HILLROM™ SMART DEVICE CONNECTIVITY AND PATIENT RISK SURVEILLANCE

Intervene Early to Keep Patient Safe

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Our Goals For Today

- Review the value of a connected care IT eco-system in meeting patient safety goals.
- Discuss promoting earlier recognition of patient deterioration.
- Present Hillrom's Smart Device Connectivity and Patient Risk Surveillance solution to:
  - Collect real-time patient data
  - Identify patients at risk for deterioration
  - Communicate actionable insights
  - Improve patient safety and outcomes

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The Med-Surg Environment is Challenging

- Increasing patients, acuity and complexity
- High patient to nurse staffing ratios
- Disparate technologies in collecting and analyzing patient data

= **REACTIVE CARE**

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New Technologies Revolutionize the Way Patient Data is Collected and Communicated

- Smart beds
- Continuous monitoring devices
- Mobile devices
- Electronic Medical Records (EMR)

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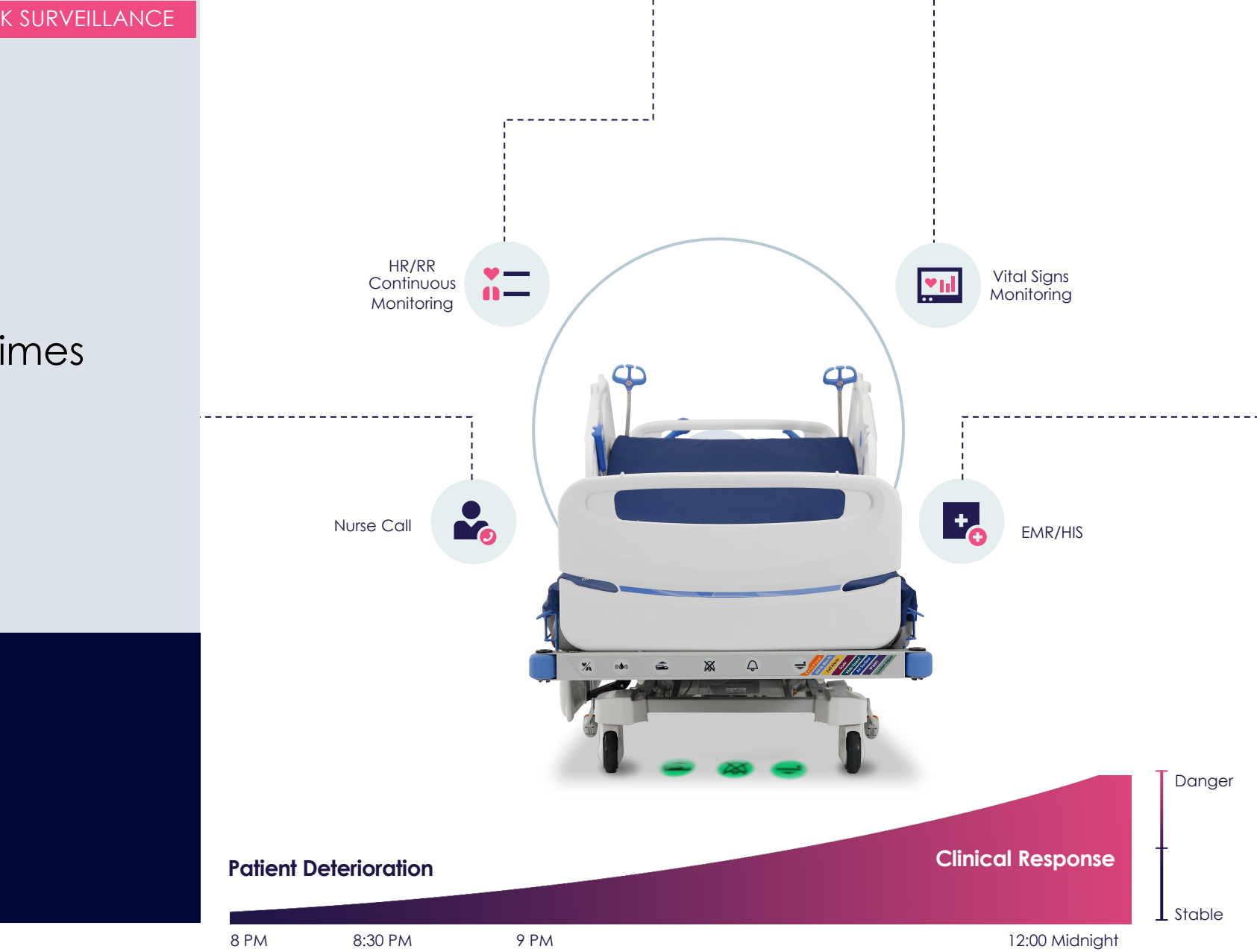
Devices not connected to capture patient data and communicate insights can increase clinical response times for patients at risk of deterioration.

Current State:

Clinicians are often unable to identify patients at-risk until 4+ hours after the patient's condition deteriorated and entered greater danger.



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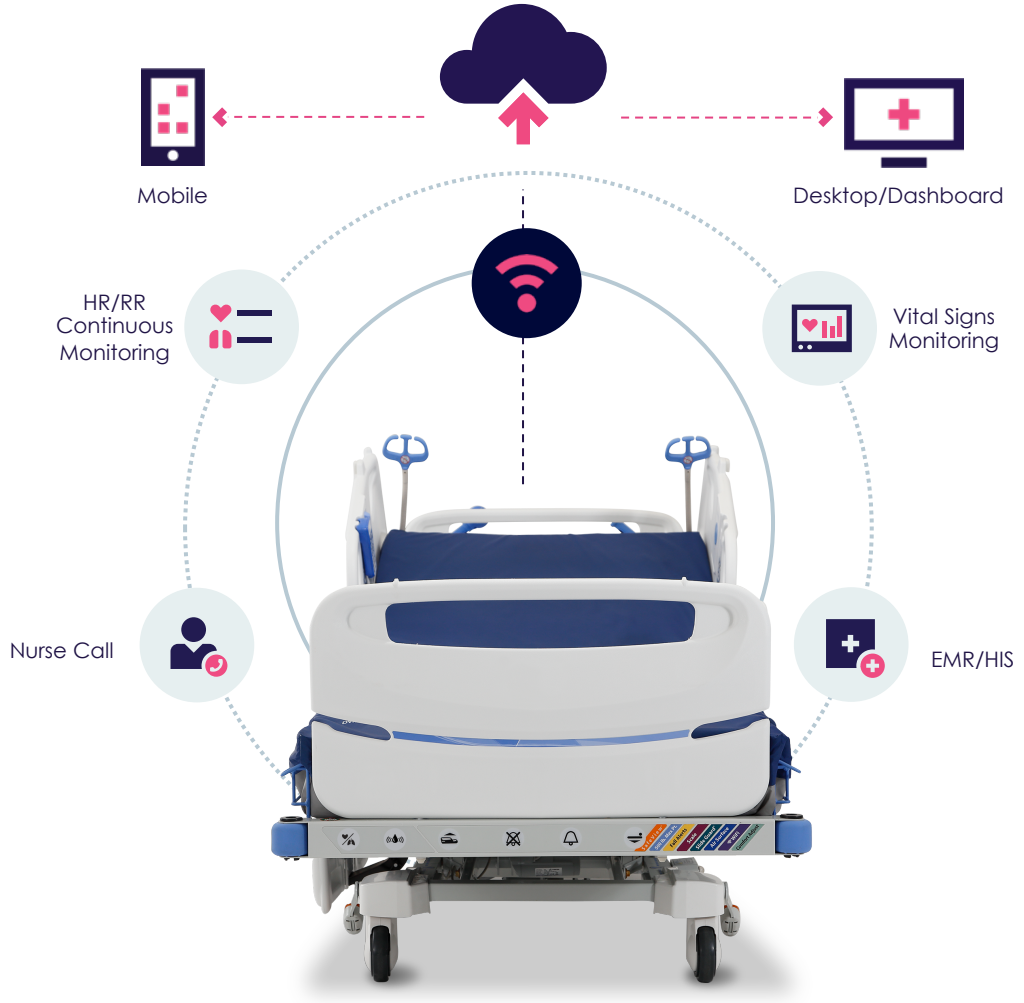
Connecting devices to collect and analyze patient data in near real-time produces:

- Simplified and actionable patient insights to clinicians
- Proactive clinical intervention
- Enhanced care communication
- Improved patient safety

Desired State:

Early detection of changes in patient deterioration and clinician intervention to improve safety, outcomes and cost of care.



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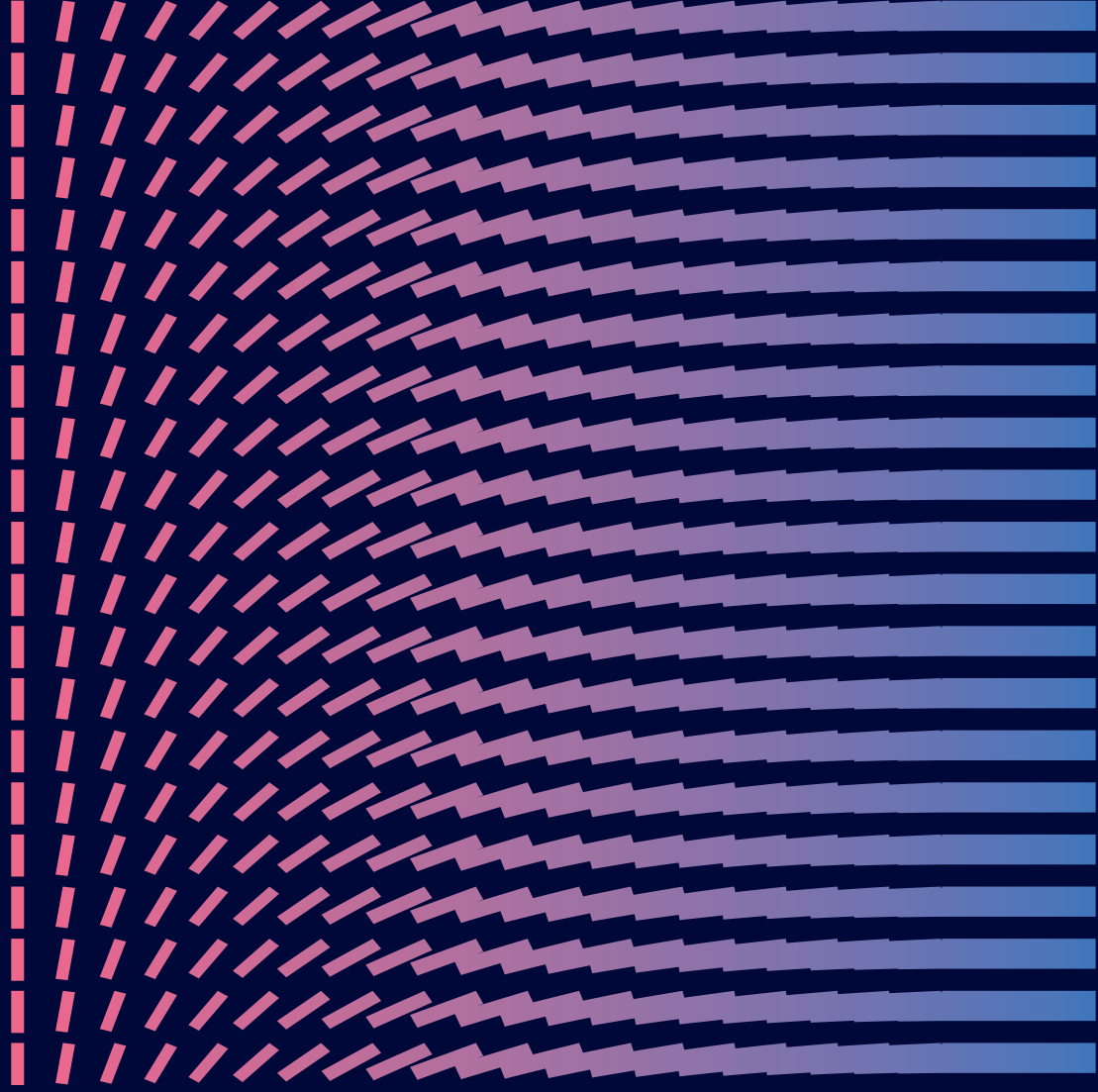
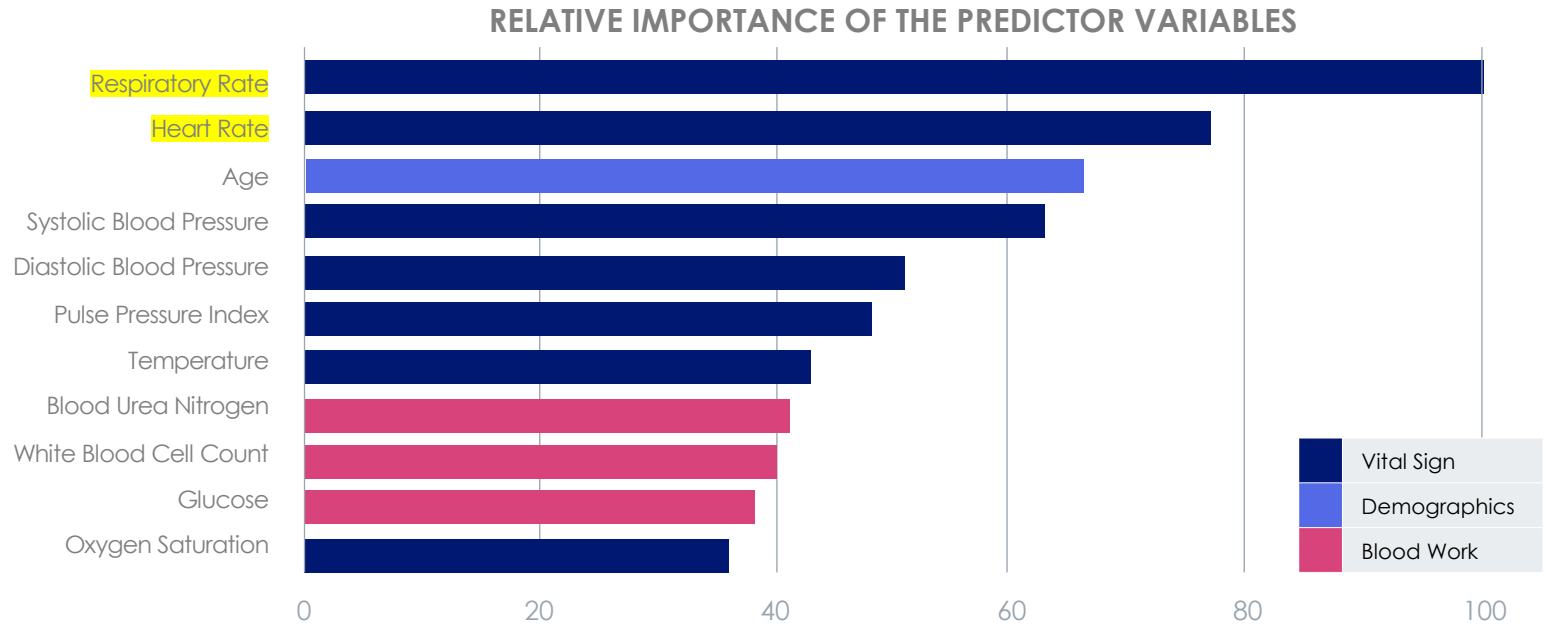
PROMOTING EARLY DETECTION OF PATIENT DETERIORATION



