Chief Nursing Officer Council Leads Journey to Achieve HIMSS Stage 7 Designation at 4 Acute Care Hospitals:
A Case Study

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When Rochester Regional Health (RRH) Chief Nursing Officer (CNO) Council was organized in 2014, the members, who represented all acute care hospitals in the RRH system, determined several goals, 1 of which was: "Improve the patient experience in collaboration with other system leaders." As electronic medical records became a government mandate and technology took hold in health care organizations, nurses immediately realized the benefits to patient care and patient safety by doing away with paper and moving the electronic age of medicine forward. Thus began the RRH CNO Council's journey to achieve HIMSS Analytics Stage 7 designation in the RRH acute care hospitals.

Registered nurses (RNs) are well positioned to contribute to and lead the transformative changes that are occurring in health care today. RNs continually take a leadership role in bridging information across settings of care for patients and view the electronic medical record (EMR) and data generated by the EMR as an opportunity to improve patient care, safety, quality, coordination and communication.[1,2] Because RNs continue to push the expansion of EMRs and increase the use of technology throughout hospitals, they are prime movers in health care organizations to lead their hospitals through the 8-stage Healthcare Information Management Systems Society Analytics (HIMSS) Electronic Medical Record Adoption Model (EMRAM) model, the industry's highest standard for EMR adoption and implementation.[3] The HIMSS EMRAM model incorporates methodology and algorithms to achieve organizational culture and readiness to leverage technology to improve patient outcomes. Throughout the 8-stage journey from Stage 0 to Stage 7,[3] collaboration and coordination of team members at every level of the health system are required. At the highest level, HIMSS Stage 7, a hospital provides an information technology (IT) strategy road map that will help to achieve clinical and operational excellence. HIMSS Stage 7 demon-

strates a commitment to outcomes, satisfaction, and patient safety, and emphasizes data analytics to identify opportunities and problems, and monitor compliance.

AT STAGE 7
The hospital no longer relies on paper charts to deliver and manage patient care and has a mixture within its EMR environment; data warehousing is being used to analyze patterns of clinical data to improve quality of care, patient safety, and care delivery efficiency; and the hospital demonstrates summary data continuity for all hospital services. Hospitals now focus on quality and process improvement; understand what data are telling; and how to use data to improve outcomes. "The hospital has a mixture of discrete data, document images, and medical images within its EMR environment. Data warehousing is being used to analyze patterns of clinical data to improve quality of care, patient safety, and care delivery efficacy. Clinical information can be readily shared via standardized electronic transactions with all entities that are authorized to treat the patient, or a health information exchange. The hospital demonstrates rapid data continuity for all hospital services."[3] By the third quarter of 2016, only 4.6% of hospitals in the United States had achieved Stage 7, and 30.5% had achieved Stage 6.[4]

THE 8 STAGES OF HIMSS CERTIFICATION[5] (HIMSS ANALYTICS DATABASE 2014)

Stage 0: All 3 ancillaries not installed

Stage 1: Ancillaries all installed (lab, radiology, pharmacy)

Stage 2: Clinical data repository (CDR), controlled medical vocabulary, clinical decision support/rules engine (CDS), may have document imaging health information exchange (HIE) capable

Stage 3: Nursing/clinical documentation (flow sheets), Clinical Decision Support System (error checking), picture archive and communication systems (PACS) available outside radiology

Stage 4: Computerized physician order entry (CPOE), clinical decision support (clinical protocols)

Stage 5: Closed loop medication administration.

Stage 6: Physician documentation (structured templates), full Clinical Decision Support System (variance & compliance), full radiology PACS

Stage 7: Complete EMR: chief compliance officer transactions to share data; data warehousing; data continuity with emergency department (ED); ambulatory, outpatient.

- Engineering Document Management, Security Control Assessment, Health Information Management, Digital Radiology, Continuity of Care Document, Hemodynamics Monitor Interface plan for operating room (OR) and ED, Treatment Authorization Request, Bar Coded Expressed Breast Milk (neonatal intensive care unit [NICU] only)

HIMSS EMRAM REQUIREMENTS TO MEET STAGE 7

Hospitals must meet the following key requirements to achieve HIMSS Stage 7:

1. Ninety-five percent barcode enablement: medications, blood products, expressed breast milk (NICU) for 4 consecutive months
2. Physician documentation with structured templates capturing discrete data
3. ED live with bedside verification, CPOE, physician documentation
4. All medications on the electronic medication administration (eMAR) or patient profile (code and anesthesia medications.
5. Data analytics used to drive change with demonstrated improved outcomes
6. Clinically relevant paper scanned within 24 hours of creation
7. Live exchange of information with outside organizations

ROCHESTER REGIONAL HEALTH CNO COUNCIL JOURNEY TO HIMSS STAGE 7

The HIMSS Analytics EMRAM was created in 2005 (Healthcare Informatics) to reflect how individual hospitals and integrated delivery systems in the United States and Canada adopt information technology and apply that information to improve patient safety and care quality. EMRAM comprises 8 stages. Each stage has a higher level of health IT accomplishment to provide the foundation for improved patient safety, care quality, health information exchange, and a paperless environment.

