RUSH

A critical solution for critical care

Standardized patient monitoring facilitates the quadruple aim

A nurse at Rush University Children's Hospital Pediatric Intensive Care Unit uses the Philips IntelliVue MX800 bedside monitor to check on a patient.

Executive overview

Critical care units account for a disproportionate share of inpatient charges and patient errors.[1] That makes effective monitoring of patients critically important—not only to alert clinicians when a patient's condition deteriorates, but also to acquire, organize and present physiological data to support good care decisions.

But safely monitoring patients across numerous units and facilities is a daunting task, especially when units rely on a variety of point solutions with different interfaces that don't exchange data. That's why standardizing with a single advanced monitoring system is so crucial—especially when units rely on a variety of solutions that don't work together in unison. Such a system can potentially facilitate the quadruple aim in the following ways:

Boosting health outcomes—delivering virtually gap-free patient data with anywhere, anytime access to enable rapid, informed care decisions

Improving providers' work lives—reducing stress and increasing the time spent on patient care

Enriching patient and family experiences—creating a quieter environment and improving health outcomes[2]

Improving operational and financial performance—increasing productivity and patient throughput, cutting costs and saving administrative time[3]

In addition to providing industry data on the potential impact of a standardized monitoring solution on each of these pillars, this paper includes examples from the Rush University System for Health in the Chicago area. In 2017, Rush partnered with Philips to standardize its patient monitoring system across its large campus, which included over 700 beds and seven critical care units in three hospitals. Taking just 18 months, the project was completed on time and on budget, helping Rush to enhance care, improve staff work lives, simplify operations and reduce costs.

Critical care challenges

Critical care is at a critical juncture. It's incredibly expensive; ICUs account for 29% of stays but 47% of charges, and hospitals continue to add critical care beds.[4,5] Yet critical care is prone to costly errors and significant staff and patient stress, which is more prevalent in the U.S. Misdiagnosis is 50% more common in U.S. ICUs than the rest of the hospital[6] and 29% of adverse events in U.S. hospitals are related to improper patient monitoring.[7]

Given that critically ill patients have multiple, complex conditions that can deteriorate quickly, it's not surprising that achieving good outcomes is difficult. But the industry must do better. A patchwork approach to patient monitoring solutions may potentially contribute to the problem through the following:

- Inaccurate, delayed and/or limited data
- Time-consuming and error-prone manual re-entry of data
- Lack of intuitive graphical display of data that may obscure vital information
- Alarm fatigue due to frequent alarms, many of which are unnecessary
- Lost visibility during transport
- The need for multiple EHR interfaces
- Lost productivity when staff need to be trained on each new monitoring device

"Standardization is key because it eliminates variability. Less variability leads to better care. It also can decrease costs, increase efficiency and improve productivity."[8]

— Shafiq Rab, MD, Senior VP and CIO, Rush University Medical Center

A saner, more standardized critical care world

The right standardized patient monitoring system can create a more efficient, streamlined world. A world where all critical care units share a single interface to the EHR. Where staff trusts that alarms are meaningful, and that patient monitoring data is presented in the right format at the right time and place. Where the health system can count on its patient monitoring partner to deliver consistent technical and clinical support.

For Philips customers, that saner world is already a reality. Philips takes a strategic, consultative approach with its customers to enable them to quickly standardize its advanced monitoring system across an entire health system. The resulting benefits of this approach on health outcomes, provider work lives, patient and family experiences and health system operations are detailed below, and accompanied by examples of how this standardized system is paying off for the Rush University System for Health in the Chicago area.

"Philips helped to standardize our processes by creating a core configuration and alarm strategy agreed on by a multidisciplinary team. A standard monitor also makes it easy to flex up and down according to patient needs."

— Sheila Whalen, DNP, RN-BC, Clinical Integration Program Manager, Rush University Medical Center

Facilitating the quadruple aim at Rush with standardized patient monitoring

Rush, a Chicago-based health system that includes Rush University Medical Center, Rush Copley Hospital and Rush Oak Park Hospital, prides itself on being a quality leader that has won numerous quality and safety awards. In keeping with this focus, in early 2017 it sought a new enterprise-wide patient monitoring solution to standardize care across every patient bed, including the emergency department, multiple Operating Rooms (ORs), adult intensive care units (ICUs) and cardiac care units (CCUs), and a neonatal and pediatric ICU (NICU and PICU).

After selecting the Philips patient monitoring system, a Rush implementation team worked closely with Philips to launch it first in the PICU, and then sequentially in its remaining critical care units.