Leading Indicators of Deterioration

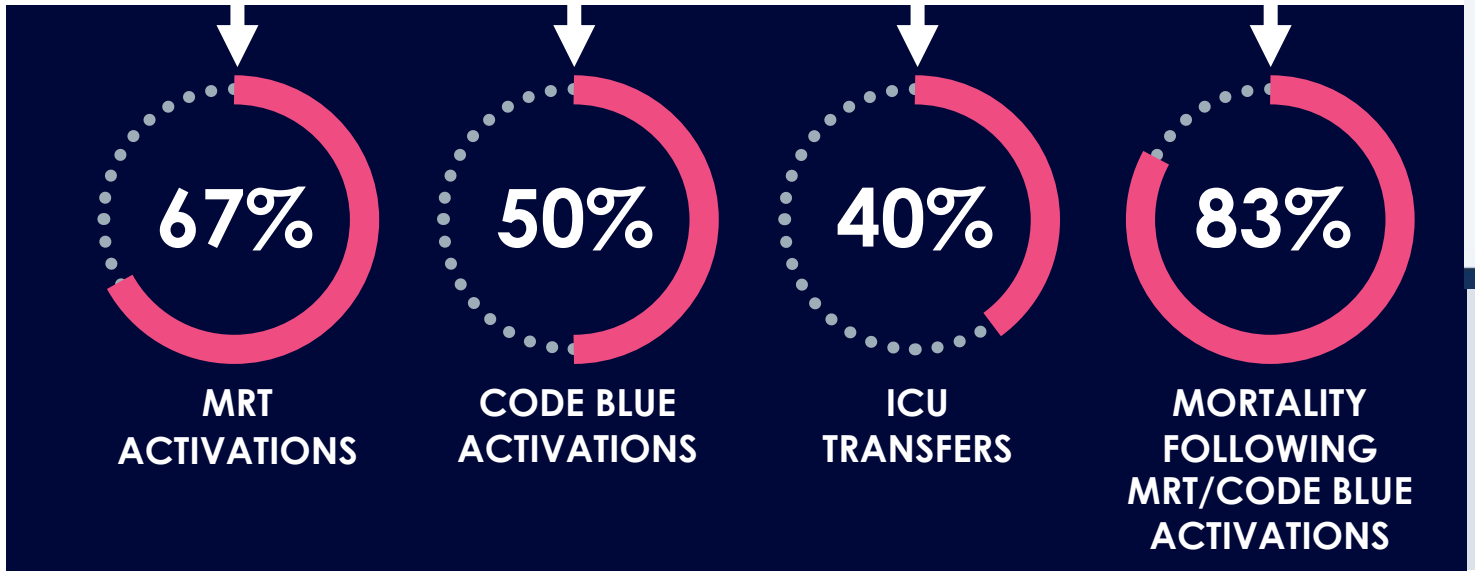
Respiratory rate and heart rate are the most important predictor variable of deterioration.[1]

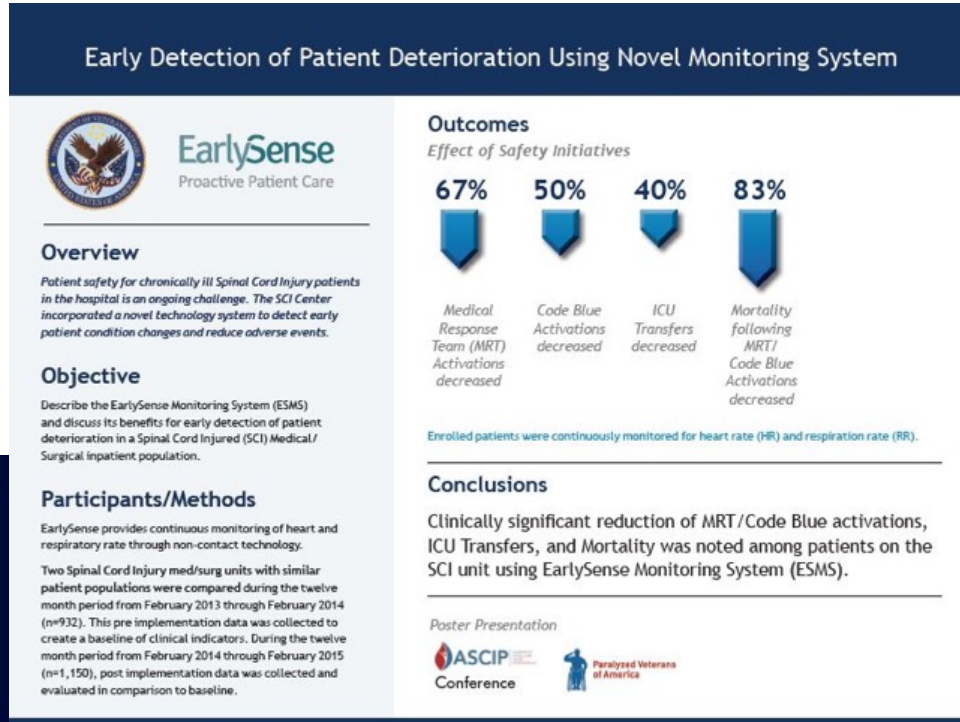


1. MC11587: Welch Allyn White Paper: Telemetry Monitoring on the Medical/Surgical Floor.

Contact-Free, Continuous Monitoring

EARLY DETECTION OF PATIENT DETERIORATION USING A NOVEL MONITORING SYSTEM[1]




Early Detection of Patient Deterioration Using Novel Monitoring System

EarlySense
Proactive Patient Care

Overview

Patient safety for chronically ill Spinal Cord Injury patients in the hospital is an ongoing challenge. The SCI Center incorporated a novel technology system to detect early patient condition changes and reduce adverse events.

Objective

Describe the EarlySense Monitoring System (ESMS) and discuss its benefits for early detection of patient deterioration in a Spinal Cord Injured (SCI) Medical/ Surgical inpatient population.

Participants/Methods

EarlySense provides continuous monitoring of heart and respiratory rate through non-contact technology.

Two Spinal Cord Injury med/surg units with similar patient populations were compared during the twelve month period from February 2013 through February 2014 (n=932). This pre implementation data was collected to create a baseline of clinical indicators. During the twelve month period from February 2014 through February 2015 (n=1,150), post implementation data was collected and evaluated in comparison to baseline.

Outcomes

Effect of Safety Initiatives

67% Medical Response Team (MRT) Activations decreased

50% Code Blue Activations decreased

40% ICU Transfers decreased

83% Mortality following MRT/ Code Blue Activations decreased

Enrolled patients were continuously monitored for heart rate (HR) and respiration rate (RR).

Conclusions

Clinically significant reduction of MRT/Code Blue activations, ICU Transfers, and Mortality was noted among patients on the SCI unit using EarlySense Monitoring System (ESMS).

Poster Presentation

ASCIP Conference

Paralyzed Veterans of America

Clinically significant reduction of MRT/Code Blue activations, ICU Transfers, and Mortality

1. Early Detection of Patient Deterioration Using Novel Monitoring System. VA Poster. ASCIP Conference.

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Earlier Recognition of Patient Deterioration

Contact-Free, Continuous Monitoring

Early Recognition of Patient Deterioration

Earlier Intervention

Improved Patient Safety Outcomes

Reduced Financial Burden

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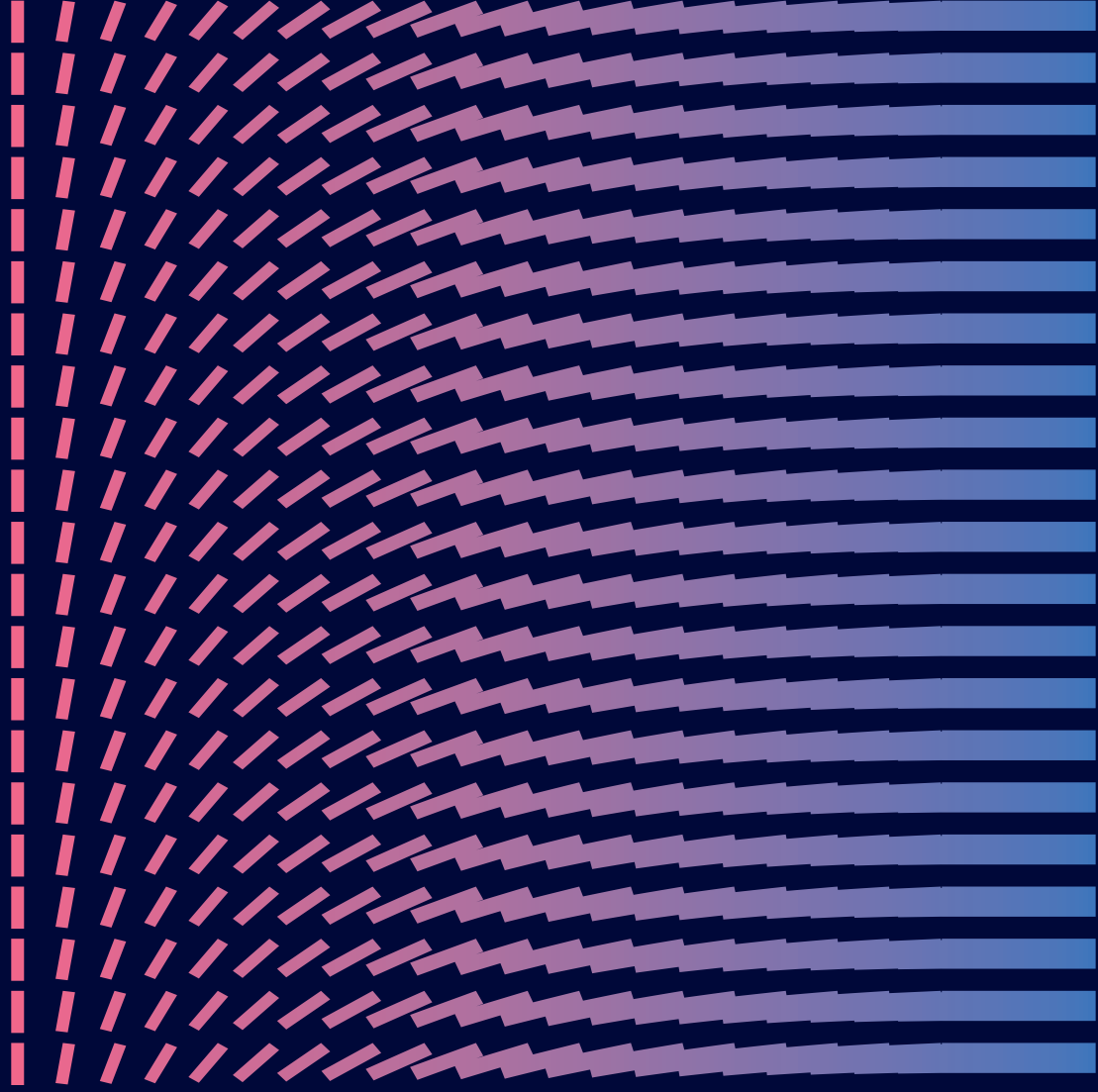
HILLROM™ SMART DEVICE CONNECTIVITY AND PATIENT RISK SURVEILLANCE



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Hillrom™ Smart Device Connectivity and Patient Risk Surveillance

Communicate actionable insights at the point of care to improve patient safety.

