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Tiered Model of Nurse Staffing for Critical Care and Emergency Departments in the Wake of a Pandemic

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AIM: To identify strategies that increase hospital bed capacity, material resources, and available nurse staffing during a national pandemic.
BACKGROUND: The COVID-19 outbreak resulted in an influx of acutely ill patients requiring critical care. The volume and acuity of this patient population increased the demand for care and stretched hospitals beyond their capacity. While increasing hospital bed capacity and material resources are crucial, healthcare systems have noted one of the greatest limitations to rapid expansion has been the number of available medical personnel, particularly those trained in emergency and critical care nursing.
EVALUATION: Program evaluation occurred on a daily basis with hospital throughput, focusing on logistics including our ability to expand bed volume, resource utilization, and the ability to meet staffing needs.
CONCLUSION: This article describes how a quaternary care hospital in New York City prepared for the COVID-19 surge in patients by maximizing and shifting nursing resources to its most impacted services, the emergency department (ED) and the intensive care units (ICUs). A tier-based staffing model and rapid training were operationalized to address nurse-staffing shortages in the ICU and ED, identifying key factors for swift deployment.
IMPLICATIONS FOR NURSING MANAGERS: Frequent communication between staff and leaders improves teamwork and builds trust and buy-in during normal operations and particularly in times of crisis.

On March 11, 2020, the World Health Organization officially declared the coronavirus disease 2019 (COVID-19) outbreak a pandemic, describing it as the defining global health crisis of our time.[1] Healthcare systems worldwide have observed an influx of COVID-19 patients, many of whom are severely ill and require longer hospital stays.[2] The volume and acuities of the COVID-19 patients have increased the demand for care and stretched hospitals beyond their capacity. At the peak of the pandemic in Italy, some hospitals could not provide intensive care unit (ICU) beds or potentially lifesaving ventilators to all patients who needed it because of shortages.[3]

Early models offered sobering estimates that the healthcare needs created by COVID-19 would exceed the resources of US hospitals.[4] New York City (NYC) witnessed as many as 1718 new hospitalizations a day during the pandemic.[5] This situation required hospital officials to develop surge capacity that would prepare for the influx of patients. While increasing the number of hospital beds and material resources has been crucial, healthcare systems have noted one of the greatest limitations to expanding care capacity

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has been the insufficient number of available medical personnel, particularly those trained in emergency departments (EDs) and ICUs.[6-9]

As all elective surgeries and procedures were suspended per the New York Governor's mandate, the ICU and ED experienced a surge in admissions. Increasing nurse staffing is a difficult and costly task, especially in light of our country's ongoing shortage of nurses. While the hospital faced a shortage of ICU nurses, there was an excess of procedural nurses and perioperative assistive staff. Optimizing resources to where they were most needed was made possible by redeploying perioperative and procedural nurses to the ED and ICU. Literature assessing healthcare worker attitudes has demonstrated that approximately 50% to 89% of US healthcare workers would be willing to work during a pandemic or similar healthcare crisis.[10-12] Our model encouraged camaraderie, and as a result, many staff members willingly worked extra shifts, to maintain adequate nurse staffing levels.

This article describes how a 1139-bed quaternary care hospital in NYC maximized its existing staffing resources to expand care capacity during the COVID-19 pandemic, specifically focusing on the EDs and ICUs and highlighting how these 2 services modified their processes to accommodate additional staffing resources. While the ED was able to rapidly train travel nurses, the ICUs relied on in-house redeployment using a modified Tiered Model of Staffing strategy to oversee patient delivery in critical care.

Optimizing the ED Surge

The ED was the 1st service to be heavily impacted by COVID-19. In the initial phase of the pandemic, the New York Department of Health Wadsworth Center was the only laboratory in the state capable of performing COVID-19 testing. Because of the long turnaround time for test results, many acutely ill patients remained in the ED for extended periods; compounded by higher admissions rates, this created an overflow of patients in the ED.

The ED implemented a split flow model for throughput in 2015. In this model, all patients are seen by a "sort" nurse immediately upon arrival and were quickly registered. The sort triage RN obtains the patient's chief complaint, performs a brief focused assessment, and assigns a triage level based on the Emergency Severity Index 5-level triage system. To manage the surge of patients presenting with COVID-19 symptoms and to separate potential infectious patients from noninfectious patients, the ED expanded this split flow model and added a second sort triage nurse during the peak of COVID-19 visits. This nurse triaged all patients with fever, cough, and upper respiratory tract symptoms, as well as hypoxia and tachypnea. Patients without COVID-19 symptoms were assigned to the main ED and those with symptoms assigned to 1 of 2 designated surge areas. Patients with mild symptoms were rerouted to a separate space out of the main ED. Those with more severe symptoms were moved and isolated in the ED-ICU, which is an area within the ED where critically ill patients requiring ICU care await transfer to the ICU. To safely manage the influx of patients with COVID-19 symptoms, 20 rooms in the nearby urgent care center were converted into ED surge spaces where low-acuity patients were cared for. Additionally, the 13 beds in the observation unit of the ED were converted into an ED-ICU to accommodate critically ill patients suspected of having COVID-19. Because the ED needed to rapidly respond and adapt to changing conditions, interdisciplinary team huddles were held twice per day to provide timely communication, ensure adequate workflow, and address staff concerns.

