

Organization:

University of Maryland Baltimore Washington Medical Center

Solution Title:

Implementation of a Critical Care Outreach Program

Program/Project Description, including Goals:

In the current paradigm of critical illness, the critical care team typically cares for patients shortly before transfer to the intensive care unit (ICU) when consulted by the emergency department team or when a rapid response team is activated on admitted patients. Critical care is then provided through a patient's ICU stay. Patients transferring out of the ICU have their care transferred from the critical care team to predominantly hospitalist teams. Each year, more patients survive ICU admission, which results in new conditions, increased morbidity, and new healthcare needs.

Although critical care teams have an expertise in the diagnosis, prognosis, and treatment of conditions with a high risk of organ failure or death, this expertise is not fully leveraged to care for the entire spectrum of critical illness – most care is limited to the time the patient spends within the walls of the ICU. As such, our primary goal was to expand the traditional role of the critical care team to care for critical illness from prevention through the journey to survivorship by creating a Critical Care Outreach Program. In addition to restructuring the critical care team, we partnered our frontline clinical team with our quality department to ensure that all available resources were being strategically utilized in alignment with broader institutional priorities. By fully leveraging the expertise of the critical care team more broadly, we hypothesized that patient-centered outcomes would improve.

Our baseline data analysis of inpatient cardiac arrests, mortality, potentially preventable complications (PPCs), patient safety indicators (PSIs), and patient quality indicators (PQIs) for pulmonary-related conditions identified an opportunity to 1) identify patients at risk for respiratory compromise, 2) initiate critical care interventions in a more timely manner, and 3) optimize transitions of critical illness survivors back into routine medical care. Therefore, the structure of our Critical Care Outreach Program was designed to improve prevention and early recognition of organ failure, early intervention for critical illness, timely care delivery, and post-ICU care. The impact of these interventions was evaluated by comparing post-implementation results to the baseline data analysis above.

Process:

The infrastructure for the Critical Care Outreach Program was created and continues to be refined utilizing Lean Six Sigma methodology. Beginning in the spring 2018, a process map for the current state was created, and goals were established. A business plan was prepared and approved by the medical center's executive leadership team. The critical care leadership team then sponsored retreats for the ICU and rapid response nursing staff and the critical care medical staff teams in August 2018. As we sought to redefine the traditional role of the critical care team, it was essential for us to ensure that we had engagement and buy-in from the frontline clinical staff. During these retreats, we reviewed baseline performance metrics and current state processes along with the programmatic vision. The staff was then given tools to successfully brainstorm opportunities and barriers. Utilizing this information, future state processes were created with a focus on maximizing operational efficiency with high impact interventions. With

our operational processes establish, we were able to partner with the Quality Department's Clinical Decision Support team to create a real-time dashboard for monitoring the process and outcome metrics of the program. The Critical Care Outreach Program was implemented in September 2018. Since this time, the program has undergone multiple iterations as the processes are re-evaluated and optimized.

Solution:

Based on our initial needs assessment, we developed and implemented a Critical Care Outreach Program (figure 1). This program has five overarching tenets that created an infrastructure to overlay both existing and new processes and initiatives: 1) prevention & early recognition of critical illness, 2) early intervention after recognition, 3) expedient delivery of critical care services, 4) prompt bedside procedures, and 5) post-ICU care with the ultimate goal to transition patients back to the community to prevent recurrent critical illness. The primary staffing model for this program includes one dedicated critical care nurse 24 hours per day who is partnered with a dedicated critical care physician. By reconfiguring our existing staffing models, these team members are dedicated to the Critical Care Outreach Program and do not have competing responsibilities within the ICU.

Domain 1 – Prevention and Early Recognition: Prior to implementation of the Outreach Program, we had a Guardian Program in place (figure 2). The Guardian Program monitors all the inpatient units (except the ICU, psychiatry, and labor and delivery) to assess for risk or evidence of clinical status changes. Continual re-evaluations of the Guardian Program has resulted in the implementation of new predictive algorithms, which enhances the breadth of clinical status changes that are detected. Within the construct of the Outreach Program, the Guardian nurses are partnered with the critical care physician to bring the expertise of the broader critical care team to the patient's bedside before critical illness develops in order to implement preventative strategies. Similarly, the Quality Department's Sepsis Committee designed and implemented a sepsis screening program for the inpatient units for the early identification of sepsis and severe sepsis by the bedside nurse (figure 3). In addition to identification, this screening program also provides the nurse with the tools to initiate early sepsis diagnostic tests and interventions. Within the construct of the Critical Care Outreach Program, the bedside acute care nurse can directly activate a consult to the critical care physician of the Outreach Program to expedite care for patients meeting established criteria for severe sepsis. This allows the critical care team to be involved in a patient's care much earlier than in a traditional model.

