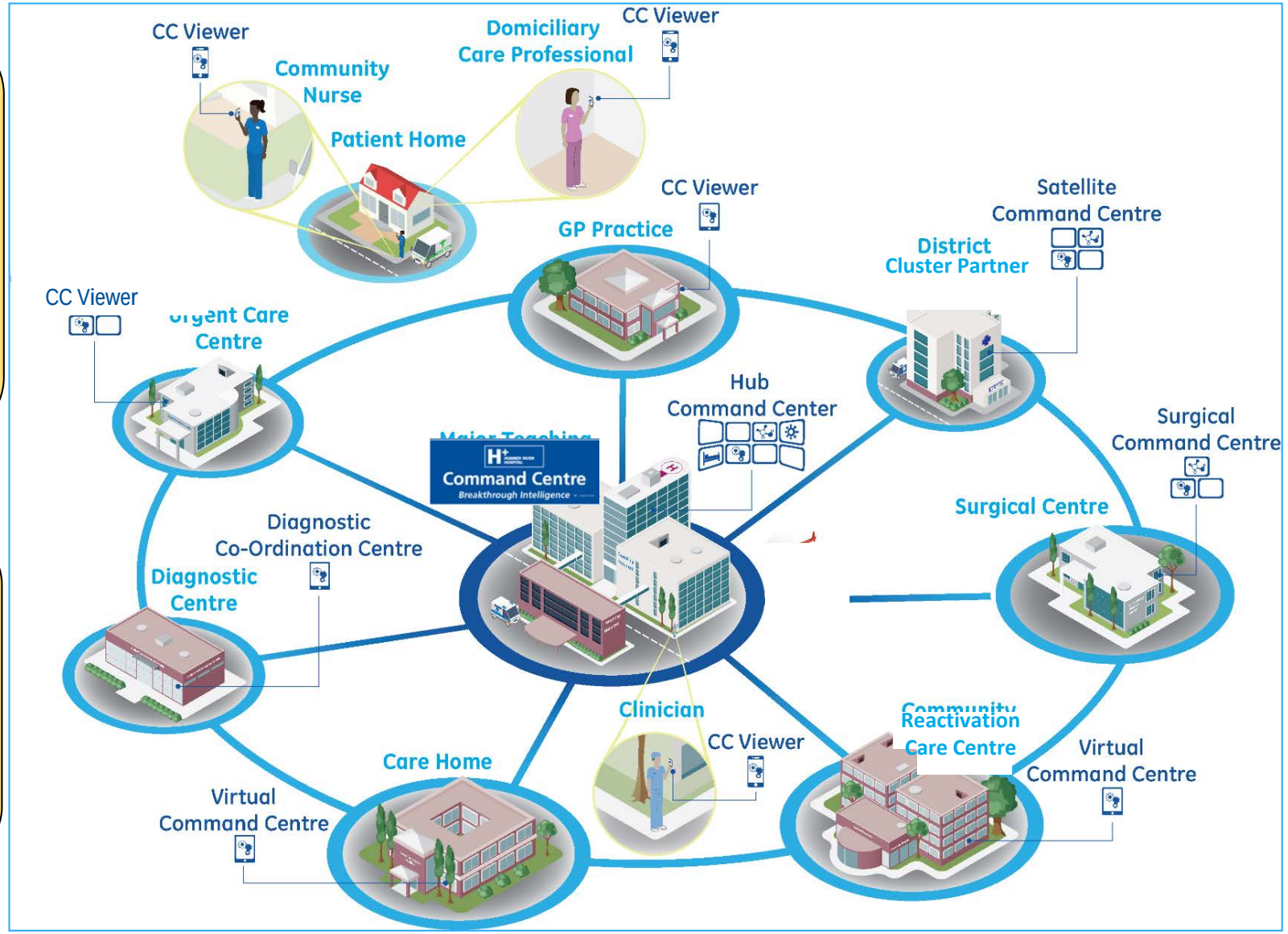
Hub of a Care Community - Coordination and Empowerment

Community Reach

- Support and empower patients to support their own health and wellness
- Monitor patient cohorts
- Expand access to chronic disease management tools and education

Patient Access

- Increase capacity of specialists
- Enable communication and collaboration within the Constellation of Care®