RRH senior management was not surprised to hear that the RRH Chief Nursing Officer (CNO) Council wanted to focus on informatics with a goal to achieve HIMSS Stage 7. The RRH CNO Council, comprising system-wide CNOs, was formed in 2014 under the leadership of the RRH chief executive officer. One of the initial goals of the Council was to "improve the patient experience in collaboration with other system leaders." Gaining HIMSS Analytics Stage 7 designation would mean a valuable achievement for RRH. To achieve this goal, continuous collaboration and commitment must be deployed across all levels of the RRH organization. One hundred percent utilization of an integrated, comprehensive paperless EMR system would be required. The Council and RRH senior management knew that a transformation away from the reliance on paper would significantly reduce potential medical errors and ultimately provide safer, more efficient, cost-effective, and a higher quality of care for their patients. The RRH journey to Stage 7 began.

To meet the requirements for HIMSS Stage 7, the CNO Council first had to ensure that the RRH acute care hospitals met the requirements through stages 0 to 6. Once that was established, the Council focused on driving change and demonstrating improved outcomes in 2 specific areas within the RRH acute care hospitals: reduction in central-line associated bloodstream infections (CLABSI) and reducing patient falls. Many challenges to improvement existed in both areas.

Challenge #1: Reduce Patient Falls Across RRH Acute Care Hospitals

Older Americans experienced 29 million falls causing 7 million injuries in 2014.[6] Dr. Tom Frieden, Centers for Disease Control and Prevention (CDC) director, stated, "Older adult falls are increasing and, sadly, often herald the end of independence."[6]

The Joint Commission (TJC) Sentinel Event database revealed the most common contributing factors in falls and fall-related injuries in health care facilities to be: inadequate assessment; communication failures; lack of adherence to protocols and safety practices; inadequate staff orientation, supervision, staffing levels, or skill mix; deficiencies in the physical environment; and lack of leadership.[7] Prevention of falls is not an easy task, and the solutions are complex; however, research shows that close to one-third of falls can be prevented. Fall prevention involves managing a

Figure 1. Rochester Regional Health Facilities and Services

patient's underlying fall risk factors and optimizing the hospital's physical design and environment.[8]

Major falls may result in internal bleeding, fracture, lacerations, stitches, subdural hematoma, or other injuries impacting the quality of life or cause death. The RRH CNO Council reviewed the challenge to reduce patient falls within the RRH acute facilities:

- In 2016, 1,273 falls occurred in 5 RRH acute care facilities; 15 of the falls had severe injury (Data on File RRH).
- The objective of the CNO Council was to:
  o By 2017, identify and implement a standardized, evidence-based fall risk-screening tool in all 5 acute care facilities.
  o By 2018, further decrease total falls at all acute care facilities.

At the same time that the RRH CNO Council was addressing the challenge to reduce patient falls and how to prevent them, the Council began to study the rising occurrence of CLABSIs in the RRH acute care hospitals, another barrier to achieving HIMSS Stage 7.

Challenge #2: Reduce CLABSI Across RRH Acute Care Hospitals

Of all health care–associated infections, CLABSIs are the most costly, at $46,000 per case. Many CLABSI cases are preventable through proper aseptic techniques, surveillance, and management strategies.[9] CLABSIs can lead to increased hospital stay, increase in cost, and mortality. It is estimated that nationally, 250,000 blood stream infections occur annually, and most are related to the presence of intravascular devices. The rate of CLABSI in US intensive care units (ICUs) is approximated at 0.8 per 1000 central line days. Many central lines are found outside the ICUs.

One study reported 55% of ICU patients and 24% of non-ICU patients had central lines.[9]

The RRH CNO Council reviewed the need to reduce CLABSI rates across the RRH acute care facilities:

- The current process for collecting rate data was suboptimal.
- Data collected were inconsistent and labor intensive.
- High CLABSI rates could lead to high Centers for Medicare & Medicaid Services financial penalties.

The objectives of the CNO Council were to:
- Reduce CLABSI rates
- Query EMR for central line data to improve data accuracy
- Relieve bedside nurses of non-patient care tasks

This paper presents a case study of the RRH CNO Council's journey to achieve HIMSS Stage 7 in 4 acute care hospitals in the RRH System. The paper also discusses how meeting the objectives of reducing patient falls and reducing CLABSI rates helped RRH achieve HIMSS Stage 7 designation.

METHODS

Identify Barriers to Attain HIMSS Stage 7

The RRH CNO Council completed an initial evaluation of barriers to achieving HIMMSS Stage 7 standards within the 4 RRH acute care hospitals (*Figure 1*). The Advisory Council, comprising members from the CNO Council, identified the following eight barriers that needed to be addressed within the four RRH acute care hospitals.

To be validated as a Stage 7 hospital, all clinically relevant information must exist electronically in the

Table 1. Ways to Address Challenges

Begin closed loop bar code administration to ensure blood transfusion scanning.

Begin closed loop bar code administration scan of breast milk.