Domain 2 – Early Intervention: Our pre-existing Rapid Response Team was bundled into the Outreach Program in conjunction with the Guardian nurses. Based on the team's involvement in domain 1, the team is often able to proactively move to a patient's bedside before the traditional parameters of a rapid response activation are met. However, any staff member or family member can activate the rapid response team if there are concerns about a patient's condition. In addition to the Outreach nursing and physician staff, the activation of the rapid response team also triggers bedside assessment by a critical care pharmacist and respiratory therapist. The Critical Care Outreach Team also responds to inpatient brain attack activations to support the neurology team.

Domain 3 – Expedient Delivery of Critical Care Services (The Mobile ICU): When a patient meets criteria for traditional ICU-based interventions, the dedicated Outreach team is equipped to initiate life support interventions wherever the patient is located. In this model, care does not need to be delayed until the patient is physically transferred to the ICU and the primary

ICU-based team does not need to be pulled out of the ICU to care for patients throughout the hospital; even small delays in the initiation of critical care interventions are associated with worse outcomes. We are able to ensure that patients receive the right care at the right time regardless of location. Our goal in this domain is to improve morbidity and mortality and reduce ICU utilization with early critical care interventions.

During our process improvement cycles, a lack of standardization of supplies in non-ICU locations was identified. The Critical Care Outreach Team subsequently partnered with these areas to ensure that the same supplies and equipment were available to the patient despite location. Similarly, the Outreach team continues to attempt to standardize the critical care practices throughout the hospital. When critically ill patients have a prolonged stay in the Emergency Department (ED) during times of high ICU capacity, the Outreach team performs rounds in the ED utilizing the traditional interdisciplinary ICU rounding structure that is routine within the ICU itself. Ordersets for mechanical ventilation and sedation practices have been standardized between the ICU and the Emergency Department to ensure that patients have smooth transitions of care with reduced variability in practice regardless of physical location.

Additionally, the frontline Outreach team also identified that vasopressors were being delayed because of a lack of central line access. This led to the development and implementation of a peripheral vasopressor policy to safely administer vasopressor agents as soon as possible. Minimizing delays in vasopressor initiation is aligned with the Surviving Sepsis Campaign's 1-hour bundle.

Domain 4 – Procedural Timeliness: The Critical Care Outreach Team performs bedside procedures including paracenteses, thoracenteses, and bronchoscopy among others at the bedside as soon as the need is identified. The timing of these procedures do not need to be coordinated with other departments or procedural areas, and there is not a dependency on the time of day or day of week. The Outreach infrastructure is also utilized to perform penicillin-allergy testing throughout the hospital. The use of penicillin-allergy testing in hospitalized patients has been associated with reduced use of broad-spectrum antibiotics, improved antibiotic stewardship, and reduced *Clostridium difficile* infections.

Domain 5 – Post-ICU Care: The time spent within the ICU is a difficult and complex time for patients and families. ICU care is associated with prolonged physical and neuropsychologic impairments. In traditional models of care, patients are abruptly transferred from the ICU to an acute care ward to have on-going care by new nursing and physician teams. A critical care team's expertise in understanding critical illness can be invaluable in the transition of patients from the ICU to the floor and eventually home. In our Critical Care Outreach Program, patients leaving the ICU continue to have the Outreach team follow them throughout the hospitalization to provide clinical insight and to provide continuity and emotional support for the patient and family throughout this journey. More recently, we have initiated outpatient follow-up for ICU survivors with the critical care physician team. We are currently in the planning phase to implement a full interdisciplinary outpatient ICU survivorship program.

Domain 6 – Administrative Quality: Concurrently, the Critical Care Outreach physicians have integrated with the Quality Department and Clinical Documentation teams as physician leads for pneumonia, respiratory failure, COPD, sepsis, shock, and cardiac arrest to ensure consistent education, case reviews, and overall alignment is achieved across the institution. These critical care providers are now members on all Quality Department multidisciplinary workgroups to provide clinical expertise, support streamlined communication, data reporting, and implementation of action plans.

Figure 1.