Collect real-time patient data

Identify patients at risk for deterioration

Communicate actionable insights

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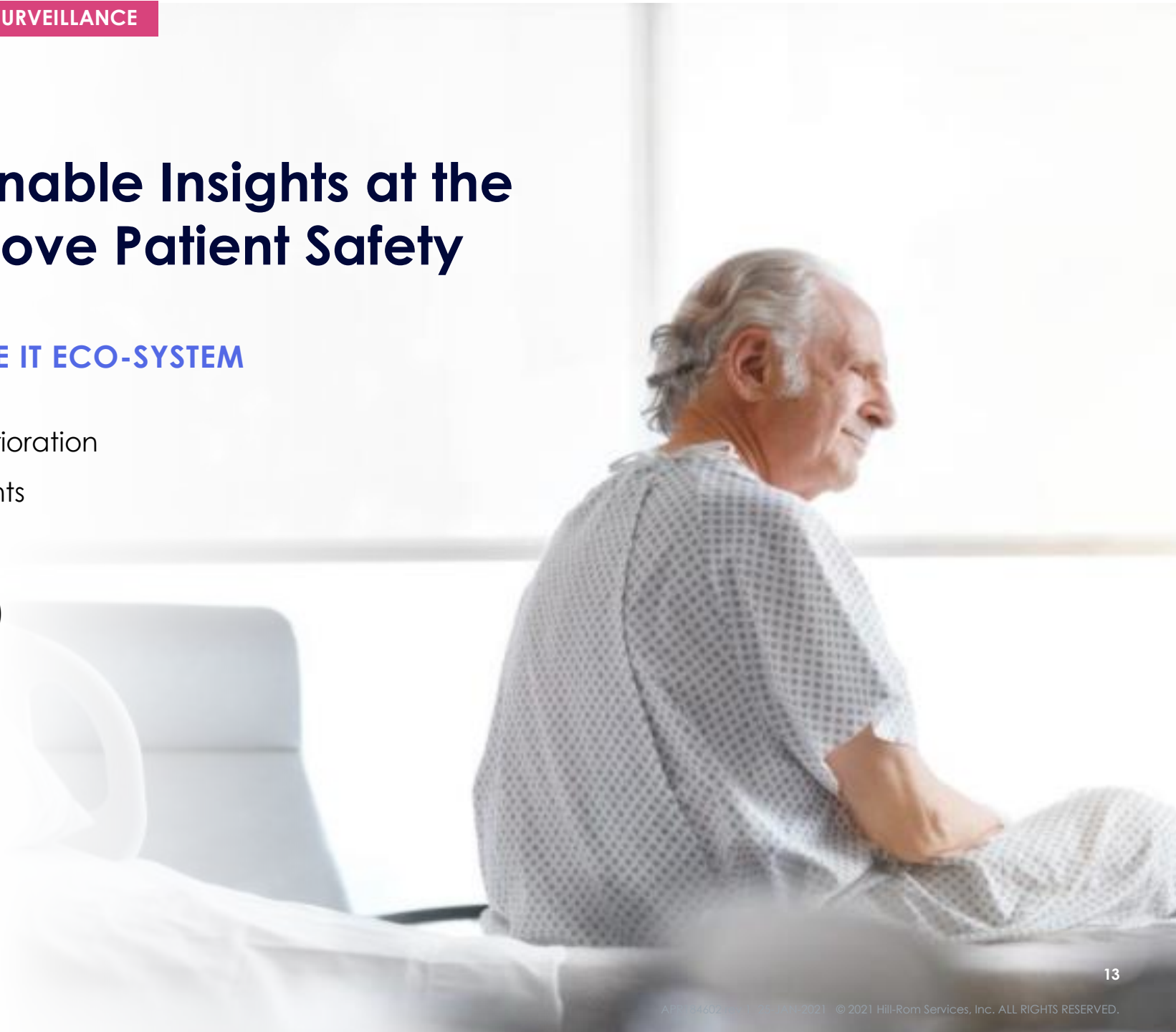
Communicate Actionable Insights at the Point of Care to Improve Patient Safety



A CLOUD-BASED CONNECTED CARE IT ECO-SYSTEM

- Collects real-time patient data
- Identifies patients at risk for deterioration
- Communicates actionable insights

AT THE POINT OF CARE

- Early warning scores (MEWS/SIRS)
- Alerts and notifications
- Contextual information
- Hospital protocols

TO IMPROVE PATIENT SAFETY

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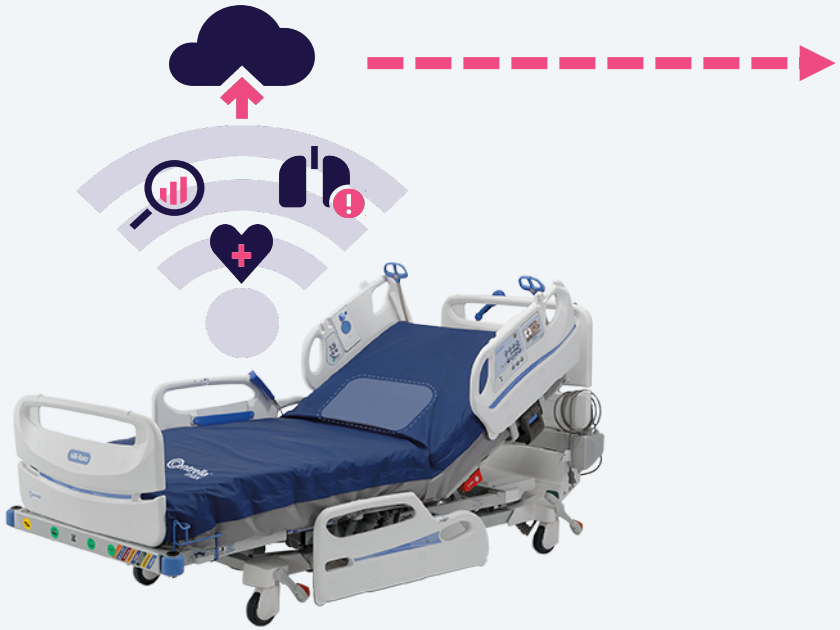
Convert your meaningful data into actionable information and deliver it to caregivers.



Collect clinically relevant data that can be sent wirelessly to the hospital's ecosystem.

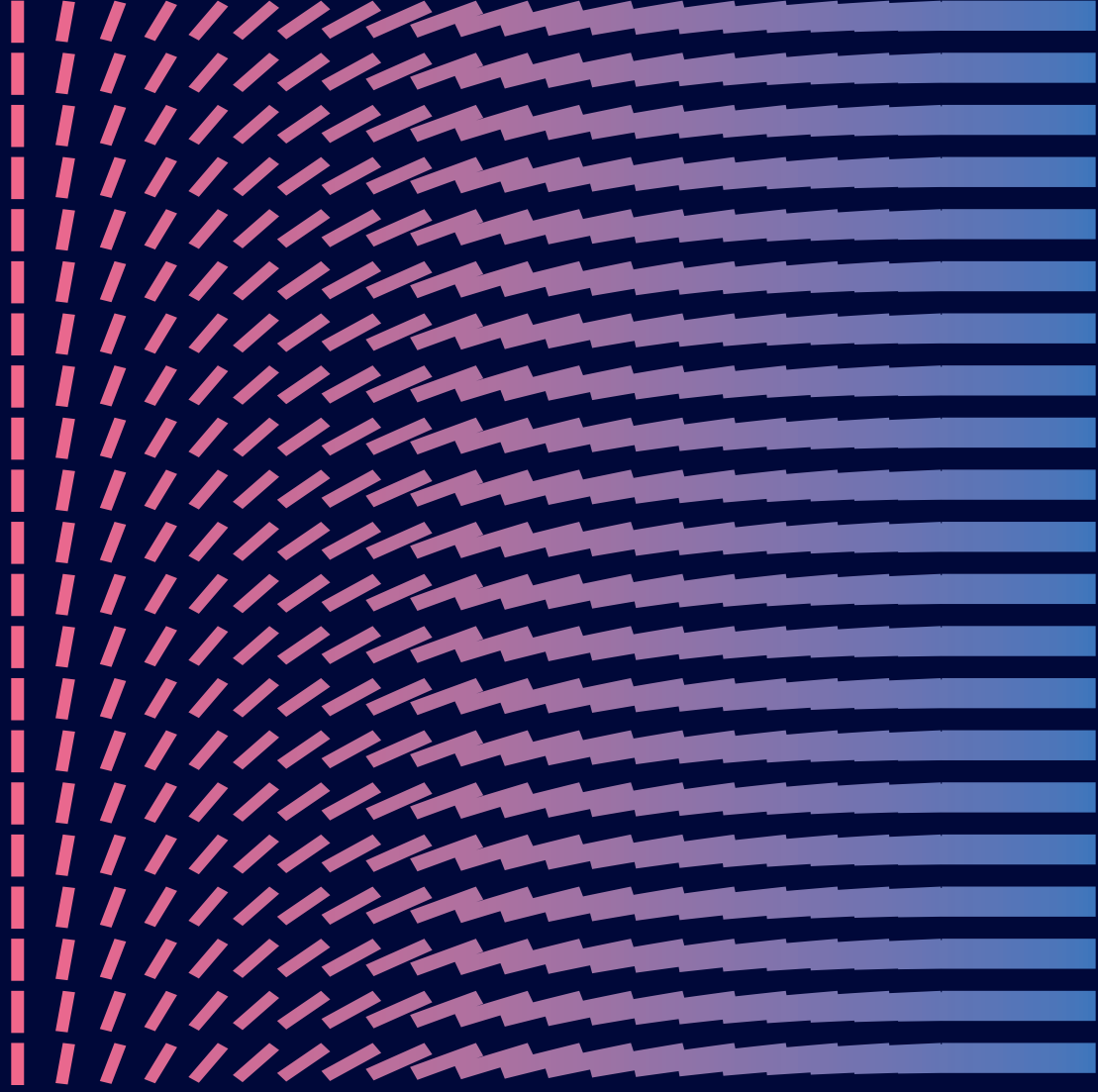
Smart Device Connectivity

- Alerts to Alarm Managers, Nurse Call, and Mobile platforms
- EMR integration for charting weight, Heart Rate, Respiratory Rate, and other bed values
- Visualization of data on Voalte® Mobile App, dashboards, and reports

Patient Risk Surveillance

- HR/RR data updates early warning scores to identify patients at risk for deterioration

HOW IT WORKS



Contact-Free, Continuous Monitoring

POWERED BY EARLYSENSE TECHNOLOGY

- Identify signs of patient deterioration
- Initiate an early intervention
- Promote patient safety

THE PROVEN PERFORMANCE AND ACCURACY OF EARLYSENSE MONITORING IS NOW EMBEDDED INTO THE CENTRELLA® SMART+ BED.

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Contact-Free, Continuous Monitoring

HOW DOES IT WORK?

When your heart beats it creates motion.

When you breathe, your lungs expand and contract, creating motion.

The Contact-Free, Continuous Monitoring sensor detects cardiac and respiratory motion through the mattress.

The sensor can update the Heart Rate & Respiratory Rate values twice per second.

This information is compiled in an algorithm:

- Creates a running trend of HR/RR
- Filters out other constant motion
- (e.g. air surface)

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Connect Wirelessly for Bed Association and Patient Verification

- Easily connect your Centrella® Smart+ bed wirelessly to your hospital wi-fi network
- Collect clinical data from your hospital ADT, EMR and other IT systems
- Assign the bed to the room/location and to your patient

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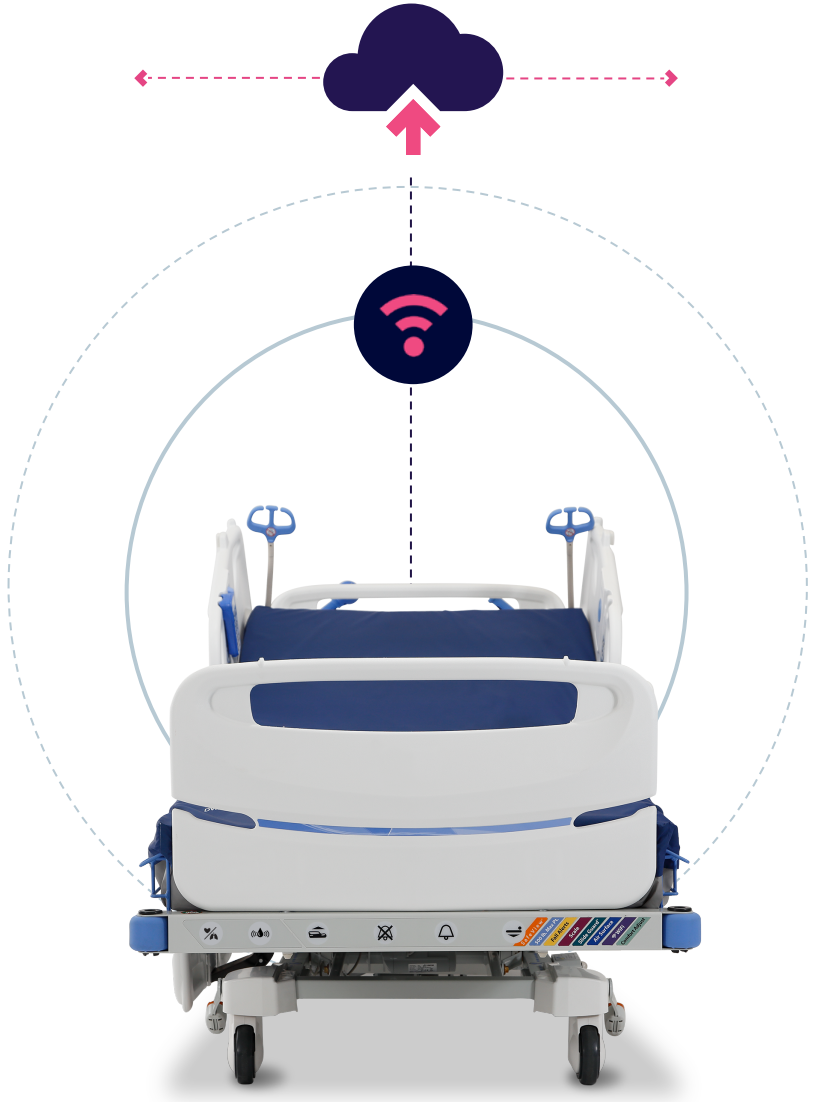
Collect Real-time Patient Data

By collecting and analyzing patient data, including patient heart rate, respiratory rate, weight, and alert information, caregivers can make informed decisions and care plans to keep patients safe.