Ensure computerized entry of bedside notes at handoff to end use of paper notes at bedside.

Ensure CPOE by scanning all documents into the EMR.

Ensure entry of inpatient medication via closed loop bar code administration within 1 hour.

Institute closed loop bar code administration to ensure medication scanning.

Decrease total patient falls at all acute care facilities through identification and implementation of the standardized, evidence-based fall risk-screening tool.

Reduce CLABSI rates by querying EMR for central line data to improve data accuracy and relieve bedside nurses of non-patient care risk.

EMR, electronic medical record.

Outcomes-focused Analytics & Decision Support	Demonstrate the use of data to improve clinical practice and patient or business outcomes (3-5 case studies).
Minimal Transcription and Structured Physician Documentation	Demonstrate a decrease in transcription services since moving to an EMR. Demonstrate a "prevalent use" of structured physician documentation tools.
Generally Paperless but with Timely Document Scanning	Scan clinically-relevant documents within 24 hours of creation or receipt. Non-clinically-relevant (ex. Consents) scanned 3 days post-discharge.
Device Integration	Integrate at least vitals monitoring devices in ICUs.
Interoperability	Care Everywhere is live with a connection to a non-Epic system.
All medications in Epic (e.g. codes, trauma, & anesthesia)	Document meds given during codes, trauma, and anesthesia in Epic, real-time or through back-entry.
90% CPOE	Average across nursing units and the ED, including protocols.
Electronic Repackaging Verification	Medications are verified electronically when producing unit doses (e.g. loading into a re-packager to create "blister packs").
95% BCMA + BCMA in ED	95% compliance based on the number of attempted scans. BCMA must be live in the Emergency Department.
Breast Milk & 95% Blood Scanning	Barcode-scan breast milk. Barcode-scan blood with partial blood bank matching (95% attempted).

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Figure 2. IT Categories to Track Compliance via EMR
BCMA, barcode-assisted medication administration.

EMR within 24 hours of creation, not 24 hours of discharge. The Advisory Council identified several ways to address the challenges (*Table 1*).

The Advisory Council established communication with frontline staff regarding the barriers. Once completed, teams in each area were formed to develop new processes. The Advisory Council also partnered with the RRH IT department to begin building reports via EMR to track compliance in all areas (*Figure 2*).

Project Organization and Governance
The Advisory Council then developed a work organization plan (*Figure 3*) that would ensure a steady work stream to address all barriers and provide necessary data to track progression of each challenge. The project

organization plan was organized into 3 working groups: RGH, Newark-Wayne Community Hospital (NWCH)/ Clifton Springs Hospital & Clinic (CSH), and Unity Hospital (UH). CSH work was reallocated:
- Monitoring devices were integrated in the ICU to ensure clinical documentation.
- A "new" CPOE work stream was instituted for CPOE compliance.
- Preliminary radiology reports remained paper to ensure clinical documentation.
- No plan was in place to transition away from paper charts that were pulled by HIM for physicians. This practice will be monitored closely.
- No plan exists for transitioning away from paper electrocardiogram clinical documentation.

RRH HIMSS Stage 7: Project Organization

		RGH	Eastern Region	Unity
	COO →	President	President	President
	CMO Council →	CMO	CMO	CMO
	CNO Council →	CNO	CNO	CNO
Work Streams & Owners	HIMSS Stage 6		X	X
	Analytics	X	X	X
	Document Mgt & Scanning	X	X	X
	Closed Loop Admin/CNO Council	X	X	X
	Clinical Documentation/CNO Council	X	X	X
	Downtime	X	X	X
	Governance	X	X	X
	CPOE	X	X	X
	Survey Readiness	X	X	X

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Figure 3. RRH HIMSS Stage 7 Project Organization Plan
CMO, chief medical officer; COO, chief operating officer.

RRH HIMSS Stage 7: Project Governance

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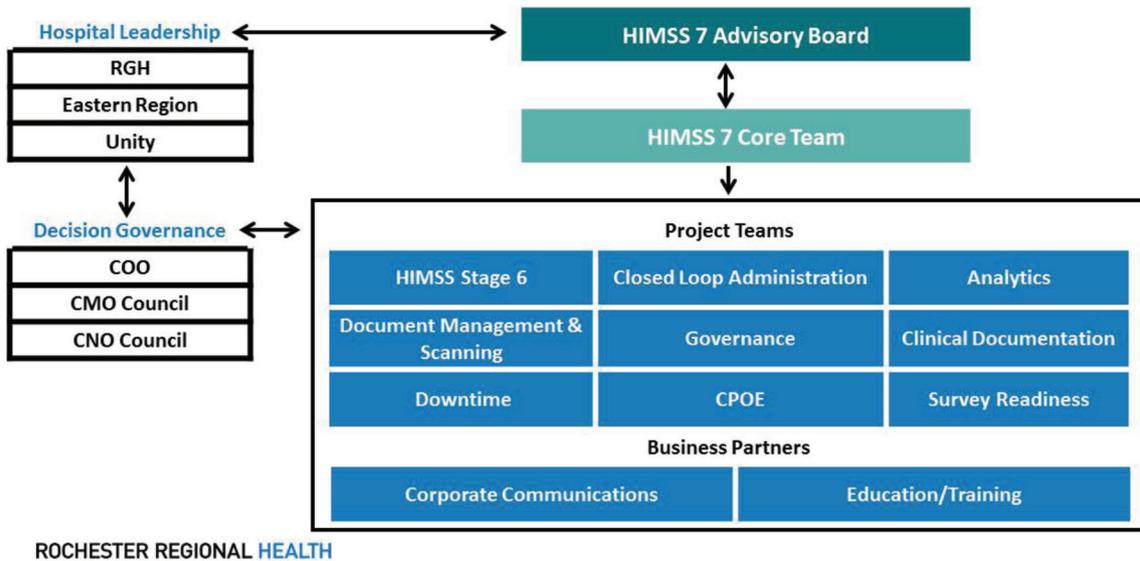
Figure 4. Project Governance