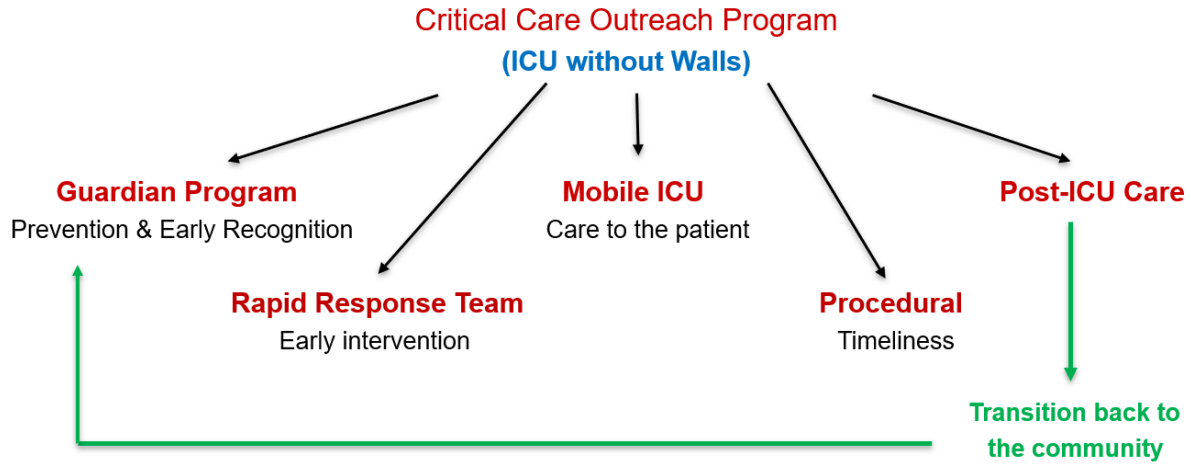



Figure 2.

Primary Problem	LOS	Code Status	NEW: ▲	Temp	Pulse	Systolic BP	Diastolic BP	MAP	Resp	SpO2	Last O2 Dev	ETCO2	WBC	Bands-24 hr	Lactate-24 hr	CO2	Sleep Apnea Score
Acute on chronic systolic (congestive) hea...	2	○	9	36.6 (97.9)	95	(!) 85	59	68	(!) 22	95	Nasal cannula	—	11.7 K/mcL	—	—	36.0 mm...	—
Alcohol withdrawal syndrome without complication...	4	○	9	(!) 38.6 (101.5)	75	102	54	70	(!) 23	96	Ventilator	43	7.8 K/mcL	—	—	24.0 mmol/L	—
None	0	⊕	8	36 (96.8)	89	99	51	67	(!) 26	93	Nasal cannula	—	13.0 K/mcL	—	—	35.0 mm...	10/2/... 06:11 [5]
Respiratory failure (HCC) (Additional Hospital Problems)	2	⊕	6	36.6 (97.9)	112	119	66	84	18	93	Nasal cannula	44	8.0 K/mcL	—	—	>45 mm...	—
Anemia (Additional Hospital Problems)	1	⊕	6	36.9 (98.4)	76	107	53	71	20	100	High flow nasal cannula	—	2.7 K/mcL	—	—	24.0 mmol/L	—
COPD, frequent exacerbations (HCC) (Principal...	8	⊕	6	37 (98.6)	64	123	62	82	(!) 30	95	Nasal cannula	—	23.5 K/mcL	—	—	34.0 mm...	—
Syncope and collapse (Additional...	3	○	5	37.5 (99.5)	104	113	69	84	18	93	Nasal cannula	—	10.2 K/mcL	—	—	30.0 mmol/L	9/29/... 18:33 [4]
Pneumonia (Additional Hospital Problems)	3	○	5	37.4 (99.3)	70	130	75	93	(!) 22	97	None (Room air)	—	2.0 K/mcL	—	—	27.0 mmol/L	—
Leukocytosis (Additional Hospital Problems)	4	⊕	5	36.8 (98.2)	102	(!) 93	45	61	18	100	Nasal cannula	—	29.3 K/mcL	—	—	41.0 mm...	—
Acute appendicitis with perforation and generalized...	10	○	5	36.9 (98.4)	100	111	65	80	18	93	Nasal cannula	—	16.5 K/mcL	—	—	29.0 mmol/L	—
Hemianopsia (Principal Hospital Problem)	2	⊕	4	36.4 (97.5)	77	106	67	80	20	94	Nasal cannula	—	9.2 K/mcL	—	—	38.0 mm...	9/30/... 23:27 [2]

Figure 3.

Sepsis Screen Warning 2




This patient's Sepsis Screen indicates that he/she may meet criteria for **Severe Sepsis**.