- Collect patient data from many devices in near real-time
- Gather, store and analyze information from your EMR, smart bed,patient monitoring devices and more



Identify Patients at Risk for Deterioration

CONTINUOUSLY MONITOR, UPDATE, AND ALERT ON PATIENT RISK.

1. **Calculate Risk:** On admission, patient history, vitals, and weight are charted. **Baseline risk** is calculated by MEWS/SIRS scores with inputs from EMR. HR/RR is acquired continuously from CFCM and Centrella® Smart+ bed to update scores.
2. **Detect Risk:** Risk scores are updated and communicated on Dashboard, Voalte® Status Board and Voalte® Mobile App. Scoring thresholds can be configured to communicate status using nurse call as risk increases.
3. **Address Risk:** Caregiver is alerted proactively and can activate any necessary protocol.

Dedicated Clinical Services to Sustain Optimization and Support Patient Risk Surveillance Solution

- Dedicate clinician on-site during go-live
- Deployment support
- Ongoing education at each client site
- Develop training plan for new hires and super users
- Provide new release communication and training
- Continuous on-site clinical support

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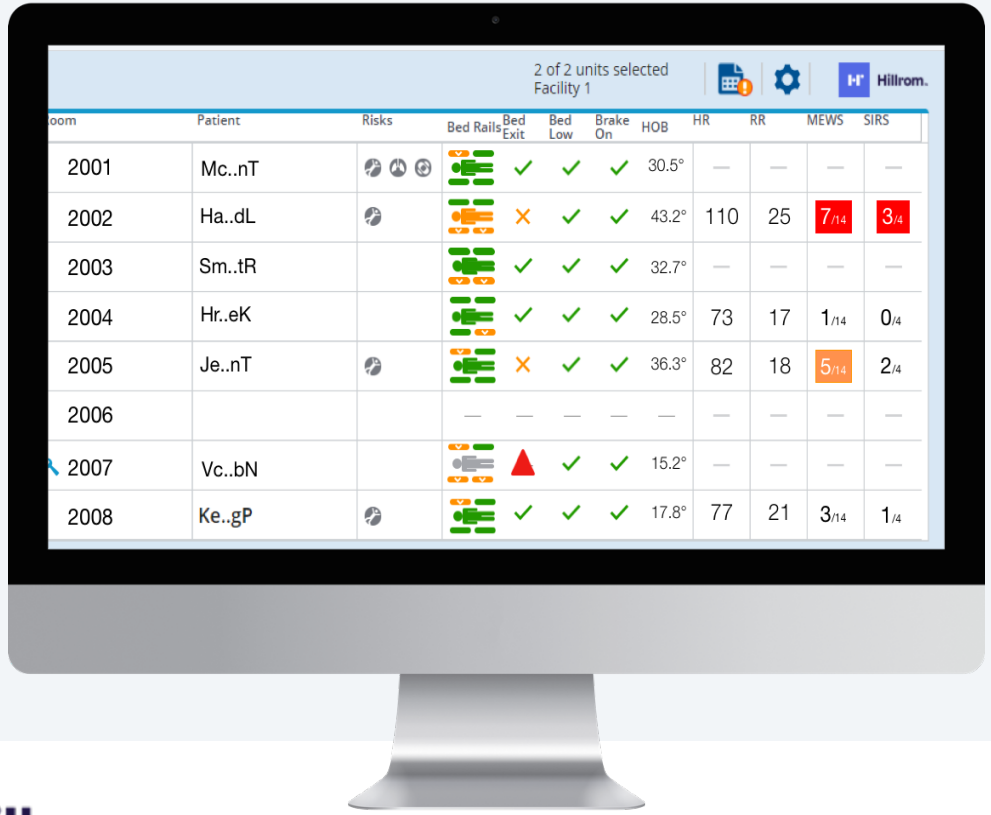
Communicate Actionable Insights on Dashboard

PROVIDE VISUALIZATION OF MEWS/SIRS PATIENT RISK SCORES AND HR/RR DATA



HR/RR Values

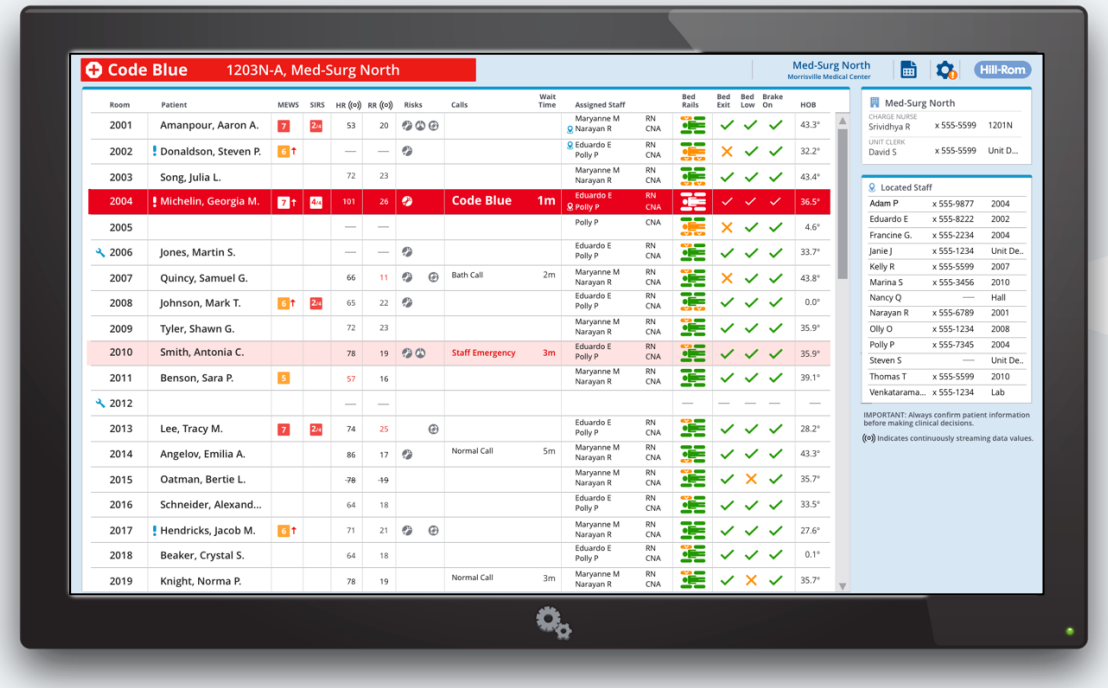
HR	RR
—	—
110	25
—	—
73	17
82	18
—	—
—	—
77	21

Risk scores

MEWS	SIRS
—	—
7/14	3/4
—	—
1/14	0/4
5/14	2/4
—	—
—	—
3/14	1/4

Communicate Actionable Insights on Voalte® Status Board

PROVIDE UNIT-WIDE VISUALIZATION OF MEWS/SIRS PATIENT RISK SCORES AND HR/RR DATA



Summary of patients at risk and risk scores

HR	RR	Risks
53	20	
—	—	
72	23	
101	26	
—	—	
—	—	
66	11	
65	22	
72	23	

Dynamic sensing of patient HH/RR vitals

MEWS	SIRS
7	2/4
6 ↑	
7 ↑	4/4
6 ↑	2/4

Staff Assignments

Assigned Staff		Bed Rails
Maryanne M Narayan R	RN CNA	
Eduardo E Polly P	RN CNA	
Maryanne M Narayan R	RN CNA	
Eduardo E Polly P	RN CNA	
Polly P	CNA	
Eduardo E Polly P	RN CNA	
Maryanne M Narayan R	RN CNA	
Eduardo E Polly P	RN CNA	
Maryanne M Narayan R	RN CNA	

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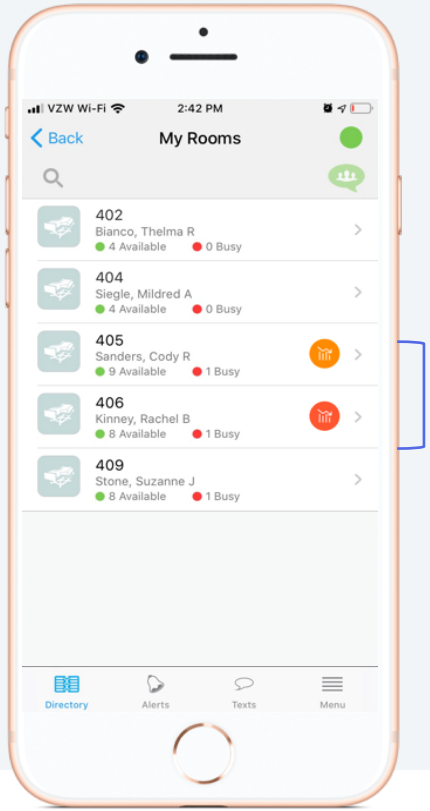
Communicate Actionable Insights on Voalte® Mobile App

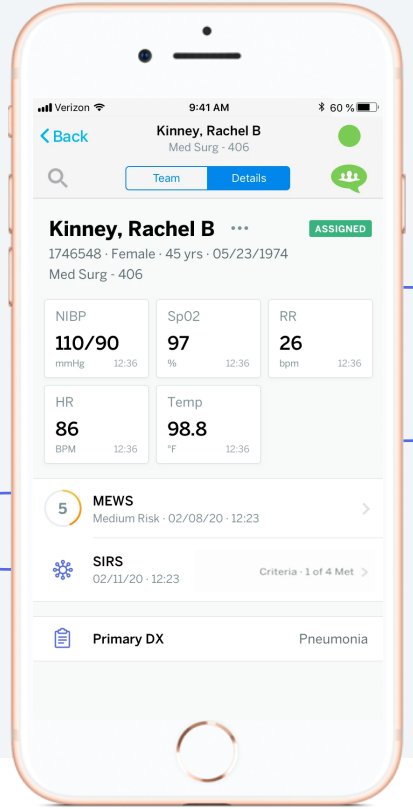
DISPLAY PATIENT DATA, RISK SCORES, AND PROTOCOLS

Patients integration on Voalte® Mobile App

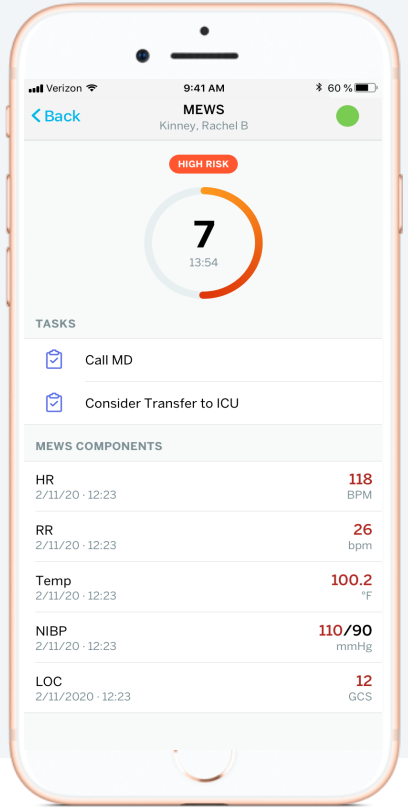


Risk indication

Risk scores



Vitals Summary



Tasks can be displayed to communicate facility protocols

Values that make up the score can be displayed

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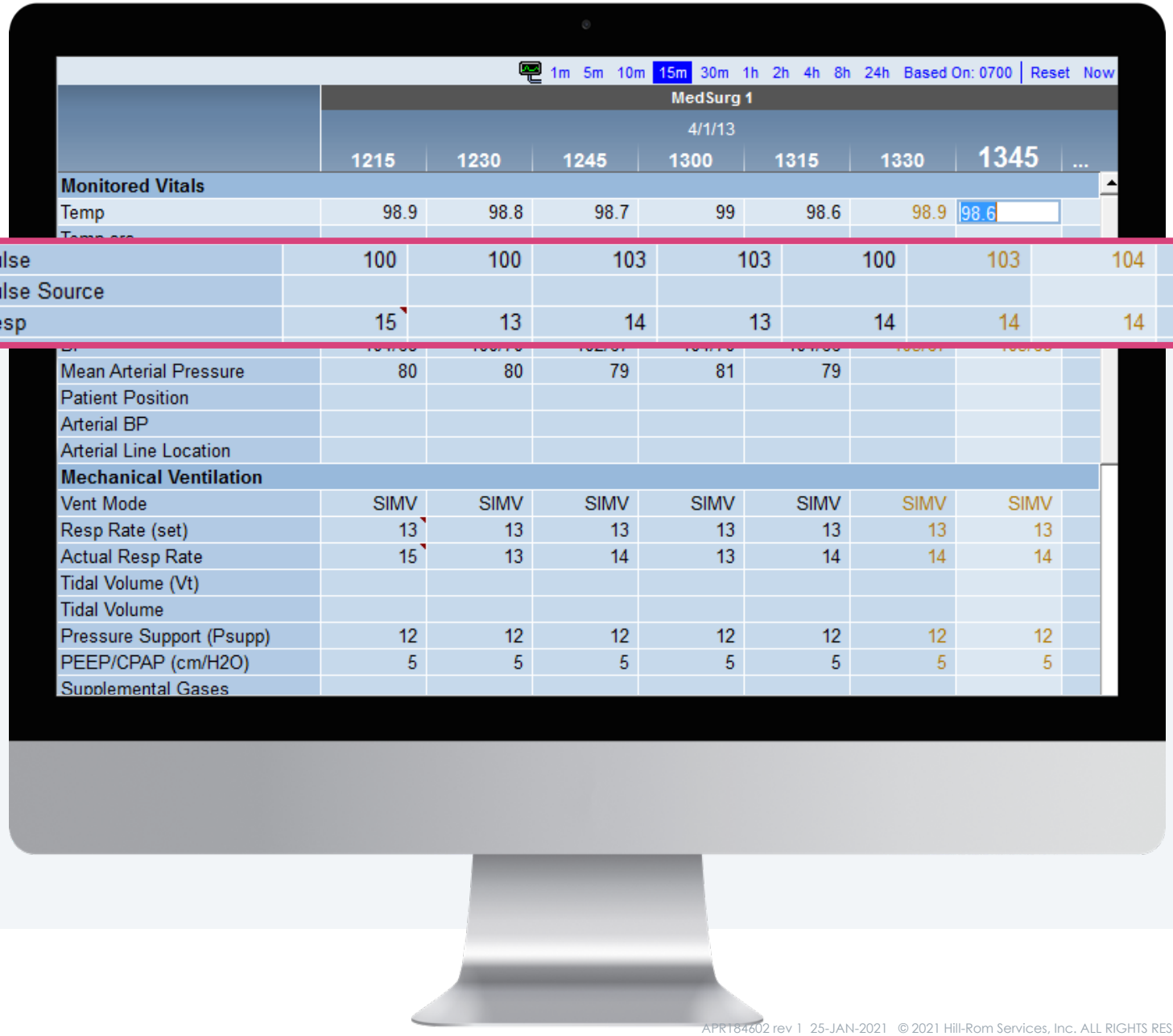
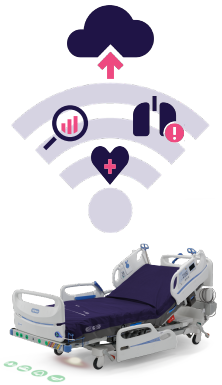
Communicate Actionable Insights to the EMR