Project Governance

Project governance (*Figure 4*) was managed by the CNO Advisory Board, which also included hospital leadership. The HIMSS 7 Core team comprised project teams and business partners. Decision governance was under the direction of the RRH chief operation officer, the Chief Medical Officer Council, and the CNO Council.

The Core Team and project teams met weekly. As new data became available, the measures and specifications and policy priorities changed. The work of the Core Team and projects teams remained dynamic. As part of the accountability plan, the project teams worked to change behaviors and sustain performance through establishment of new or improved processes. The Core Team continued to communicate goals at each weekly meeting throughout the project, which was ongoing through 2017.
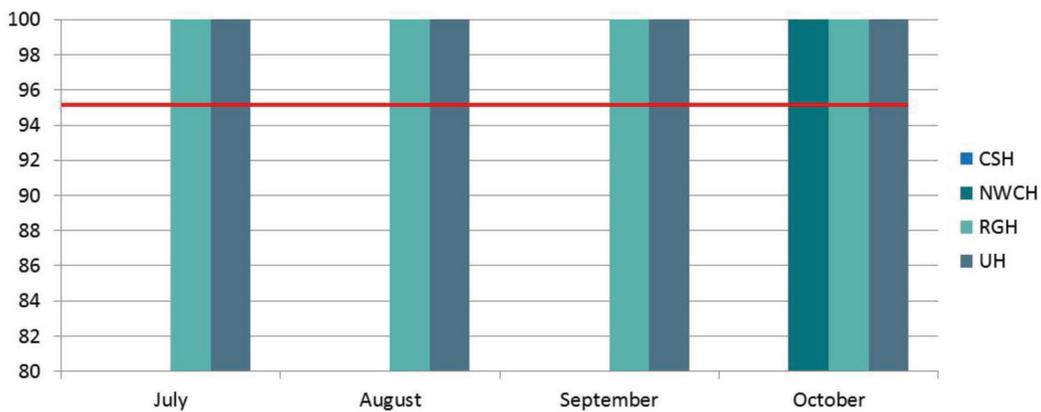
% of Blood Products via Closed Loop Bar Code Administration
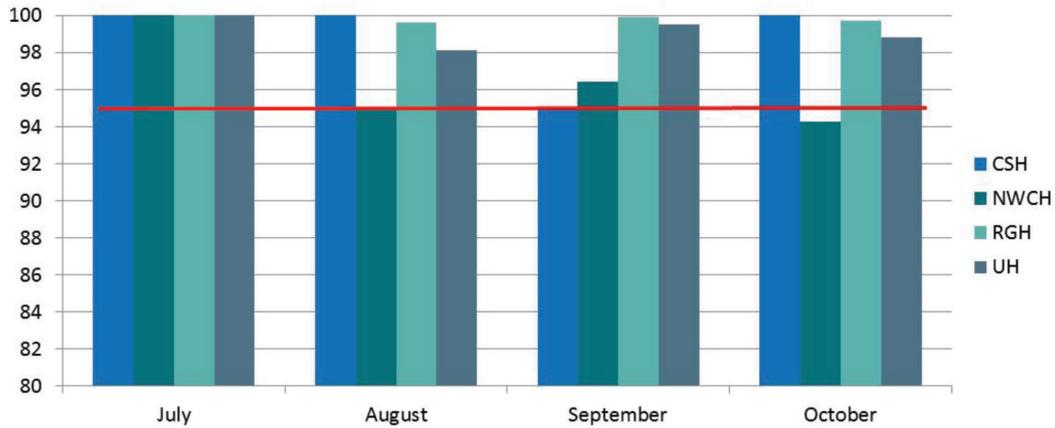
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Figure 5. Blood Scanned via CLBCA
CLBCA, closed loop bar code administration.

% of Breast Milk via Closed Loop Bar Code Administration

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Figure 6. Breast Milk via CLBCA
CLBCA, closed loop bar code administration.

Sustainability for Improvement to Reach HIMSS 7

Closed Loop Bar Code Administration

Blood transfusion scanning: begin closed loop bar code administration. All 4 RRH acute care hospitals—CSH, NWCH, RGH, UH—achieved better than 90% scanning via closed loop bar code administration (*Figure 5*).