- **Initiate** the following *standing orders* if applicable.
- **Activate Rapid Response Team.**

Last WBC: Not on file
 Last CO2: Not on file
 Last ANIONGAP: Not on file
 Last LACTATE: Not on file
 Last WBCU: Not on file

Order	Do Not Order	➔ XR Chest AP (Portable)
Order	Do Not Order	➔ plasmalyte-A bolus
Order	Do Not Order	➔ Vital Signs (Increase Frequency)
Order	Do Not Order	➔ Consult to Critical Care Medicine: Severe Sepsis Screen (ALWAYS order)
Order	Do Not Order	➔ CBC with Auto Diff (Do NOT order if collected in last 4 hours)
Order	Do Not Order	➔ Comprehensive Metabolic Panel (Do NOT order if collected in last 4 hours)
Order	Do Not Order	➔ Lactate (Do NOT order if collected in last 4 hours)
Order	Do Not Order	➔ Blood Culture (Do NOT order if collected in last 12 hours)
Order	Do Not Order	➔ Urinalysis with Reflex Urine Culture (Do NOT order if collected in last 12 hours)
Order	Do Not Order	➔ Pulse Oximetry (Do NOT order if already on continuous)
Order	Do Not Order	➔ Oxygen Therapy (Do NOT order if already on oxygen)
Order	Do Not Order	➔ Notify Attending: Positive Sepsis Screen (ALWAYS order)

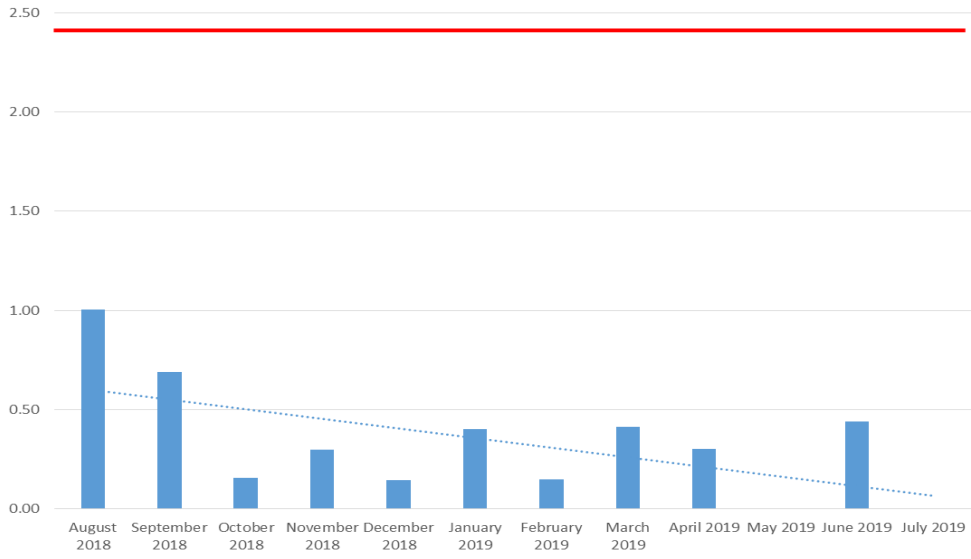
Sepsis Accordion Report 

Accept Dismiss

Measurable Outcomes:

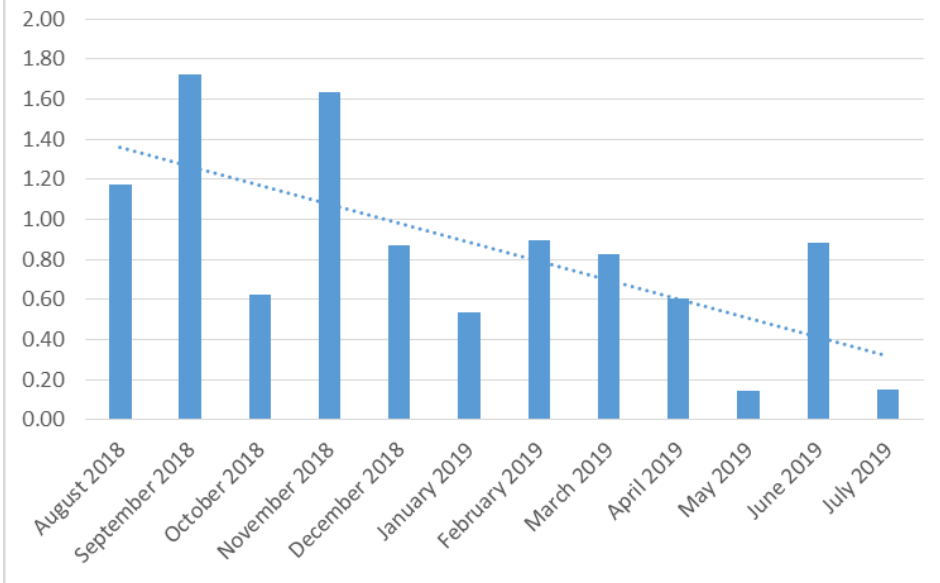
Between July 2017 and June 2018, the rate of cardiac arrest in non-patient care areas was 2.42 events per 1000 patient-days. With the implementation of the Critical Care Outreach Program, there was an 86.2% reduction in cardiac arrests to 0.33 events per 1000 patient-days between August 2018 and July 2019. Notably, all cardiac arrests in the hospital including in critical care areas have declined proportionately.