ACCESS HR/RR DATA ON THE EMR WHERE CLINICIANS CAN CHOOSE WHAT TO CHART



Communicate Actionable Insights At The Point Of Care

1 COLLECT PATIENT DATA



Wireless Centrella® Smart+ bed and Contact-Free, Continuous Monitoring

2 COMMON GATEWAY

Cloud

EMR ADT

3 IDENTIFY PATIENTS AT RISK

Vitals Patient History Diagnostic

Patient data updates early warning scores to identify patients at risk for deterioration

COMPLIANCE REPORTING

4 COMMUNICATE ACTIONABLE INSIGHTS

Voalte® Mobile App

Voalte® Status Board

Collaborative care

5 ENABLE CLINICAL ACTION

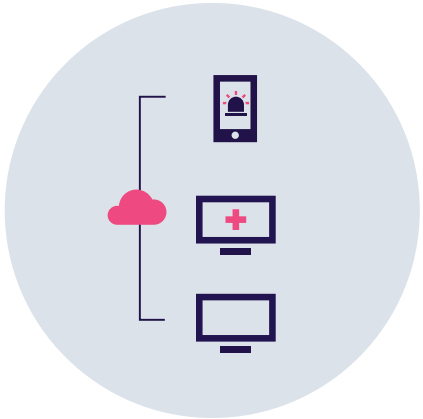
Caregiver Patient

Hillrom™ Smart Device Connectivity and Patient Risk Surveillance

Communicate actionable insights at the point of care to improve patient safety.

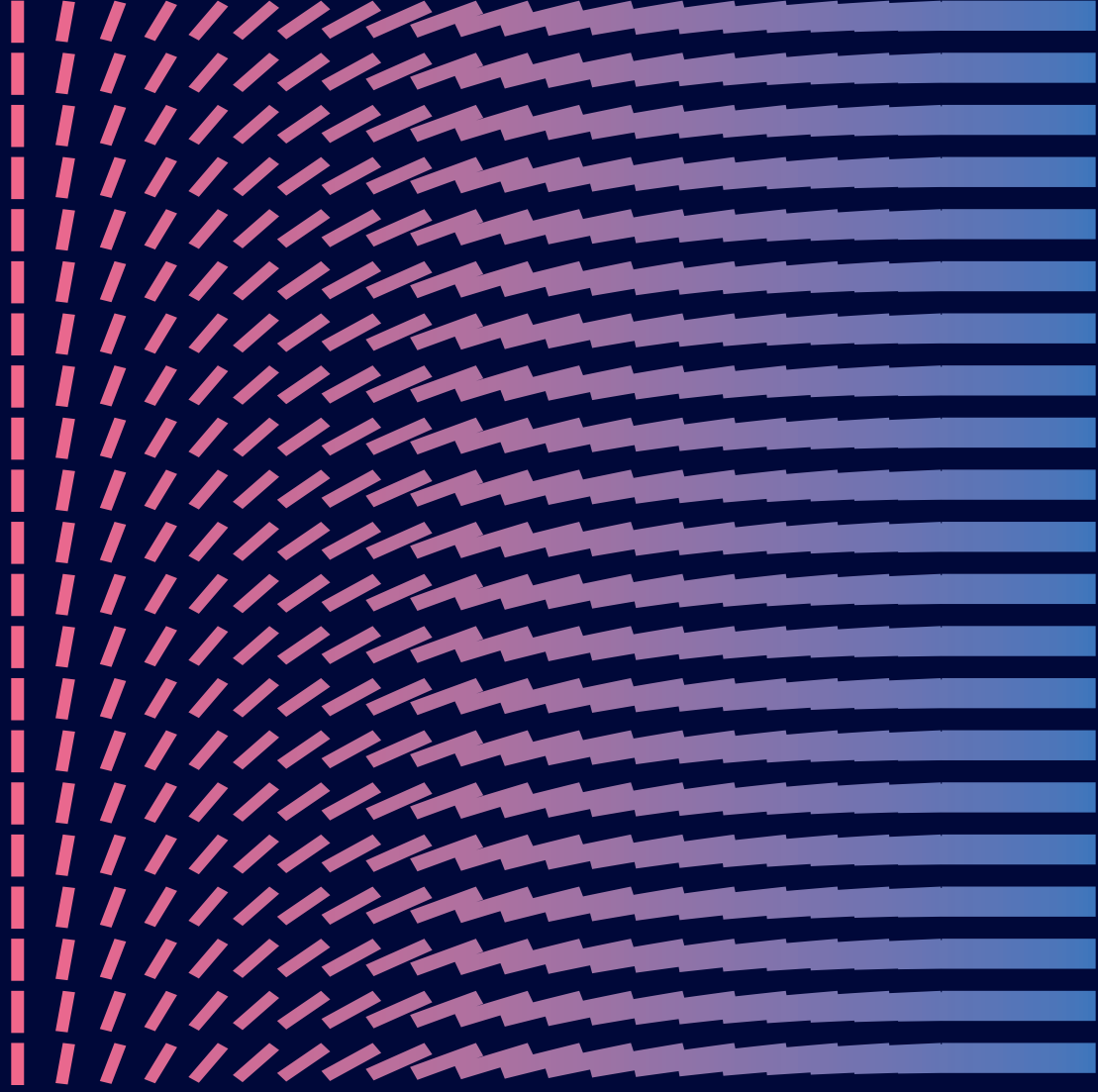
Collect real-time patient data

Identify patients at risk for deterioration

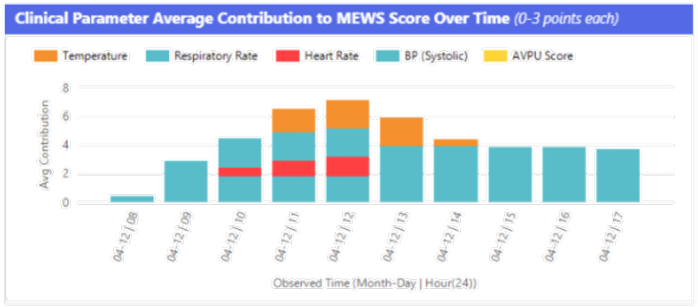


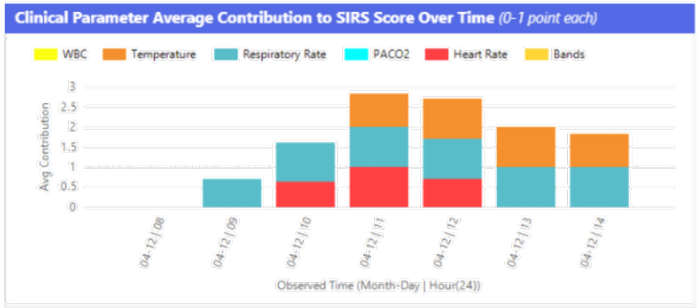
Communicate actionable insights

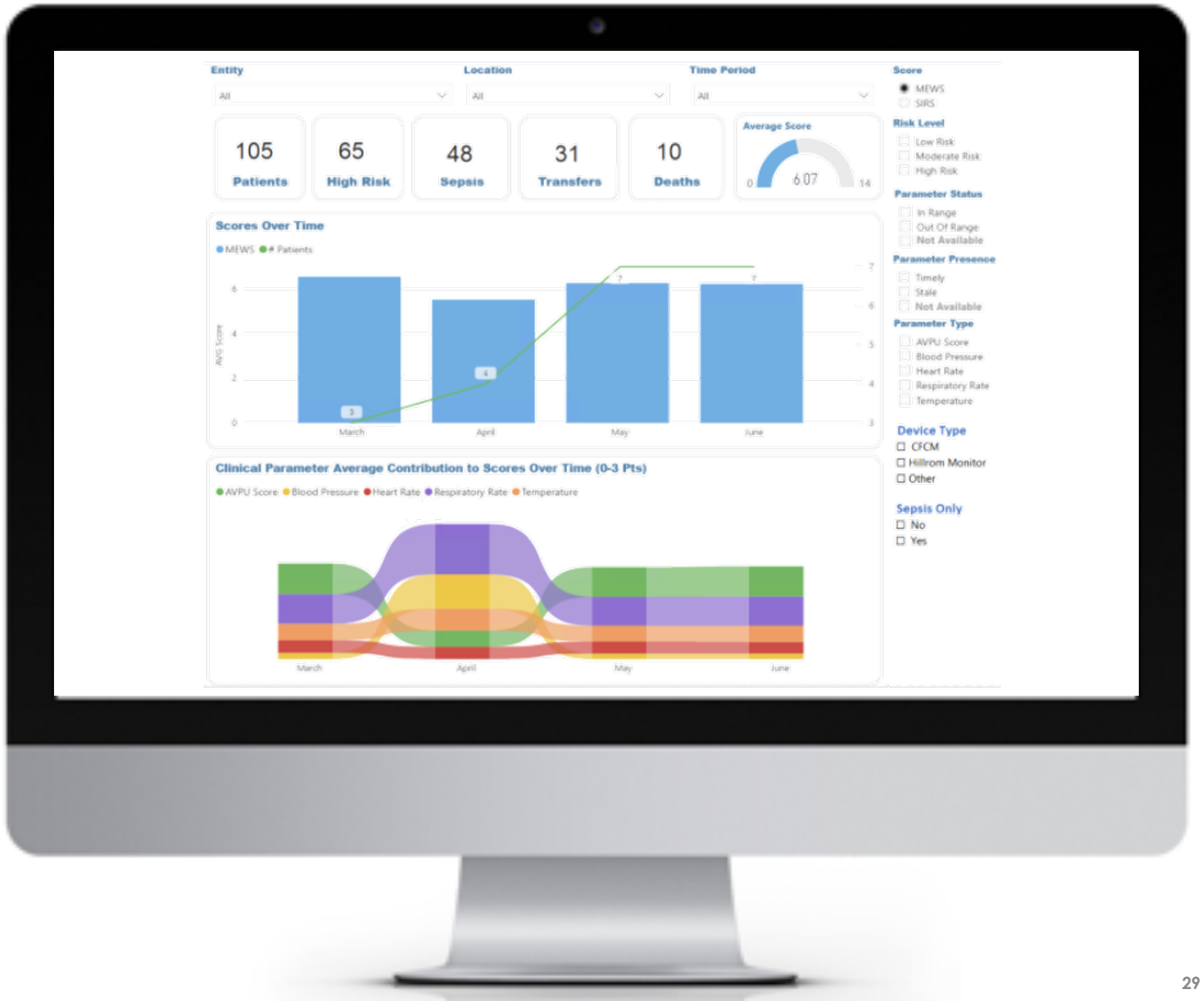
REPORTING AND SUPPORT SERVICES



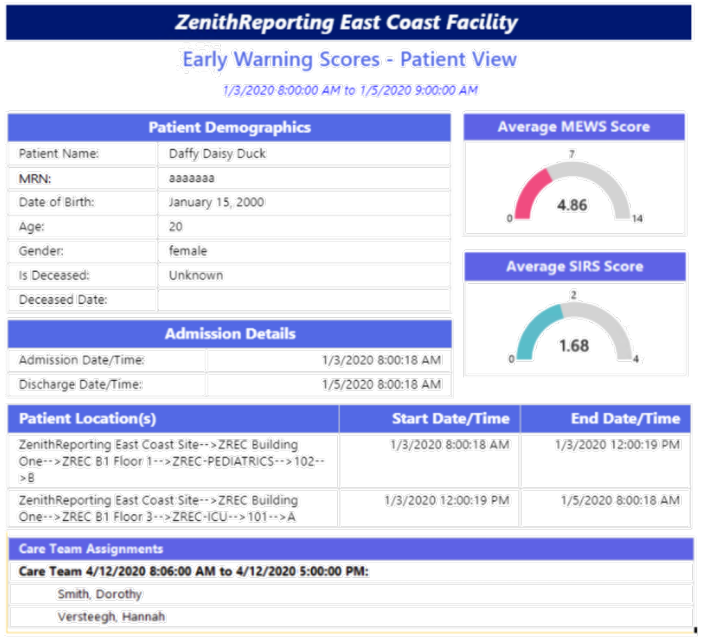
Facility or Unit Level Reports







Patient Specific Reports



ZenithReporting East Coast Facility

Early Warning Scores - Patient View

1/3/2020 8:00:00 AM to 1/5/2020 9:00:00 AM

Patient Demographics	
Patient Name:	Daffy Daisy Duck
MRN:	aaaaaaa
Date of Birth:	January 15, 2000
Age:	20
Gender:	female
Is Deceased:	Unknown
Deceased Date:	