Scanning of breast milk: begin closed loop bar code administration. All 4 RRH acute care hospitals—CSH, NWCH, RGH, UH—achieved better than 90% scanning via closed loop bar code administration (*Figure 6*).
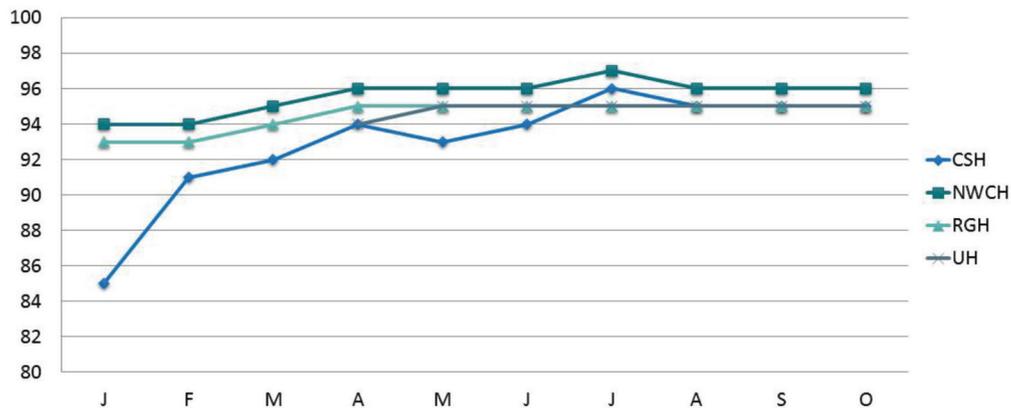
% of Computerized Physician Orders
Monthly Trend Chart
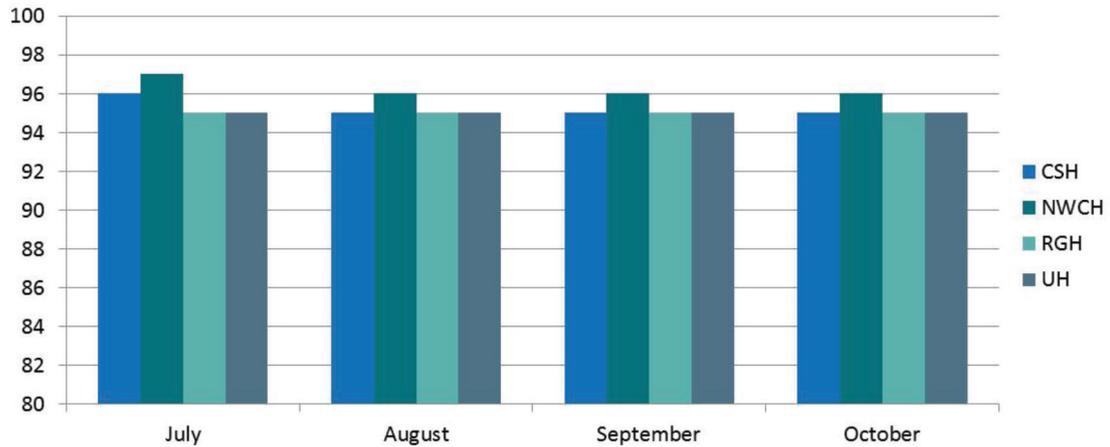
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% of Computerized Physician Orders
Year to Date

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Figure 7. CPOE Improvements Across All Acute Care Hospitals (2017)

CPOE Compliance
Scanning of documents into the EMR: ensure CPOE (*Figure 7*).

Medication Scanning
Medication scanning is used in all inpatient (IP) areas. With patient chart open, scanning a medication takes the clinician to the eMAR for that patient.

Procedural areas and ED during codes: Medication scanning is used intraprocedure in the cath lab, interventional radiology, OR, and gastrointestinal.

One-step medications are used in the EMR and pulled as needed during the procedure. Medication scanning is also used in the recovery procedure.
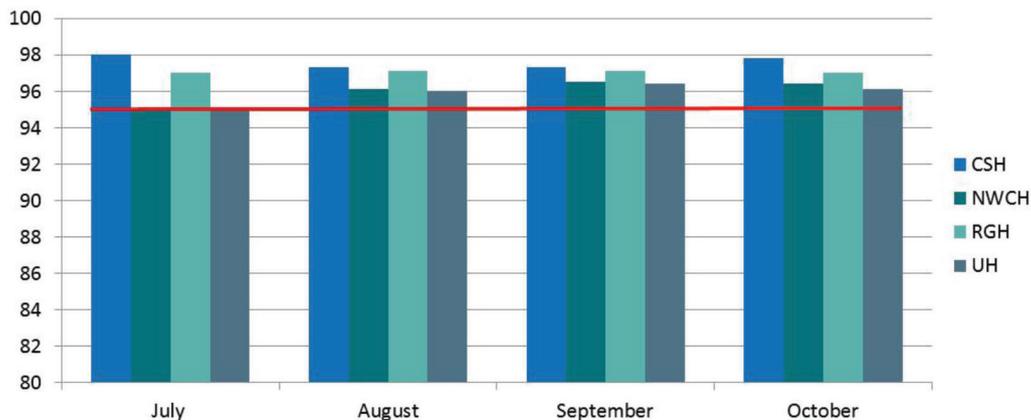
Closed loop medication scanning: institute closed loop bar code administration. (*Figure 8*)

Reducing Patient Falls
Decrease total patient falls at all acute care facilities: identify and implement standardized, evidence-based fall risk screening tool to be used in all hospitals. The Risk Assessment tool automatically uses patient age.