This ambitious project required precision planning and carefully orchestrated implementation to overcome the significant hurdle of caring for patients throughout the conversions. To maintain the care of patients and promote a smooth staff experience, Rush designed a dedicated training room that included a separate infrastructure, patient monitors, central stations and wireless to reflect the hospital environment, as well as a replicable process to standardize the rollout. The 10 student stations included MX500, MX800, each with X2s connected to two central stations.

Due in large part to these factors, the 18-month conversion process was completed on time and on budget—with minimal disruption to patient care. As a responsive, consultative partner, Philips is helping Rush improve efficiencies and reduce costs by delivering:

- Continuous visibility into patients' vital signs

- An ability for staff to trust in data that is fully integrated into the workflow

- Proactive insights into patients' conditions wherever they and their clinicians are located

- Centralized oversight and remote repair of monitoring equipment

Boosting health outcomes

A poorly designed monitoring solution can contribute to errors that increase adverse events and morbidity.[9,10] Common issues include the following:

- Inaccurate, delayed and/or limited data
- The need for time-consuming and error-prone manual re-entry of data
- Data displayed in a table format, which may obscure the most vital information
- An overwhelming number of nuisance alarms

A 2017 survey commissioned by Philips and Regina Corso Consulting underscores the importance of having an optimal patient monitoring system to support staff in enhancing patient outcomes. It found that 87% of physicians and 97% of nurses believe having a gap-free patient monitoring data record is essential for good patient care and nearly all believe it is critical to help manage clinical variation.[11]

> "With Philips, we have the ability to capture trends and know what's significant or just an anomaly. That's going to drive better treatment decisions."
>
> — Angelique Richard, PhD, RN, CENP, Vice President for Clinical Nursing and Chief Nursing Officer, Rush University System for Health and Rush University Medical Center; Acting Senior Vice President of Hospital Operations, RUMC; Associate Dean for Practice, Rush University College of Nursing

An advanced patient monitoring solution that enhances or supports the collection, synthesis and display of data can contribute to care quality through the following:

a. Seamless integration of current data into the EHR from multiple sources, including lab, imaging systems and third-party devices. Philips IntelliBridge provides a single point of contact for bi-directional communication with other hospital information systems.

b. Advanced clinical decision support tools that deliver early warnings of deterioration, which are often present six to eight hours before a critical event. Failing to recognize and act on these signs can lead to organ failure and even death.[12] To reduce serious adverse events on general ward patients, Philips' clinical decision support tools create an Early Warning Scoring system (EWS) that enables staff to detect changes in key vital signs before patients' health has deteriorated.

c. Customized alerts that reduce alarm fatigue and improve responsiveness.

> "Because we're able to configure the alarms to be more accurate and to get key clinical elements, alarm fatigue has gone down and the sensitivity and specificity of our alarming solution has increased."
>
> — Brian Patty, MD, VP and CMIO, Rush University Medical System

Improving patient care at Rush

As a leader in patient safety, having a monitoring system they can trust to deliver timely, accurate data on high-risk patients is of primary importance to Rush staff.

After installing the Philips patient monitoring system, Rush staff is achieving the reliability and configurability needed to manage their complex patients, especially in the NICU. For example, it provides a configurable SpO2 desaturation alarm that accommodates differences between pediatric and adult patients.

Philips clinical decision support tools enable Rush staff to distinguish between temporary anomalies and worrisome trends in vital signs.

Further, Rush reports that avoiding manually re-entering data into the EHR reduces the possibility of transcription errors. Philips' ability to integrate directly with Rush's EHR system speeds data delivery to facilitate decision making and enables integration with the EHR's best practice alerts.

Improving providers' work lives

The stress levels experienced in critical care units are enormous and growing—leading to burnout, talent scarcity and insufficient time to devote to patient care.[13] This stressful environment is compounded by technology that overwhelms the critical care team with data but often lacks meaningful insights.

A standardized patient monitoring solution can improve this work environment by reducing tedious tasks, facilitating faster, more accurate care decisions and freeing staff to focus on patient care.

"Philips monitors provide a better experience for our staff, reducing common interruptions like re-cabling across incompatible monitors."

— Valerie Kalinowski, MD, MHA Executive Vice Chair, Pediatrics; Chief of Clinical Operations, Rush University Children's Hospital; Medical Director, PICU

The negative impact of alarm fatigue on staff and patients has been extensively cited in the literature.[14,15] The Philips monitoring system addresses this problem in multiple ways:

- It delivers alarm-based data directly to appropriate clinicians' smartphones so they can assess the situation wherever they are located.
- It uses role-based assignment and three levels of escalation to avoid alerting non-essential personnel.
- Visual and auditory cues help clinicians distinguish among different alarm types.
- Customized alarm profiles are tailored to the needs of each patient and unit, such as patients in the NICU and PICU.