Average MEWS Score: 4.86 (0 – 7 – 14)

Average SIRS Score: 1.68 (0 – 2 – 4)

Admission Details	
Admission Date/Time:	1/3/2020 8:00:18 AM
Discharge Date/Time:	1/5/2020 8:00:18 AM

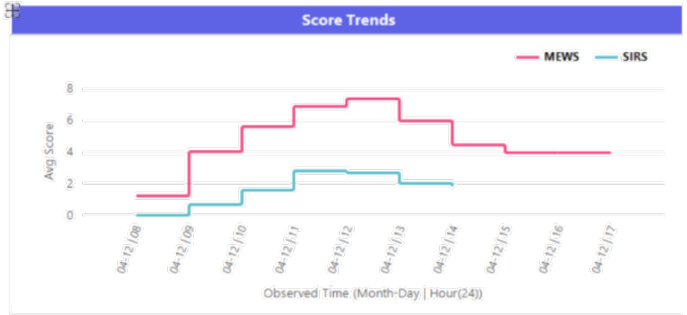
Patient Location(s)	Start Date/Time	End Date/Time
ZenithReporting East Coast Site-->ZREC Building One-->ZREC B1 Floor 1-->ZREC-PEDIATRICS-->102-->B	1/3/2020 8:00:18 AM	1/3/2020 12:00:19 PM
ZenithReporting East Coast Site-->ZREC Building One-->ZREC B1 Floor 3-->ZREC-ICU-->101-->A	1/3/2020 12:00:19 PM	1/5/2020 8:00:18 AM

Care Team Assignments

Care Team 4/12/2020 8:06:00 AM to 4/12/2020 5:00:00 PM:

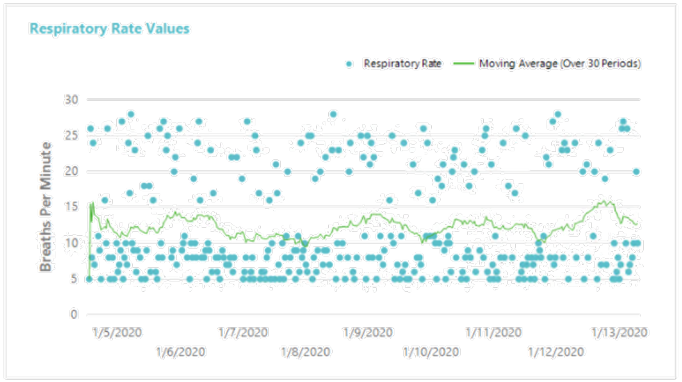
Smith, Dorothy

Versteegh, Hannah



Sepsis Risk Factors

Exposure
General Risk
Hypotension
Hypothermia
Immunocompromised
Impaired Pulmonary
Impared Endocrine
Insomnia
Suspicion of Infection



Partnering With You Every Step Of The Way

CLOUD-BASED SOLUTION

ANNUAL SUBSCRIPTION
INCLUSIVE OF SUPPORT
(Replaces SSA/SMA)

REPORTING AND ANALYTICS

HL7® International

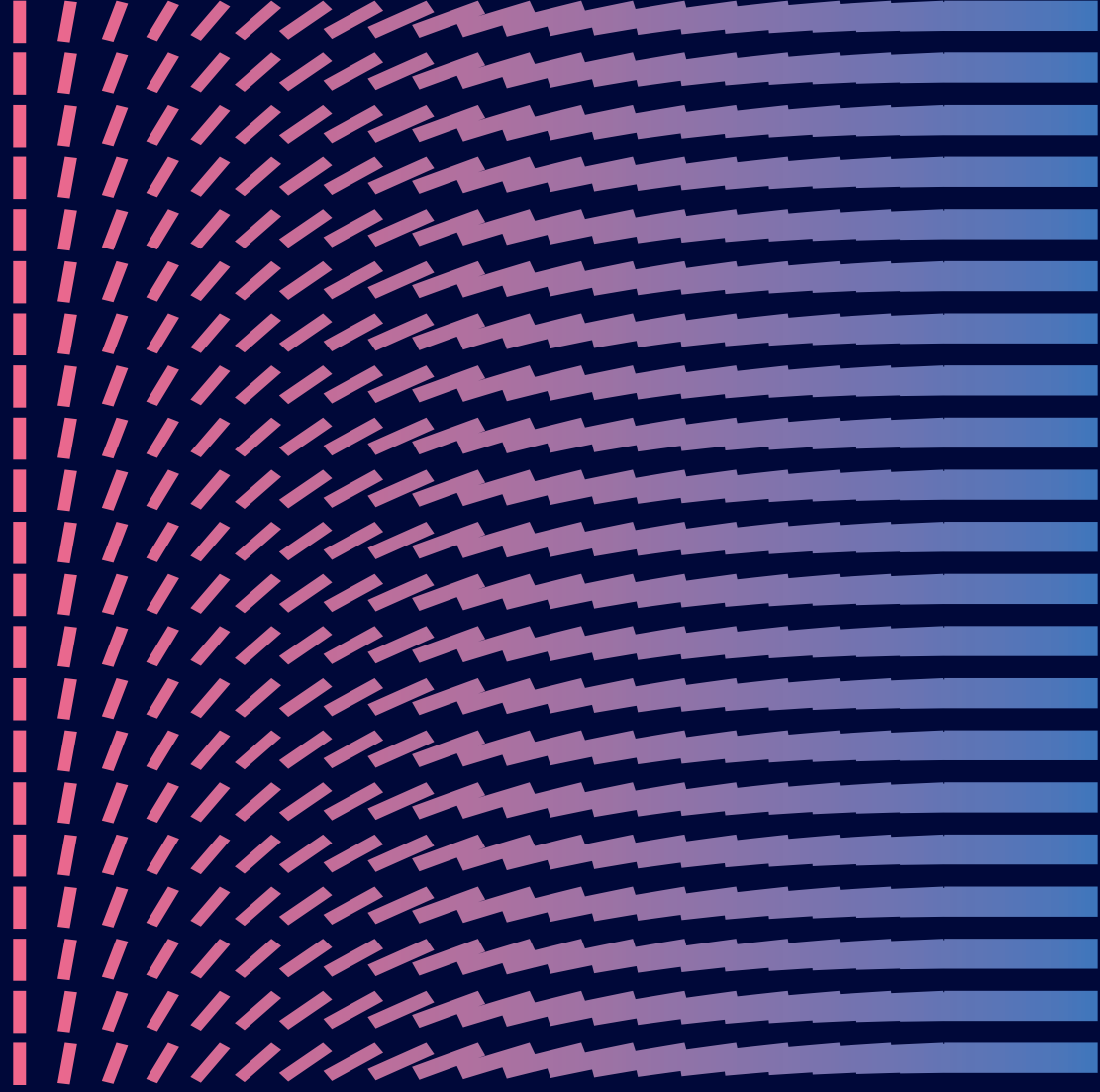
3rd PARTY INTEGRATION
USING HL7 STANDARDS

TECHNICAL SERVICES
(One Time, Varies By Project Scope)

CUSTOMER SUPPORT
24/7/365

Hillrom™

THANK YOU



ABOUT HILLROM

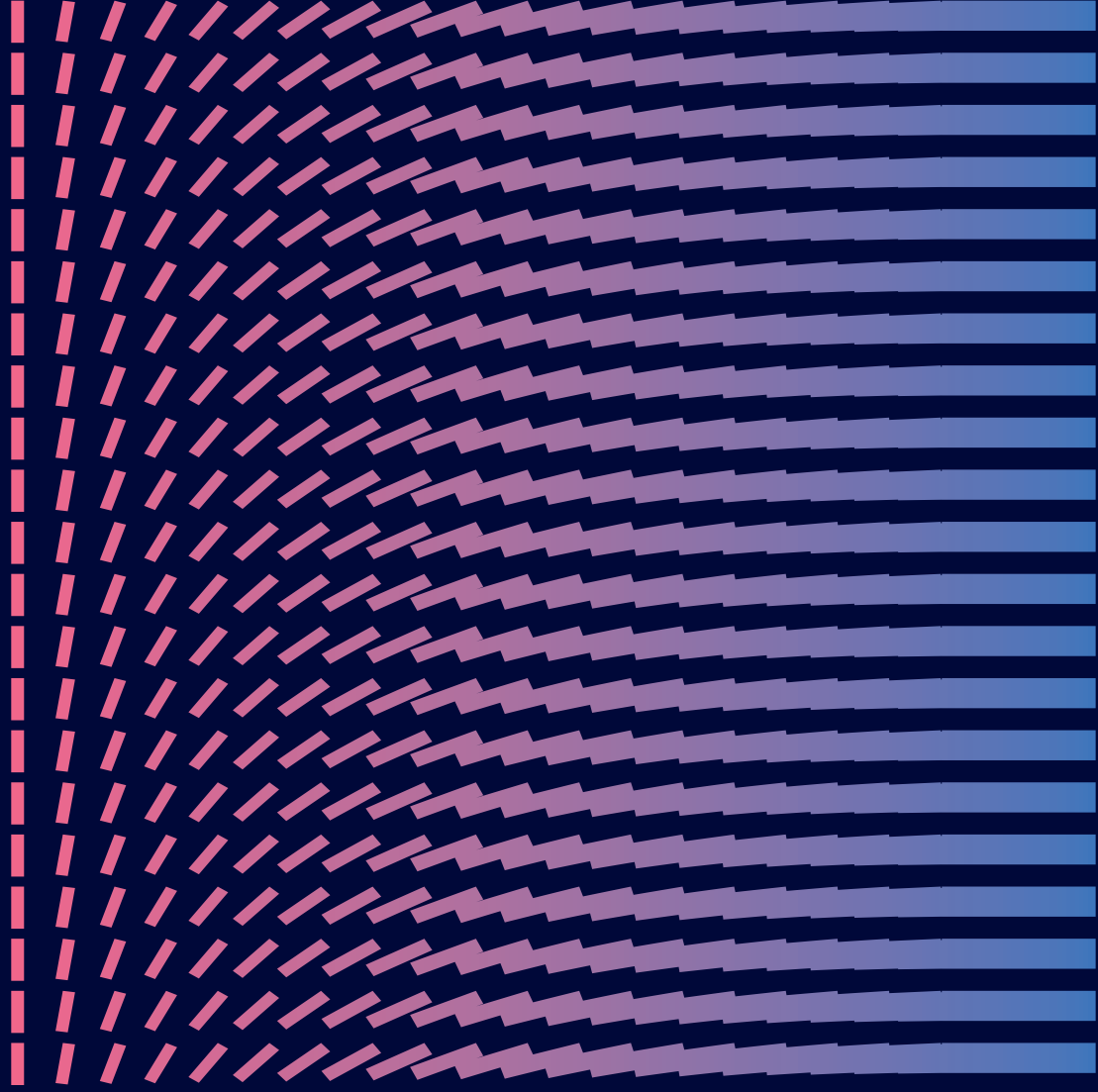
Hillrom is a global medical technology leader whose 10,000 employees have a single purpose: enhancing outcomes for patients and their caregivers by advancing connected care. Around the world, our innovations touch over 7 million patients each day. They help enable earlier diagnosis and treatment, optimize surgical efficiency and accelerate patient recovery while simplifying clinical communication and shifting care closer to home. We make these outcomes possible through connected smart beds, patient lifts, patient assessment and monitoring technologies, caregiver collaboration tools, respiratory care devices, advanced operating room equipment and more, delivering actionable, real-time insights at the point of care.

For more information, please contact your local distributor or Hillrom sales representative at 1-800-445-3730.