Non-Critical Care Areas Cardiac Arrest Events per 1000 Patient-Days

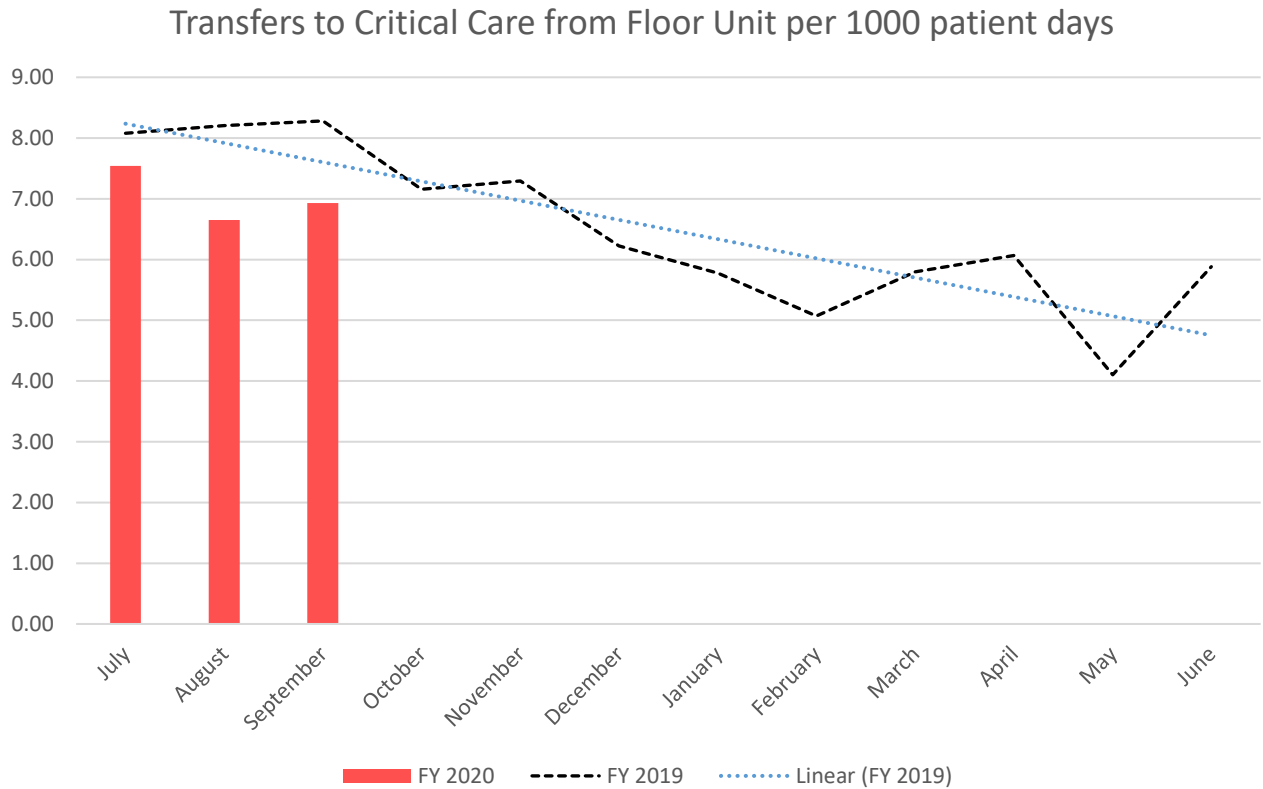


FY 2018: 2.42

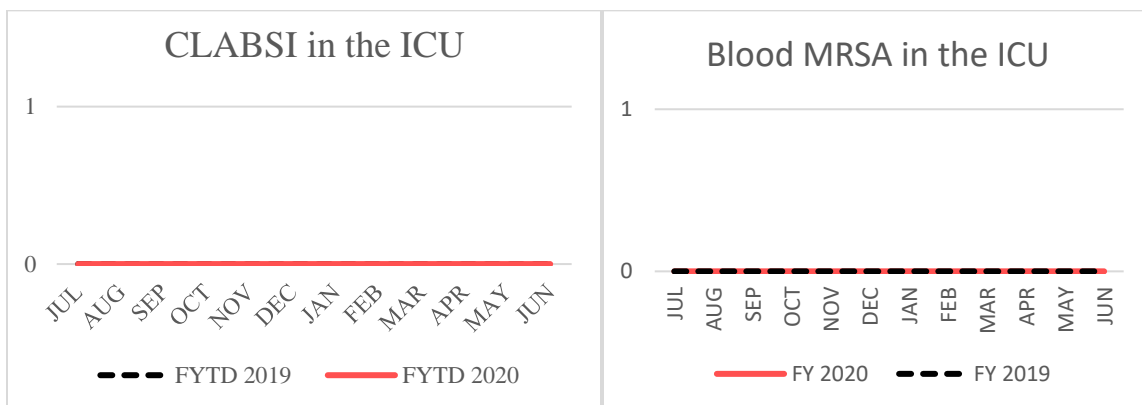
Cardiac Arrest Events per 1000 Patient-Days