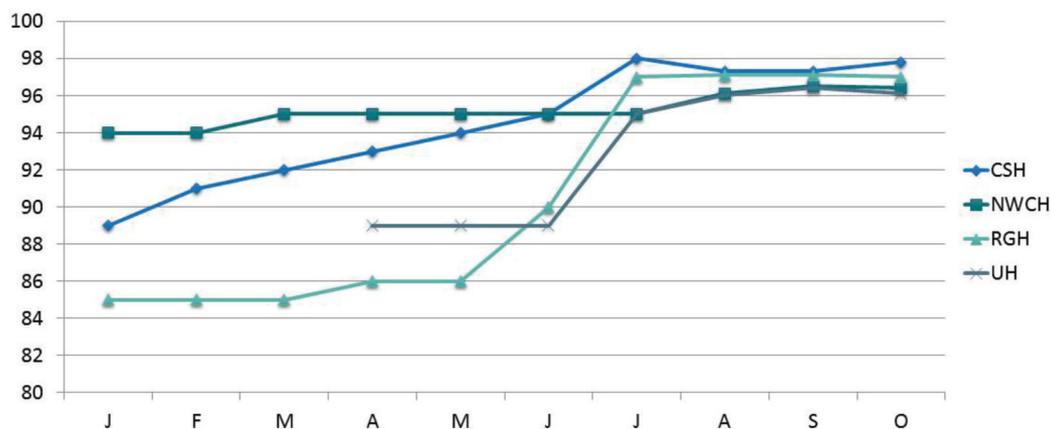## % of Inpatient Medication via Closed Loop Bar Code Administration
Monthly Trend Chart

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% of Inpatient Medication via Closed Loop Bar Code Administration
Year to Date

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Figure 8. Inpatient Medication Scanning Across All RRH Acute Care Hospitals (2017)

Any patient with a score ≥11 for falls is automatically placed on a falls intervention list (*Figure 9*). EMR automatically produces a warning banner that states falls risk in yellow, which aligns with yellow gowns and yellow signage to ensure human factors variables are taken into account (*Figure 10*).

A falls intervention flow sheet was also instituted to document interventions (*Figure 11*). EMR was successfully used to improve identification of patients at risk for falls. Implementation of electronic documentation of standardized interventions assisted nursing in ensuring compliance to safety standards for patients at risk for falls.

With 20% reduction, prevented falls were estimated at 89 falls in April 2017 through October 2017 (*Figure 12*). According to the TJC-estimated cost per fall, $1,290,500 cost avoidance was realized.

Sustaining changes include "Just-in-time" dictionary for risk screen terminology, and Hester Davis tool kit in 2018 (EMR dashboards, tracking, Best Practice Alerts).

Reduction in CLABSI Rates System-Wide Between 2015 and 2017
Query EMR for central line data to improve data accuracy and relieve bedside nurses of non-patient care risk.

Risk Assessment Tool

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Figure 9. Patient Falls Risk Assessment Tool Used All RRH Acute Care Hospitals (2017)

Alert Banner

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Figure 10. Patient Alert Banner in Use Across All RRH Acute Care Hospitals

Concordance rate is shown. Documentation education was disseminated throughout RRH system by the end of 2015. Data gathered electronically is more accurate than manually gathered data (*Figure 13*). Multiple evidence-based initiatives used to reduce CLABSI rates (*Figure 14*). Transition to electronic collection of device day data promotes nurse engagement (*Figures 15 and 16*).

Impact: With 68% reduction in CLABSI rates, 43 CLABSIs were avoided; $1,935,000 savings was realized (estimated cost per CLABSI event); and estimated length of stay reduced by 559 excess hospital days. (Agency for Healthcare Research and Quality [Fall Prevention])

Document Scanning at Daily Safety Check

When RRH began mandatory document scanning by designated departments in each acute care hospital at every daily safety check (DSC) (*Table 2*), the EMR system was further validated (RRH, unpublished data, 2017).

DISCUSSION

The shifting paradigm in health care today from episodic, provider-based, fee-for-service care to team-based, patient-centered care may place the solutions to improving quality of care and patient safety, solidly in technology. This is where data can be collected, monitored, and acted upon. Communication can then be assured across the continuum of care. Implementation and utilization of information technology applications may significantly reduce potential medical errors and ultimately provide safer, more efficient, cost-effective, and higher quality of care for patients. As more and more data become available, the challenge of immediately understanding what is happening shifts from acquiring information to what the data mean and what action should be taken.