Efficiency

- Decrease ED visits
- Decrease readmission rates by providing care at home and in the community
- Improve efficiency of care planning and management

Improved Outcomes

- Reduce utilization of acute care
- Maximize opportunities to intervene earlier and adjust patient care plan as necessary

Exceptional Care…. Healthier Community

HUMBER RIVER HOSPITAL

QUESTIONS

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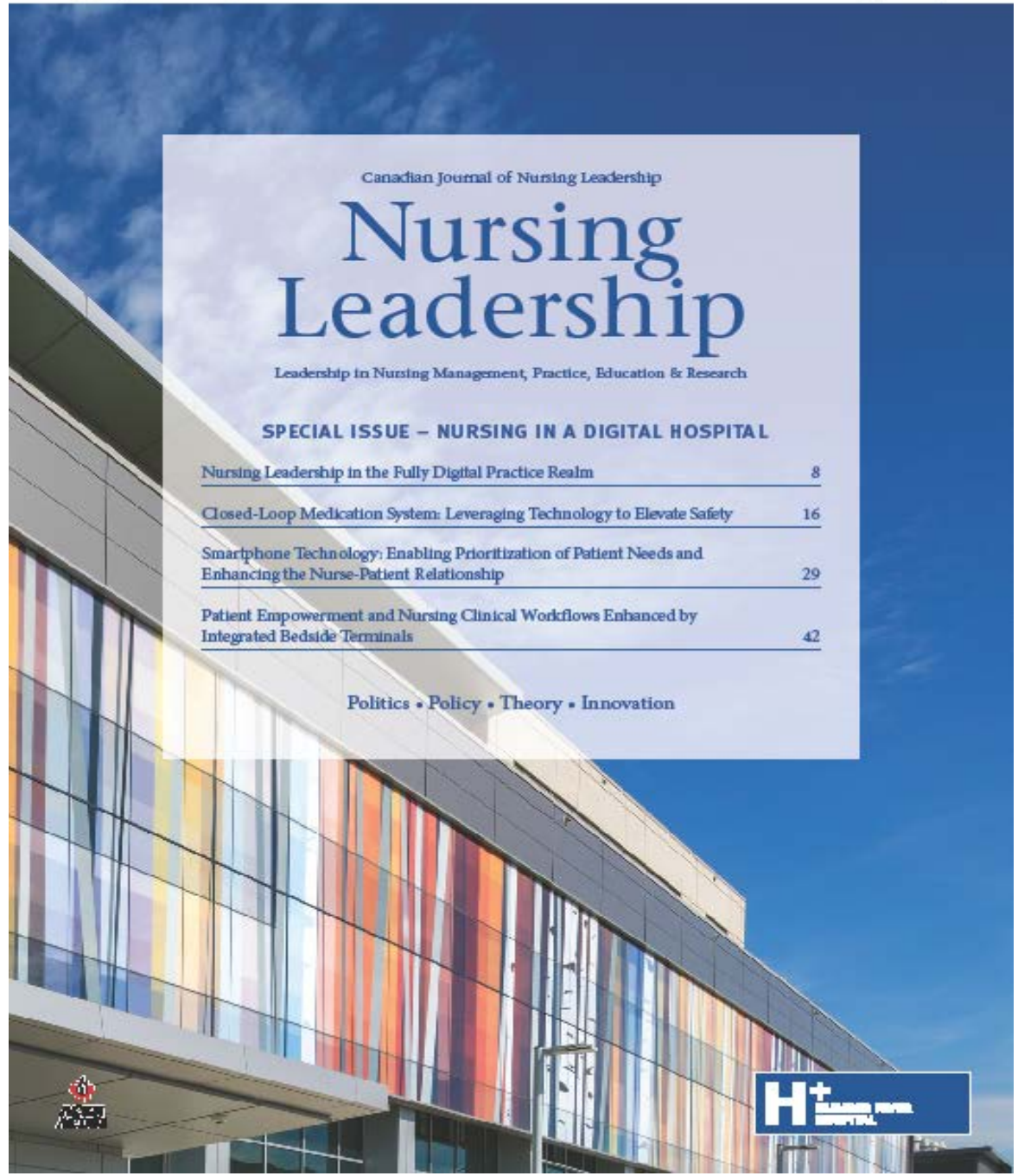

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Politics • Policy • Theory • Innovation