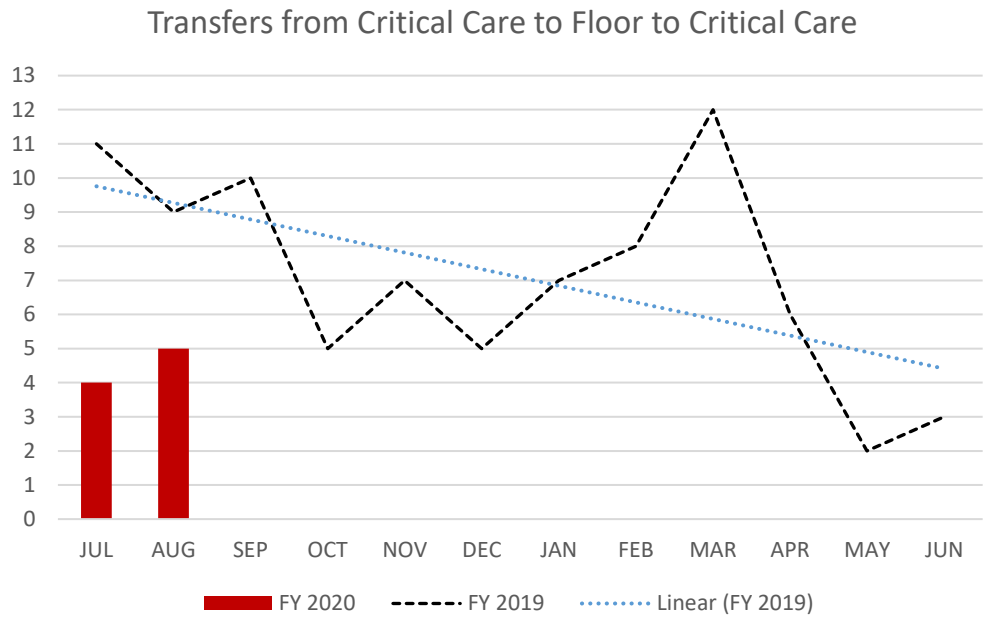
Through early detection and intervention, ICU utilization as characterized by transfers from a floor unit to the ICU has had steady decline.