Based on statistics by HIMSS Analytics, many hospitals in the United States have already implemented key components, especially the 0 to 3 stages, of the EMRAM, 8-stage model. Eighty-eight percent of hospitals have initiated barcode medication administration, with the majority of the remainder planning to install it in the near future. Eighty-two percent of hospitals have already implemented CPOE. Most hospitals in the United States already have a foundation established for advancing stages via EMRAM.[10] Achievement of HIMSS Stage 7 can help

Interventions Flowsheet

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Figure 11. Nurses' Flow Sheets of Patient Interventions Across RRH Acute Care Hospitals (2017)
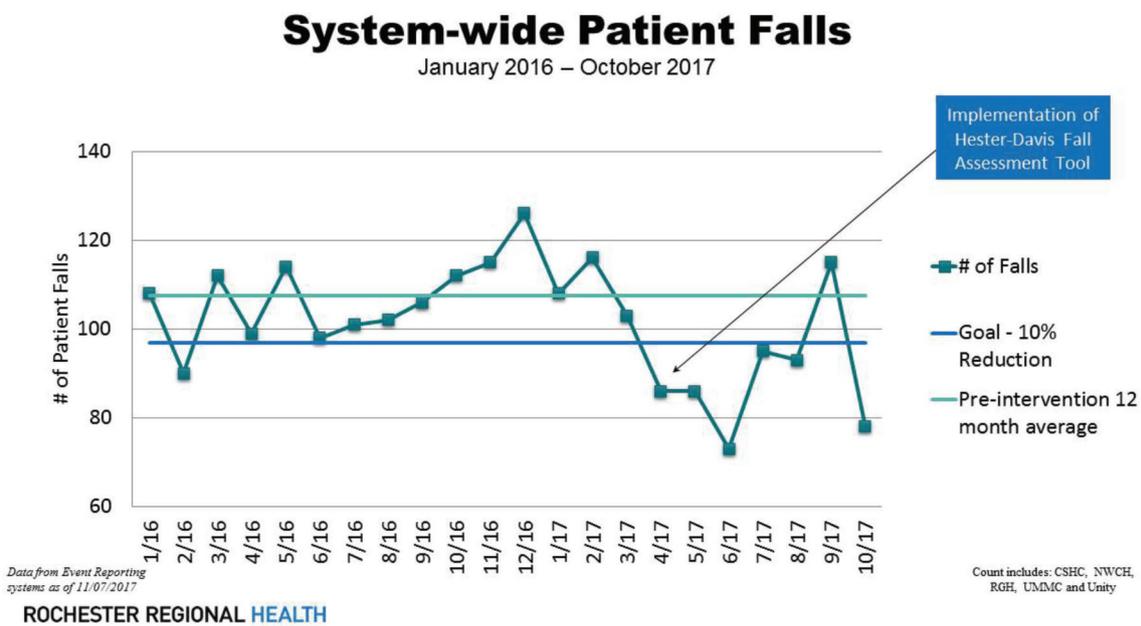

Figure 12. Patient Falls Improvement System-Wide January 2016 Through October 2017 Across All RRH Acute Care Hospitals

an organization improve patient care, and improve patient outcomes and experience, leading to a return on investment. Because few health care systems have received EMRAM recognition for stage 7, receiving the recognition can provide a "differential value" for organizations in competitive markets that share the same baseline EMR technology.[11]

CONCLUSION

We present our 2-year journey to attain HIMSS Stage 7 designation. The 4 RRH acute care hospitals:

Rochester General Hospital, Unity Hospital, Clifton Springs Hospital & Clinic, and Newark-Wayne Community Hospital, are the only hospitals in the Upstate New York area to achieve HIMSS Stage 7 and comprise one-third of all hospitals in New York State to achieve such a designation.

The vision of RRH has always been "to lead the evolution of health care." Now that 4 acute care hospitals in the RRH system have achieved HIMSS Stage 7, the RRH system has proven that it is a comprehensive, cross-disciplinary structured documentation expert and

CLABSI Concordance Rate

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Figure 13. Concordance With Data in EMR and IP December 2016 Through March 2017 Across All RRH Acute Care Hospitals

Improving Documentation as an Unintended Benefit

Compliance with documentation for central line counting improved documentation of care provided for central lines.

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Figure 14. Improved Documentation of Central Line Care Results in Stronger Compliance

a health care organization with an "aggressive" analytics program that is improving patient care. Achieving Stage 7 in 4 RRH acute care hospitals took more than technology. Even with a comprehensive EMR system, flawless implementation and strong support, the key to climbing to the top was ensuring that the entire RRH organization was on board: nurses, doctors, IT team, C-suite—everyone.