"With Philips, we can trust the alarms. We don't have to disconnect and reconnect everything when transporting patients. Their alarm audit logs provide key insights that support both patient safety and nursing confidence in the monitoring system. Philips has also reduced alarm fatigue."

— Sheila Levins, MSN, RN, CPN, Unit Director, PICU, Rush University Children's Hospital

Typically, when patients leave the wired safety of their hospital room to be transported to another area, it's even more difficult to ensure safe, continuous monitoring. Without a reliable wireless system, staff may lose connectivity during the transport. Switching monitors can be slow and cumbersome. Data can be disrupted, lost or compromised during the process, which can cause stress and the loss of valuable patient care time for staff. These issues are exacerbated as health systems continue to add more square footage and more facilities—creating longer transports and the need to expand visibility beyond any single facility's walls.

"Wireless transport monitors enable staff to stay connected to our centrals and leverage our existing infrastructure while ambulating or transporting patients throughout our massive campus."

— Sheila Whalen, DNP, RN-BC, Clinical Integration Program Manager, Rush University Medical Center
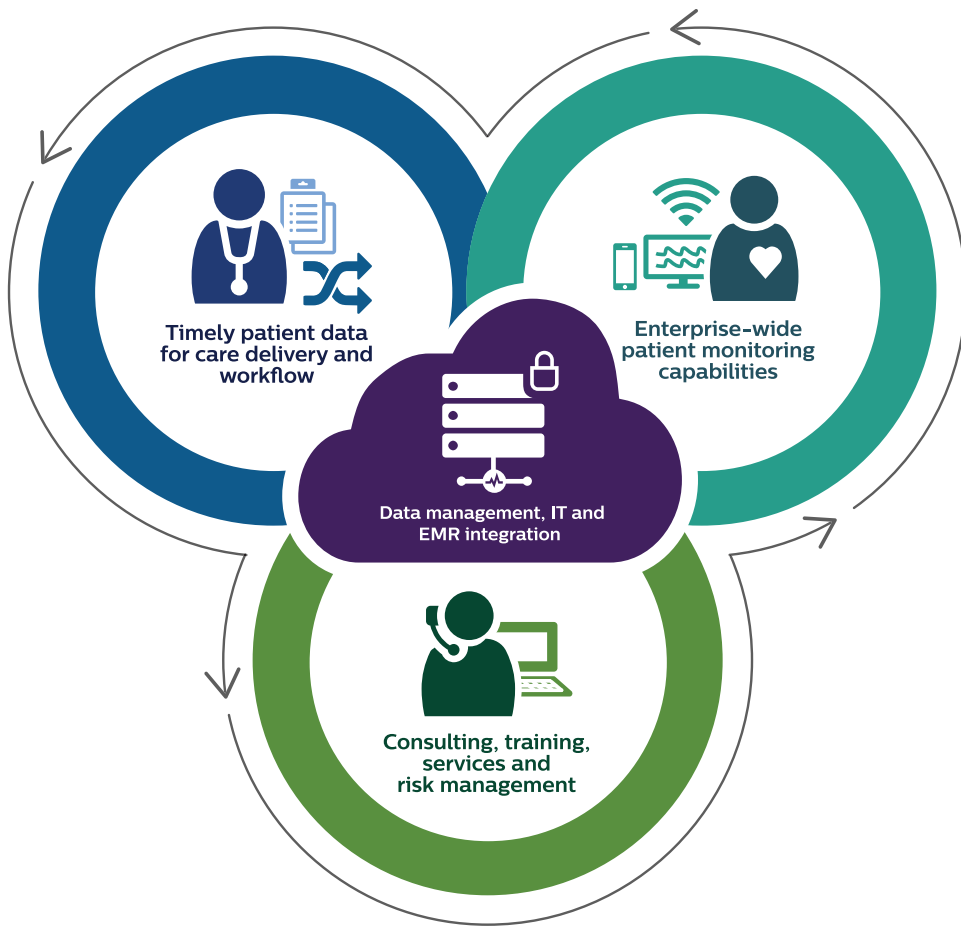
Improving provider work lives at Rush

The Philips system, which automatically integrates data in real time into the EHR, enables Rush staff to avoid manual re-entry and provides current data. Rush staff also benefits from Philips' ability to extract and view high-fidelity data from the EHR and display key information in an easy-to-read format, enabling them to quickly grasp the most critical insights and potentially boosting their efficiency.

Brian Patty, MD, CMIO at Rush, says that, prior to implementing the Philips monitoring system, nurses were hand transcribing physiologic data from the monitors into the EHR. Now, nurses can integrate data directly into the EHR, then validate and post it to the flow sheets, giving them more time to spend on patient care.