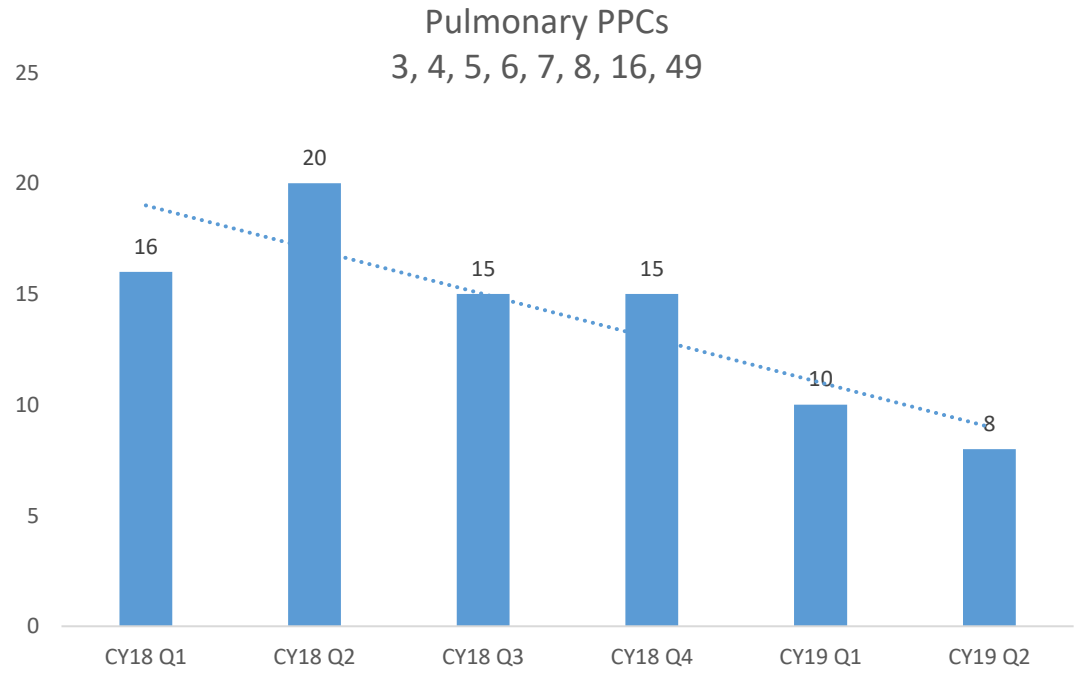
After the Critical Care Outreach Program implementation, a peripheral vasopressor policy was created and implemented. During a 1-year period, a total of 774 patients received peripherally administered norepinephrine. Of these patients, 410/774 (53%) never had a central line placed. Only 14/774 (1.8%) patients had evidence of infiltration or extravasation requiring phentolamine administration. There were 0 cases of identifiable tissue injury. Vasopressor initiation did not require a central line in these 774 patients, and more than half avoided a central line during their hospitalization. There have been no CLABSI and no MRSA blood stream infections in the ICU during this time.



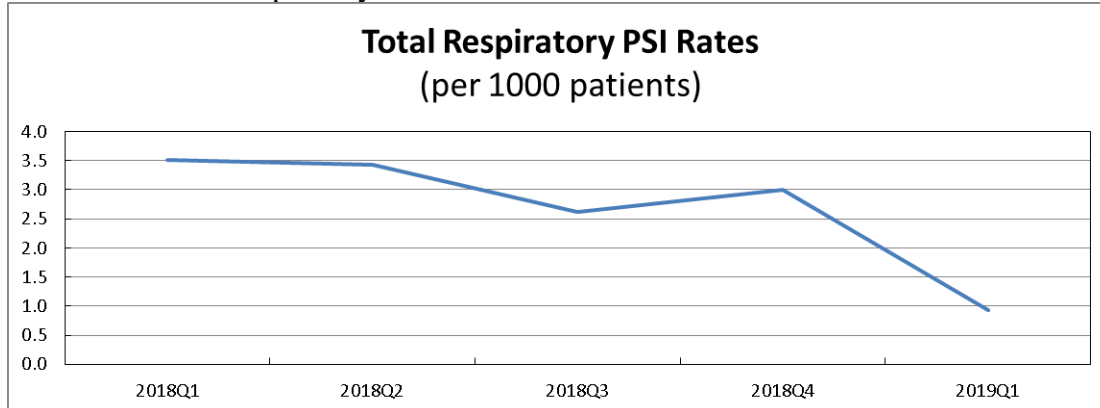
After initiation of the Critical Care Outreach Team’s post-ICU follow-up initiative, there was a 41% reduction in ICU re-admissions [5.8 per month post-implementation vs 10.0 per month pre-implementation (p=0.025)].



Significant and sustained reductions in pulmonary-related PPCs.



74% reduction in respiratory PSI rates.



Sustainability:

With over a year of experience since implementation, the Critical Care Outreach Program has been solidly imbedded into the hospital infrastructure. Within each domain, there are on-going process improvement changes being tested and implemented to ensure on-going sustainability and growth. Importantly, our partnership with the Clinical Decision Support team provides access to process and outcome metrics that allow us to grow and develop in a data-driven, opportunity-based manner. In addition to supporting our programmatic dashboard, the Clinical Decision Support team provides granular data on an *ad hoc* basis when new trends or questions arise. This access to robust data sets and the process improvement cycles that result create and maintain buy-in from both the frontline staff and leadership teams.

Role of Collaboration and Leadership:

Every patient that is admitted to our hospital is part of the Critical Care Outreach Program given the broad scope of monitoring and touchpoints by the team. The Outreach program is managed by our Critical Care Committee. This committee is composed of critical care nurses and providers, the ICU leadership team, pharmacists, respiratory therapists, nutritionists, physical therapists, occupational therapists, speech pathologists, case managers, social workers, clinical documentation specialists, members of the Quality department including infection prevention, mortality, and sepsis specialists, and leaders from other departments including emergency medicine, surgery, anesthesia, hospital medicine, cardiology, pediatrics, and palliative care medicine. This collaboration across the breadth of the Critical Care Outreach Program ensures that the goals of the Outreach program are aligned with those from the other departments within the hospital.