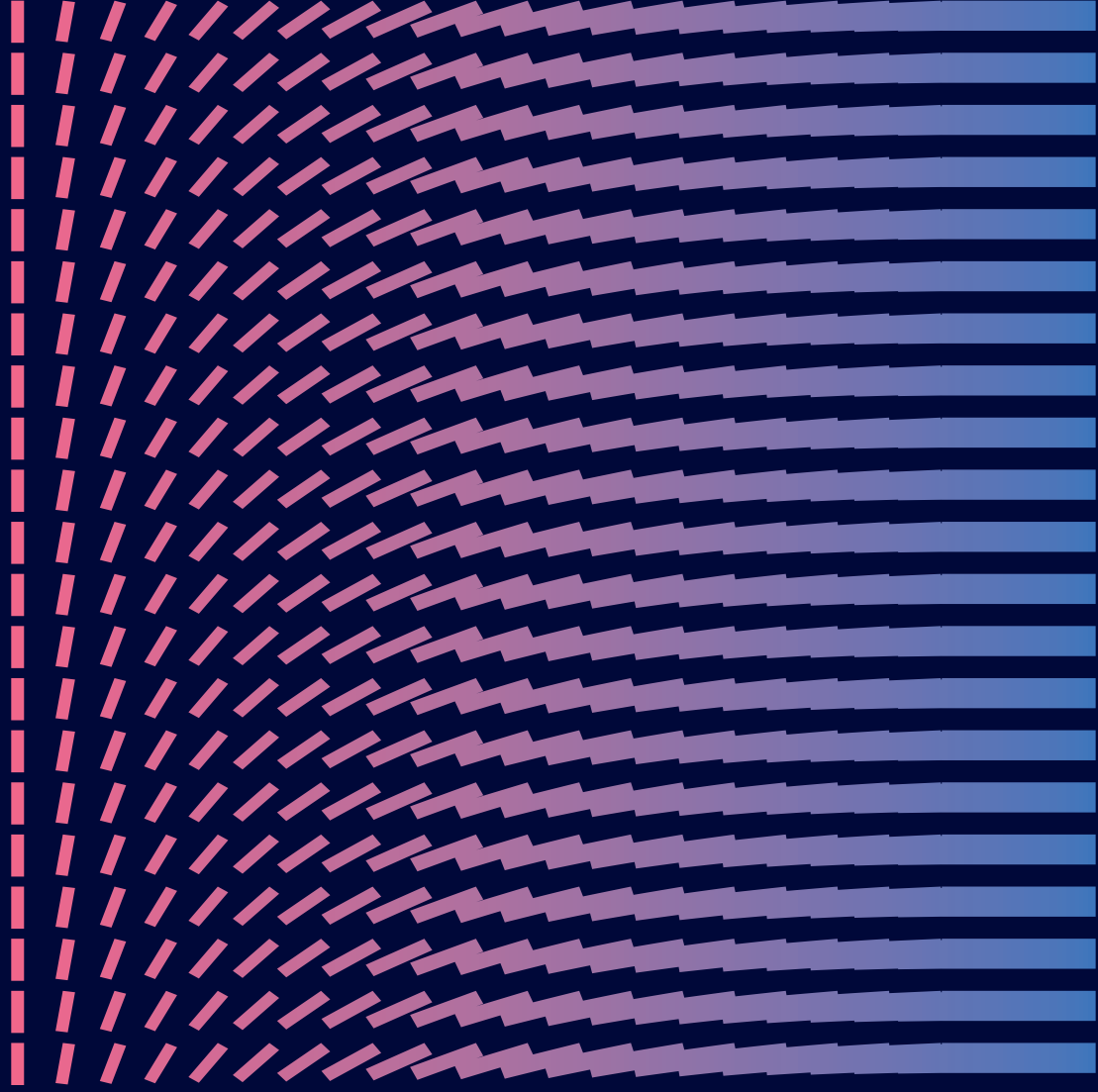
hillrom.com

130 E. Randolph St. Suite 1000, Chicago, IL 60601

SLIDE LIBRARY

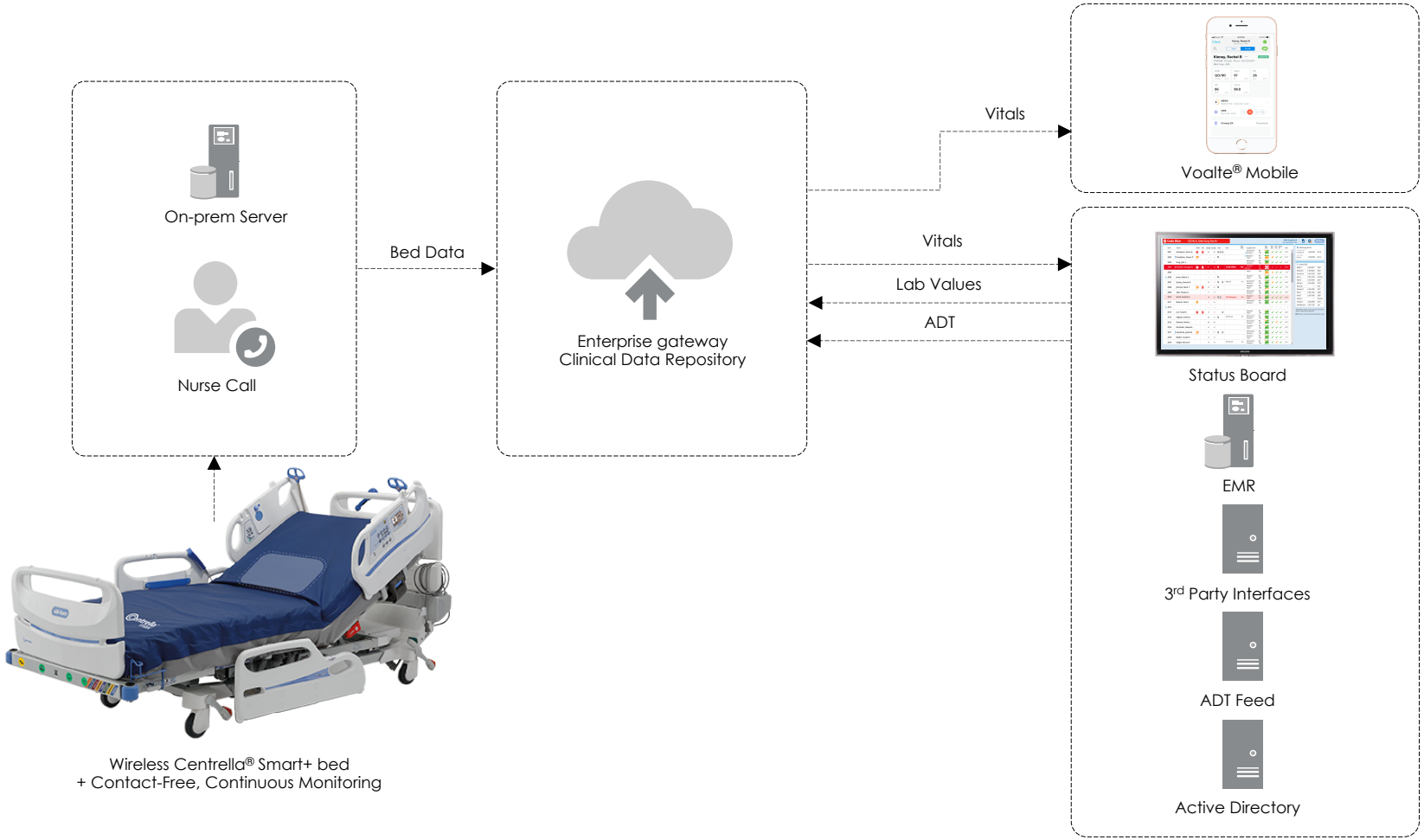


TECHNICAL SCHEMATICS



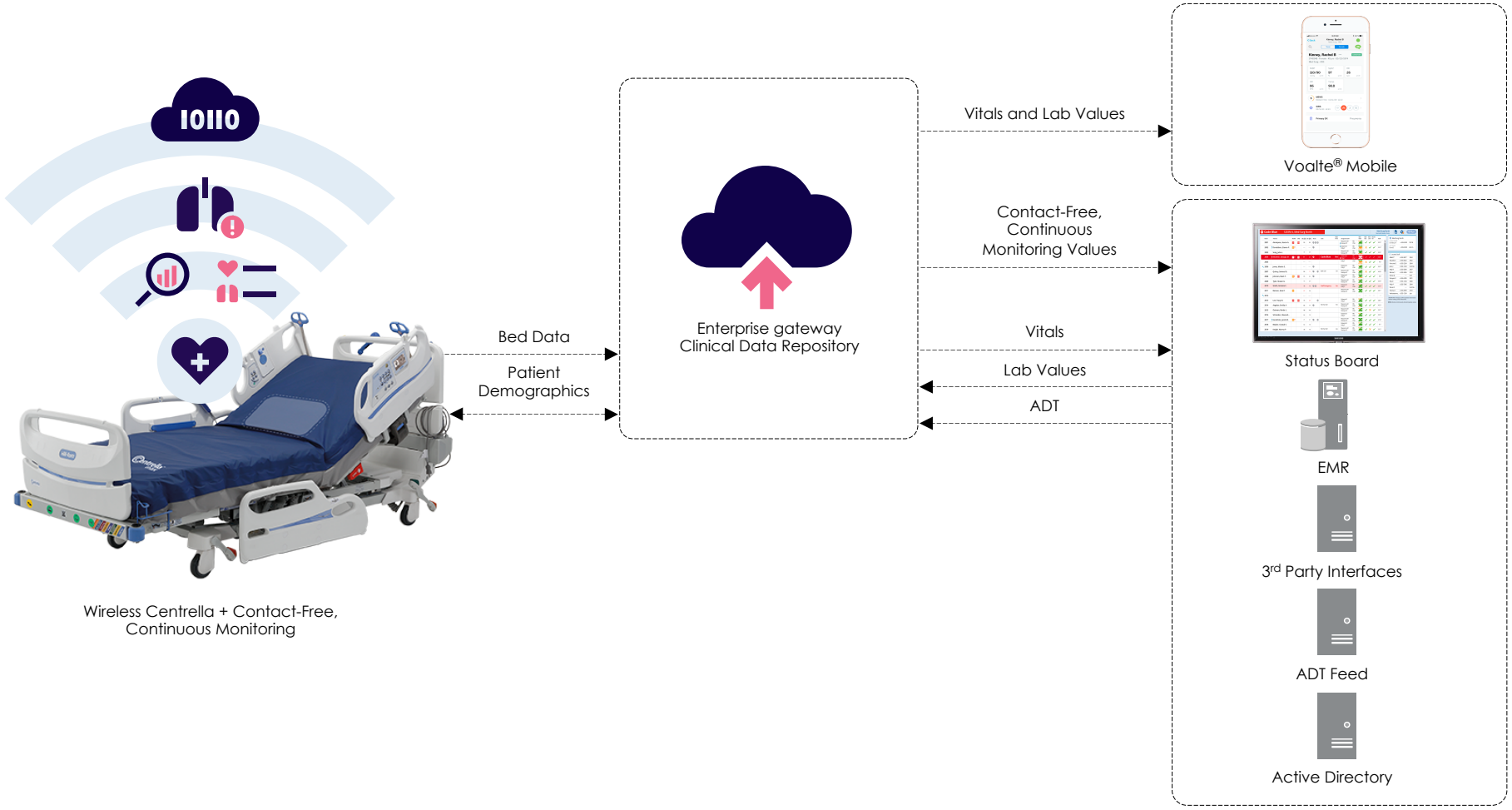
Smart Device Connectivity and Analytics

(WIRED BED CONNECTION)

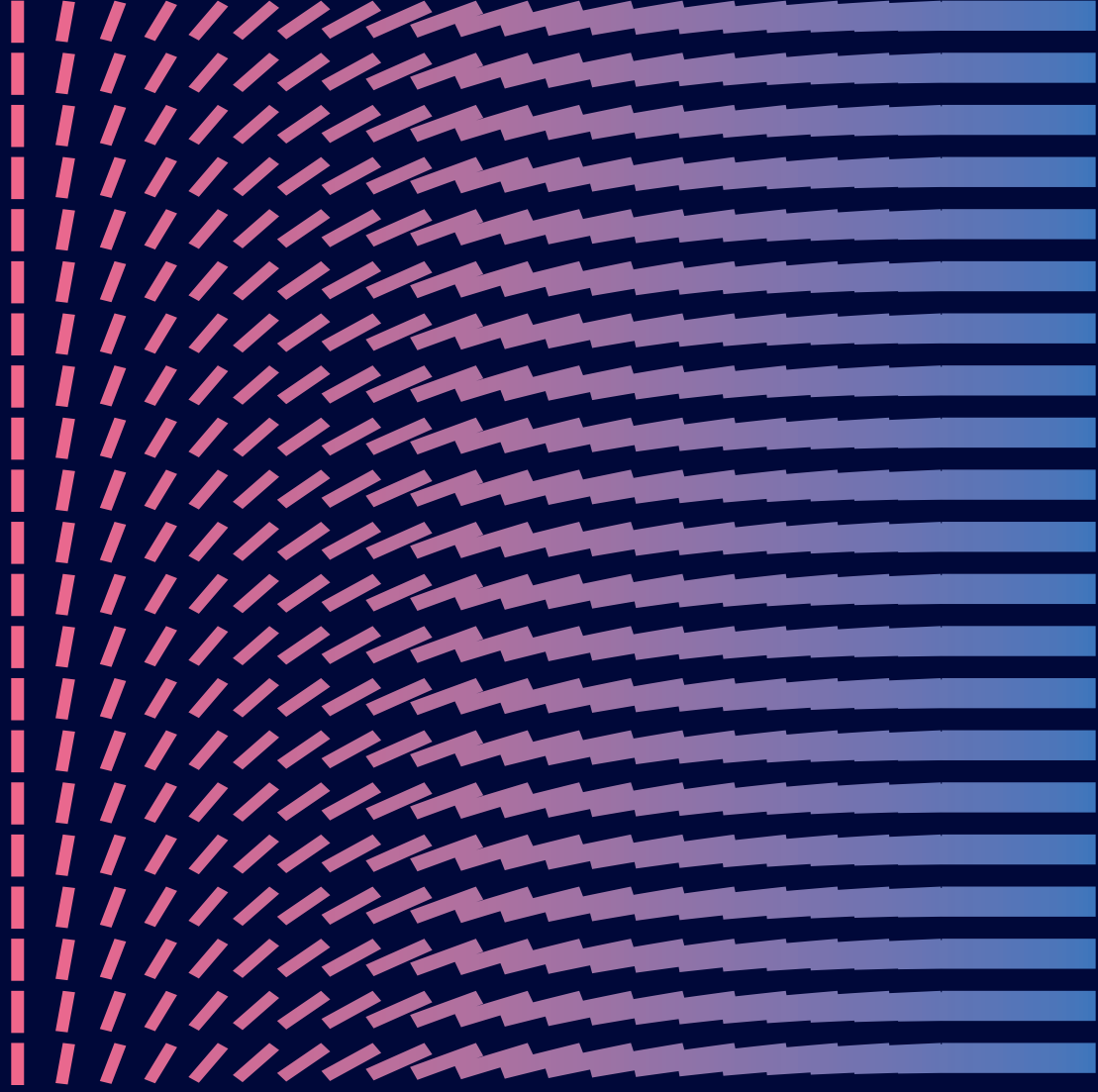


Smart Device Connectivity and Analytics

(WIRELESS BED CONNECTION)