The Philips system potentially lessens the stress and time associated with monitoring patients during transport throughout the massive Rush campus:

- It leverages the Rush wireless network to securely cover the entire health system and avoid lost transmission.
- It offers 'plug and play' capabilities that provide continuous information on patients without compromising their vital historical data or triggering false alarms. That prevents the interruption of critical monitoring data when staff switch monitors, which previously took up to half an hour for a complex patient.
- Additionally, Philips provides staff with easy access to retrospective monitoring data, and a clinical audit trail enabling them to determine if their original monitoring settings were modified during transport, then quickly take steps to resolve any issues.

Timely patient data for care delivery and workflow

Enterprise-wide patient monitoring capabilities

Data management, IT and EMR integration

Consulting, training, services and risk management

The Philips monitoring system captures virtually gap-free patient data from monitors and medical devices across the enterprise—even during transport—and securely feeds it directly to your EMR. Clinicians have virtually anytime, anywhere access to patient information, so they can make fast, informed care decisions.

Critical features for a standardized monitoring system

Integrate with the existing IT environment

Deliver a consistent look, feel and interface for every device and acuity level

Enable anytime, anywhere visibility into every patient's condition

Continuously capture data from disparate sources and feed it directly into the EHR for real-time updates

Automatically export data to the patient chart

Employ clinical decision support tools with EWS, events surveillance and advanced algorithms

Include wireless monitoring that enables continuous visibility in every location

Maximize data security and integrity through a risk-based, defense-in-depth security approach

These capabilities enable Rush staff to obtain reliable, continuous visibility throughout their campus. The health system now has over 1,000 transport monitors that provide continuous visibility wherever patients are located.

The Philips patient monitoring system also allows Rush staff to move from having a partial, location-dependent view of each monitored patient to a more comprehensive view that makes it possible to monitor all patient rooms and nursing stations in each unit. The Philips system also enables Rush staff to connect patient monitors with the CO_2 measurement extensions in each patient room, reducing third-party time needed to ensure accurate respiratory monitoring.

Angelique Richard, PhD, RN, CENP, Vice President for Clinical Nursing and Chief Nursing Officer, Rush University System for Health and Rush University Medical Center; Acting Senior Vice President of Hospital Operations, RUMC; Associate Dean for Practice, Rush University College of Nursing, notes the following benefits of the new Philips system:

- Rapid, well-orchestrated rollouts at all Rush units, thanks to a close collaboration with Philips
- Being able to view all monitors centrally as well as locally helps to drive better decisions about patient treatment
- Integrating the monitors with the EHR saves time for clinicians and increases data accuracy and timeliness
- Getting vital signs in real time makes it efficient when physicians round, reducing potential delays in care
- Improved staff engagement scores following the Philips implementation

Enriching patient and family experiences

Research shows that alarms can negatively impact patient recovery and satisfaction while contributing to stress, sleep disturbances and other health issues.[16] It also reveals that staff conversation and alarms are generally regarded as the most disturbing noises for patients' sleep in ICUs.[17]

"Given our comfort level with alarms and triggers since Philips, we have fewer alarms, reducing the level of noise for the patient and anyone who might be trying to sleep or perform work."

— Valerie Kalinowski, MD, MHA Executive Vice Chair, Pediatrics Chief of Clinical
  Operations, Rush University Children's Hospital; Medical Director, PICU

Standardizing patient monitoring across the health system can provide potential benefits for patients and their families that include the following:

- Reducing the number of alarms, which can improve rest and patient satisfaction.[18]
- Improving meaningful alarms, which may support patient safety and give nurses more time for patient care.
- Having patient monitoring data that integrates with the EHR, which speeds information and reduces the chance of transcription error to support patient safety.
- Closing gaps in monitoring, which may improve safety and transport efficiency because staff don't have to disconnect and reconnect monitors. This may also reduce the number of rescheduled or delayed procedures.
- Reducing monitoring equipment downtime, which may reduce treatment delays and improve patients' experience.

"To maximize patient safety during the transition, we held numerous planning meetings. Thanks to excellent collaboration, the process went smoothly and took significantly less time than budgeted."

— Cynthia Barginere, DNP, RN, FACHE, Acting Chief Transformation Officer,
  Rush University System for Health

Creating a better experience for patients and their families at Rush

Rush staff report that the Philips patient monitoring system creates a quiet and restful ICU environment by reducing the number of alarms.

Patients at Rush are also benefiting from staff who feels less stressed and has more time for patient care.