RRH has not evaluated whether the short-term results achieved with this designation can be sustained and what additional features might be required to sustain performance; however, the RRH CNO Council

System-wide CLABSI Rate
Central Line Infections per 1,000 Central Line Days
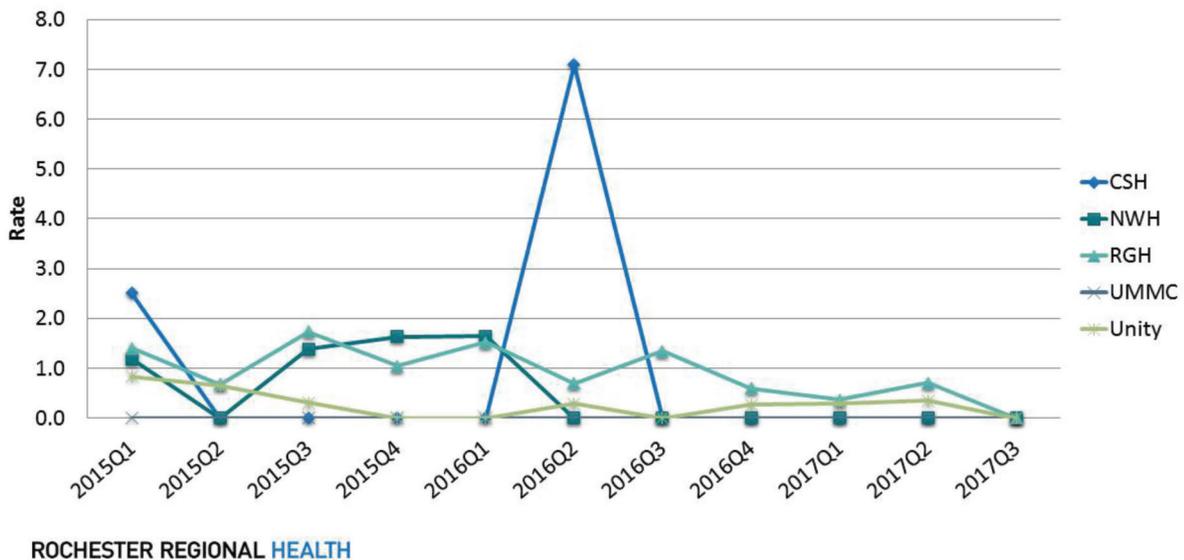### January 2016 – September 2017
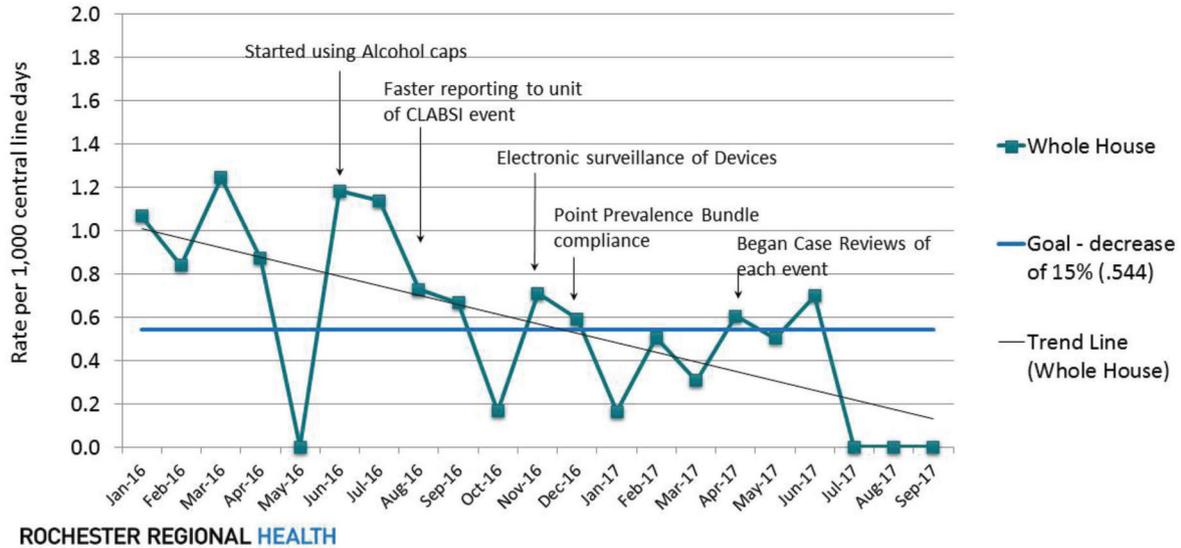
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Figure 15. 93 Days Without a CLABSI

Facility-based CLABSI Rates
2015 Q1 – 2017 Q3

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Figure 16. Dropping CLABSI Rates 2015 Through 2017

continues to maintain vigilance and governance over the elements of HIMSS Analytics Stage 7. With their oversight, RRH will continue to build on the HIMSS Analytics Stage 7 designation and remain on the path of innovative digital health care technology that will be sustainable into the future.

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Table 2. Daily Document Scanning

NWCH	ICU	100%
	OB	100%
	OR	100%
	2 South	100%
	2 West	100%
	1 South	100%
CSHC	ICU	100%
	1200	100%
	1400	100%
	W2	100%
	W3	100%

OB, obstetrics.

Rochester Regional Health. John Glynn, MBA, is executive VP, chief information officer, at Rochester Regional Health.