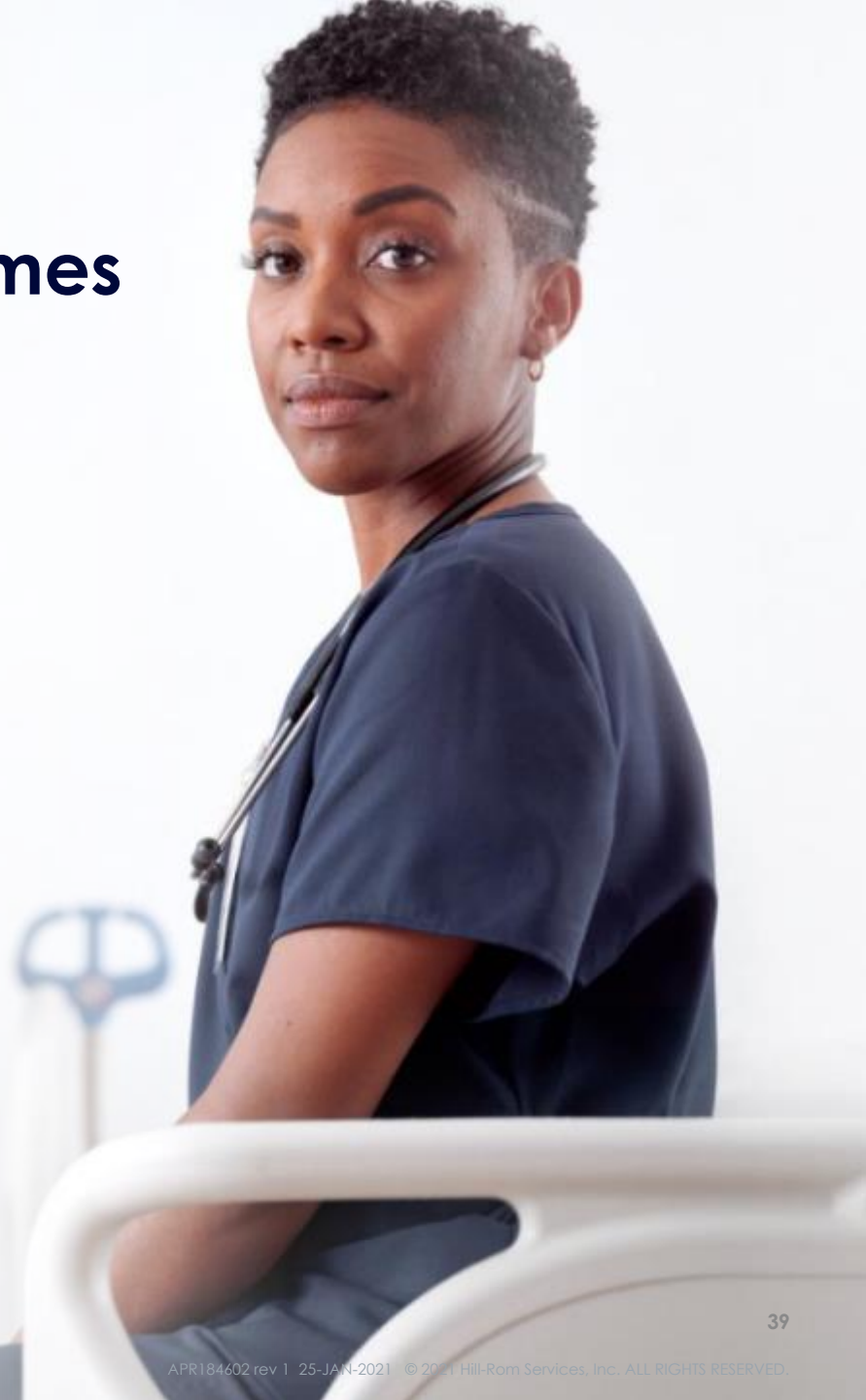
OPTIONAL DATA SLIDES IF NEEDED



Critical Events Drive Patient Safety Outcomes

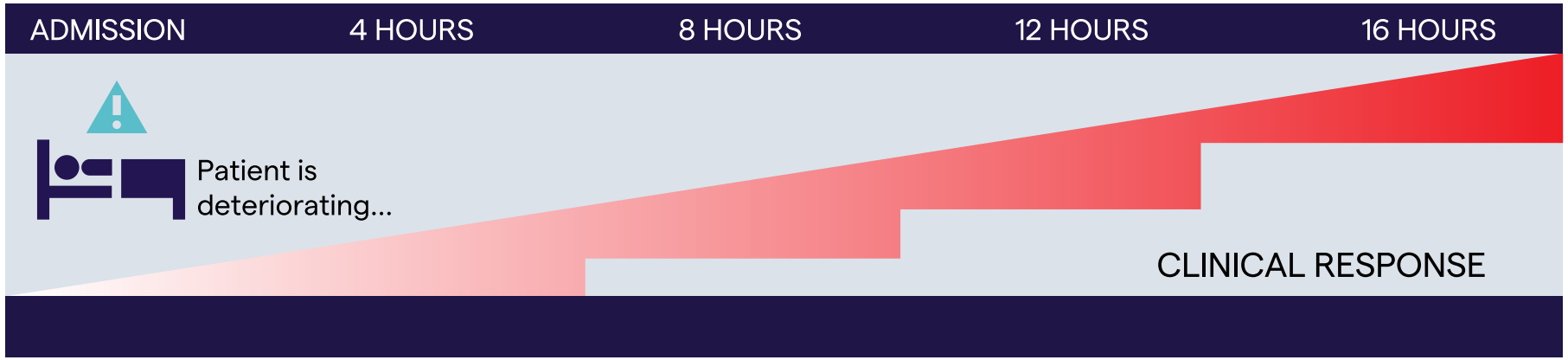
17%

POTENTIAL PATIENT ADMISSIONS WITH CRITICAL EVENTS.[1]



1. Zimlichman, et al. Contactless respiratory and heart rate monitoring: validation of an innovative tool. J of Med Eng & Tech, Vol. 34, Nos 7-8, Oct-Nov 2010, 393-398.

Patient Deterioration



6–8 POTENTIAL HOURS OF WARNING SIGNS PRIOR TO EVENT.[1]

1. Zimlichman, et al. Contactless respiratory and heart rate monitoring: validation of an innovative tool. J of Med Eng & Tech, Vol. 34, Nos 7-8, Oct-Nov 2010, 393-398.

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Continuous Monitoring In An Inpatient Medical-Surgical Unit: A Controlled Clinical Trial

Harvey Brown, MD[1]

86%
CODE BLUE EVENTS

45%
ICU PATIENT TRANSFERS

9%
MED-SURG LOS

"Results may support the hypothesis that continuous monitoring leads to earlier recognition of patient deterioration."

1. Brown HV, et al. The American Journal of Medicine. 2014; 127:226-232.

Patient Deterioration

A patient moves from one clinical state to a worse clinical state.[1]

Increasing their individual risk of

MORBIDITY → PROTRACTED HOSPITAL STAY → DISABILITY → DEATH

FAILURE TO RESCUE[2]

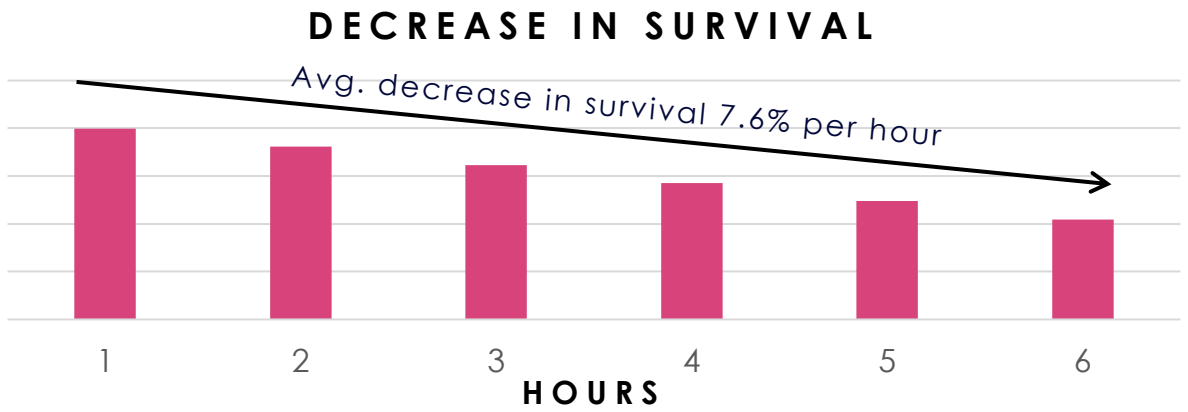
- Heart failure
- Electrolyte abnormalities
- Sepsis
- Ischemia
- DVT/PE
- Respiratory insufficiency

1. Jones D, et al. Defining clinical deterioration. 2013.
2. Edelson D MD MS FAHA. Agile MD-Hill-Rom Collaboration. Dec 2018.

Sepsis

#1 cause of death in U.S. hospitals[1]

35% OF ALL DEATHS IN HOSPITALS[1]



- Risk can be reduced by quickly identifying and managing infections[1]
- Mortality increases **8%** for every hour that treatment is delayed[1]
- **$38k**, Median hospital cost to treat Hospital Acquired Severe Sepsis[2]

1. Sepsis Alliance. Sepsis.org. Sepsis Fact Sheet.
2. Page D MD, et al. Community-, Healthcare- and Hospital-Acquired Severe Sepsis Hospitalizations in the University HealthSystem Consortium. Crit Care Med. 2015 Sept: 43(9): 1945-1951.

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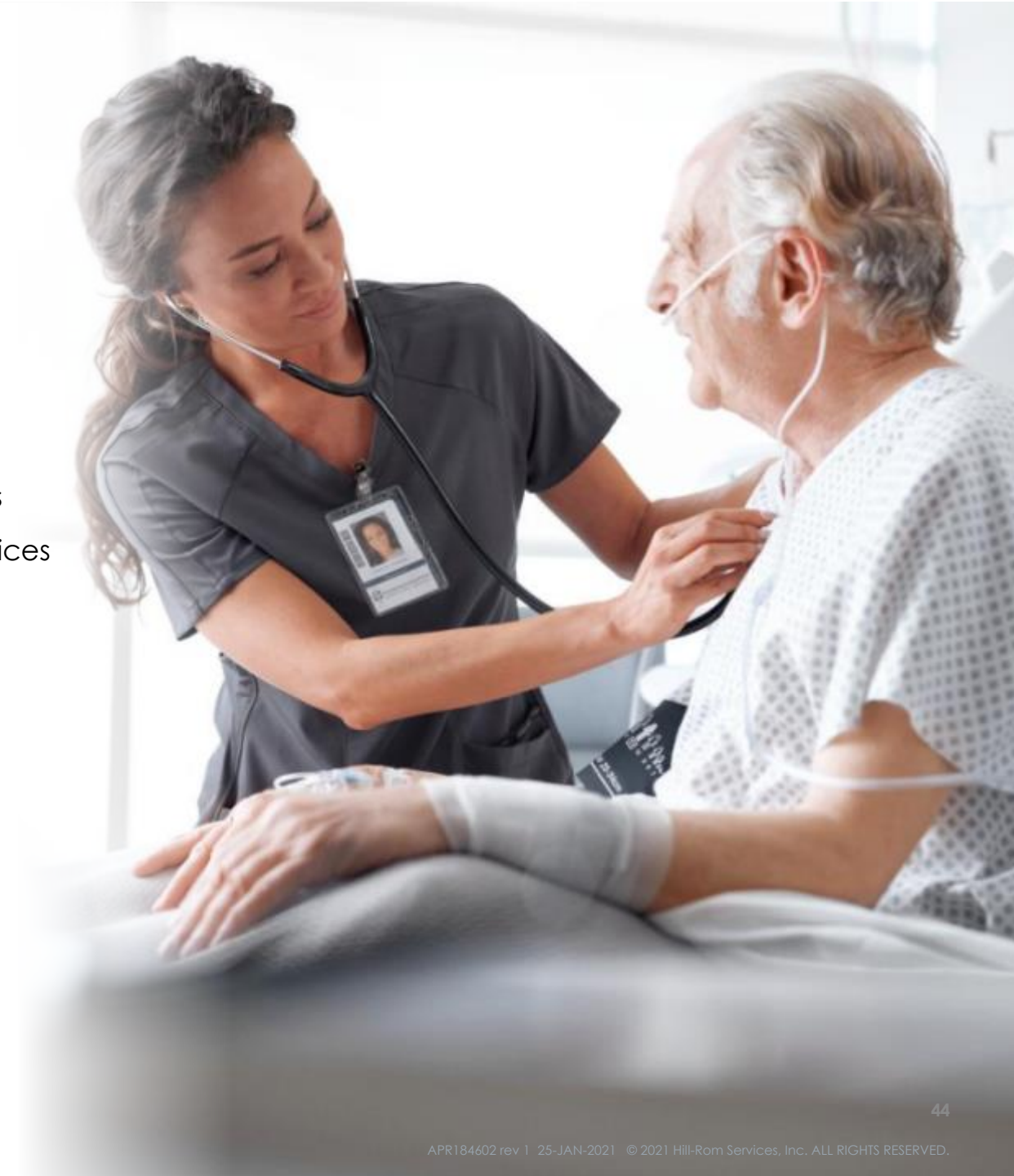
2019 Top 10 Patient Safety Concerns[1]

ECRI Institute

1. Diagnostic Stewardship and Test Result Management Using EHRs
2. Antimicrobial Stewardship in Physician Practices and Aging Services
3. Burnout and Its Impact on Patient Safety
4. Patient Safety Concerns Involving Mobile Health
5. Reducing Discomfort with Behavioral Health
6. **DETECTING CHANGES IN A PATIENT'S CONDITION**
7. Developing and Maintaining Skills
8. **EARLY RECOGNITION OF SEPSIS ACROSS THE CONTINUUM**
9. Infections from Peripherally Inserted IV Lines
10. Standardizing Safety Efforts Across Large Health Systems

1. ECRI Institute. 2019 Top 10 Patient Safety Concerns.



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