Providing patients with a seamless transition from one monitor to another is believed to benefit Rush patients with a fast and smooth experience as well as continuous data.

$ Improving operational and financial performance

Beyond the benefits to patients and staff, an enterprise-wide patient monitoring system can also yield significant operational and financial benefits by lowering costs, improving productivity and enhancing equipment security.

A. LOWER COSTS

An advanced enterprise-wide monitoring system can potentially achieve meaningful cost savings and save significant staff time over several years by aligning vendor and health system incentives. Philips is undertaking a growing number of long-term strategic partnership arrangements where it shares a commitment to continuous performance improvement and risk with its healthcare partners.[19]

It values strong relationships with customers that include training, education, service, accessories and enhancing the uptime of devices and networks.

> "We chose a single monitoring vendor to decrease costs and, more importantly, to standardize our clinical practices and capitalize on scale."
>
> — Angelique Richard, PhD, RN, CENP, Vice President for Clinical Nursing and Chief Nursing Officer, Rush University System for Health and Rush University Medical Center; Acting Senior Vice President of Hospital Operations, RUMC; Associate Dean for Practice, Rush University College of Nursing

Having a single vendor also can reduce the costs and headaches that result from having to manage multiple equipment and vendor relationships.

Standardized systems can simplify EHR interfaces, reducing the time and costs involved in integrating with existing IT infrastructure. Standardization also can simplify biomedical engineering analysis, testing and maintenance processes; this saves both time and money because all devices run on the same technical platform and share the same spare parts.

B. BETTER PRODUCTIVITY AND PATIENT THROUGHPUT

All Philips' bedside, transport and mobile monitors share the same look, feel and interface—making it easier and faster to train critical care staff to use them.

> "Philips helped us standardize our medical device integration infrastructure so we can have a singular system to support. The biggest benefit is the peace of mind from getting connectivity as close to 100% uptime as possible."
>
> — Thomas Goss, Clinical Integrated Applications Program Manager, Rush University Medical Center

C. ENHANCED CYBERSECURITY

Rigorous cybersecurity built into an effective enterprisewide monitoring system can save time and prevent costly data breaches by using a risk-based, defense-in-depth security approach. To prevent the latest virus or other intrusion from impacting security, device manufacturers must continually update their operating systems. Philips continuously works to keep its patient monitoring system updated and to help customers protect the security of these systems.

Enhancing performance at Rush

The Philips IntelliVue solution enabled the health system to standardize its monitors across Rush University Medical Center, Rush Oak Park Hospital and Rush Copley Medical Center. The partnership established a repeatable process starting with a multidisciplinary core configuration and alarm strategy that could flex up and down from the smallest to the highest-end monitor. That standardization will also expedite future expansion.

Having a standardized patient monitoring system reduced costs for the health system. For example, Rush significantly lowered costs by eliminating the need to rent ventilators because it could integrate its new patient monitors and its fleet of third-party ventilators.

Rush staff also saved time because the Philips monitoring system delivers continuous monitoring and eliminates the need to change cables each time patients are transported or transferred. Productivity has also improved because clinicians no longer need to manually enter data or respond to false alarms.

Detailed logging capabilities are built into the Philips system so that each critical care team at Rush can review the alarms, determine what action was taken by whom and set improvement objectives. Caregivers can collaborate from any location and from multiple devices, reducing the number of nursing staff needed in patients' rooms. For example, after installing the Philips system, Rush's NICU was able to reassign four full-time nurses.

Rush also served as a beta site for PerformanceBridge Focal Point, Philips on-premise management solution that assesses the health of equipment systemwide and troubleshoots most issues remotely. That can improve productivity by reducing the wait for a technician to repair equipment onsite and by resolving potential risks of system downtime before they occur.

Focal Point recently enabled Rush to perform emergency maintenance on its wireless controller with far less disruption to telemetry nursing staff and patients.

The growing value of standardization

The stakes are higher than ever for health systems, which need to consistently and cost-effectively deliver high-quality care across a growing enterprise. Standardizing equipment and processes is especially critical in critical care units—where simplifying training, usage and connectivity to streamline care delivery can, and often does, impact lives.

Health systems increasingly can benefit from strategic, consultative partnerships that align incentives and that can scale as their system grows. They need standardized solutions that can plug and play with existing technology and that staff can depend on for optimal care decisions. That can help them achieve the quadruple aim with better efficiency and lower costs, improved care quality and a better environment for patients and staff.

> **"Having a single, standardized patient monitoring platform enables our biomedical staff to support all patient monitoring devices from the same technical platform throughout the Rush health system."**

— Randall Johnson, CBET, Clinical Engineering Services, Rush University Medical Center

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