Our Critical Care Committee subsequently interacts with other management groups including the Pharmacy & Therapeutics committee, and Quality Department Collaboratives including Stroke, Sepsis, Respiratory, and Cardiac Committees. Importantly, this group is also directly linked to our senior leadership team through representation on our Performance Improvement Risk Management, Medical Staff Quality Improvement Committee, and the Medical Executive Committee among others. This infrastructure allows for the Critical Care Outreach Program to be aligned across the institution.

Additionally, the integration of the frontline critical care physicians as physician champions within the Quality Department allows for a unique collaboration resulting in a synergistic learning and creative environment.

Innovation:

Although the general concept of a wall-less ICU has been previously established and the post-intensive care syndrome has been described, the comprehensive underlying infrastructure of our Critical Care Outreach Program to care for the entire spectrum of critical illness, including prevention, is unique. Additionally, partnering this program with federal and state quality and safety outcomes programs and integrating it into the day-to-day safety culture of the institution creates a distinctive alignment that has consistently demonstrated improvements in patient outcomes.

Partnering with a Performance Improvement Coordinator in Quality, providers in the ICU became Physician Leads for pneumonia, respiratory failure, COPD, sepsis, shock and ventricular fibrillation/cardiac arrest. Each Physician Lead received education in the Maryland Hospital Acquired Conditions Program and the inclusion and exclusion criteria for the Potentially Preventable Complications. On-going retrospective chart audits with Quality led to timely identification of root causes for missed opportunities, timely attention to data and increased accessibility to front-line staff in all disciplines. Concurrent attention to documentation discrepancies led to more timely education for providers and ultimately more accurate documentation in the medical record. Buy-in from frontline physicians improved dramatically. Critical Care providers became co-chairs and members of all multidisciplinary workgroups, provided feedback and guidance based on their findings and clinical expertise and supported the Quality Department's system for streamlined communication, alignment of initiatives, data reporting and implementation of action plans.

Culture of Safety:

At UM BWMC, we continuously focus on discussions regarding safety and the prevention of harm to our patients. High risk Critical Care Outreach Patients are discussed at our daily Safety Huddle that is well attended. ICU Physician leads interact daily with Clinical Documentation Improvement staff regarding documentation opportunities and Quality staff regarding quality of care delivery opportunities. Continuous broader communication occurs clinically between the ICU Providers with the Rapid Response Team and Guardian Nurses as well as ED, hospitalist and community providers. ICU nursing and floor nursing communications ensures the ICU team is continuously in the loop. Extensive RN training has been provided regarding Sepsis on all our inpatient units as well as in the ED. The Critical Care Outreach Team is highly visible out-and-about daily throughout the institution. The team huddles with the primary patient care teams following clinical assessments and interventions. Process and outcomes data is reported to frontline staff and leadership through the Outreach dashboard and via all Quality Collaboratives, committees, and workgroups.

Patient and Family Integration:

Critical care medicine, by its very nature, involves the evaluation and management of the broad bio-psycho-social-spiritual spectrum of medicine. Similarly, a core component of the Society of Critical Care Medicine's ICU Liberation ABCDEF bundle is Family Engagement and Empowerment, which has been adopted by our ICU. We consider the patient and family to be an

inherent part of the interdisciplinary critical care team. As our critical care team members integrate with the care teams and committees throughout the hospital in our Outreach Program, our critical care ethos of keeping patients and their families at the center of our clinical encounters penetrates widely.

Times of critical illness can be some of the most difficult encounters that patients and families have with the healthcare system. Our Critical Care Outreach Program creates a continuity of care throughout the entire spectrum of critical illness from detection through survivorship, which allows us to consistently support our patients through these times of uncertainty and vulnerability.

Related Tools and Resources

- Davidson JE, et al. Guidelines for family-centered care in the neonatal, pediatric, and adult ICU. *Critical care medicine*. 2017; 45(1):103-28.
- Needham DM, et al. The functional costs of ICU survivorship: collaborating to improve post-ICU disability. *American journal of respiratory and critical care medicine*. 2011; 183(8):962-4.
- Solomon RS, et al. Effectiveness of rapid response teams on rates of in-hospital cardiopulmonary arrest and mortality: a systematic review and meta-analysis. *Journal of hospital medicine*. 2016; 11(6):438-45.
- Svenningsen H, et al. Post-ICU symptoms, consequences, and follow-up: an integrative review. *Nursing in critical care*. 2015; 22(4):212-20.

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