Developing ED Surge Teams

The staffing model for the ED surge space and ED-ICU was based on expected acuity and volume (Table 1). Staffing for the ED surge space, main ED, and ED-ICU was supplemented by nurses with prior ED experience who were deployed from closed procedural areas, the observation unit nurses, and contracted staff. Training for deployed staff consisted of completion of an ED competency checklist and 3 shifts of orientation with an ED nurse. One half-day of orientation included a boot camp class on ED workflows, policies, and documentation. Approximately 31 nurses were trained during this time period. Additional staff in both the ED surge space and ED-ICU included ED technicians and medical clinical associates who were able to perform phlebotomy, electrocardiograms, vital signs, and urine point-of-care tests.

Optimizing the Critical Care Surge

As testing for COVID-19 became available in our hospital laboratory, turnaround time for results was reduced; our focus then changed to addressing critical care volume. In order to work effectively, ICUs required space, staff, and resources. Our team identified the need for additional beds and locations, critical care nurses, respiratory therapists, and physicians, as well as ventilators, personal protective equipment (PPE), high-efficiency particulate air filters, and test kits.

Prior to the pandemic, our ICU bed complement, which does not include the ED-ICU, was 94 beds; however, the large influx of critically ill COVID-19 patients required that we expanded our ICU capacity by 148% to 233 ICU beds. Existing spaces were repurposed for ICU patients, including opening up

Table 1. ED Nursing Staffing Needs

Zone	Pre–COVID-19	COVID-19
Sort triage	1 RN 24/7	1 RN 24/7 and 1 additional RN 14 h/d (9 AM–11:30 PM)
Urgent care/ED surge	1 RN 12 h/d (8:30 AM–8:30 PM)	3 RNS 12 h/d staggered shifts to cover 16 h of operations (8 AM–noon)
Resuscitation/ED-ICU and step-down area	3 RNs 24/7 and 3 RNS 12 h/d with staggered start times	6 RNs 24/7 and 3 RNs 12 h/d with staggered start times

1 closed medical ward, converting 2 postanesthesia care units, and partially converting 3 step-down units.

At our institution, the Institute for Critical Care Medicine oversees the operation of all 7 ICUs. In collaboration with engineering and hospital throughput, traditional ICU rooms were converted into negative-pressure rooms, increasing our COVID-19 ICU space. Additionally, ICUs modified single-bed critical care rooms to accommodate double occupancy. In terms of resources, having sufficient ventilators was necessary to accommodate the projected influx of patients. In total, 209 ventilators were on site, ready to be deployed. To support the rapid utilization of PPE, a 24-hour hotline was developed to ensure adequate PPE was available to staff, so they could safely care for patients.

Developing Critical Care Surge Teams

In total, 118 members were available for deployment, including 96 RNs and 22 technologists. Although the nurses in the redeployment pool primarily specialized in perioperative services, many had previous clinical experience working in the ED, ICUs, and medical/surgical areas. All staff, regardless of their role, received infection prevention workshops, which included PPE training, such as donning and doffing. Importantly, establishment of a PPE "buddy" system, guaranteed team members properly donned and doffed, preventing the likelihood of contamination.

It was also important that nurses understood the disease process of COVID-19; as such, education included information about disease management and known interventions. Prior to deployment, all nurses completed a skills assessment, which based on their response determined where staff were reassigned and their role team (Figure 1). Training and education programs were developed, considering the role the staff member would assume and designed to allow nurses to practice within their scope of licensure. To further enhance our model, step-down nurses assisted ICU in the care of the patient. This was feasible because step-down nurses at our institution have relevant training in Advanced Cardiac Life Support and Essentials of Critical Care Orientation for progressive care.[13]

As mentioned, many of the nurses who were redeployed had previous critical care, ED, step-down, or medical surgical experience. The strategy for redeployment included prioritizing the "last-in, first-out" method. Meaning, those employees who most recently transferred into their current unit (perioperative and procedural areas) were the 1st staff to return back to their former unit, for example, ED or ICU.

A total of 79 nurses were redeployed to the ICUs, 34 from step-down and 45 from medical/surgical/perioperative floors (Figure 2). A staffing strategy was needed to ensure every patient received oversight from a nurse with ICU expertise. The Society of Critical Care Medicine proposed a tier-based model of staffing, adapted from the Ontario Health Plan for an Influenza Pandemic. In this model, the leading ICU physician would be able to oversee a greater number of patients through the assistance of advanced practice providers (APPs) and redeployed clinicians.[14]

This model was adapted for nursing, to ensure ICU nurses would oversee and lead a team of 4 to 6 patients. The deployed RN staff were assigned 1 of 4 roles based on their skill set: 1) critical care nurse; 2) resource nurse; 3) medical/surgical nursing; or 4) assistive personnel (Figure 3). ICU nurses were current and former ICU nurses who had retained their critical care competencies. The ICU nurse's responsibilities included care coordination, care planning, and delegation of tasks, as well as follow-up with team members. Resource nurses were redeployed step-down RNs who provided regular patient updates so the ICU nurses could help make decisions about patient care. In addition, resource nurses performed supportive duties such as suctioning, dressing changes, vital signs, hourly rounds, medication administration, finger sticks, COVID testing/swabbing, and teaching and validating donning and doffing skills. Medical/surgical nurses cared for patients on general nursing units. During this time, only COVID-19 patients were present in the hospital. Redeployed technicians initially served as assistive personnel, who later were moved to the proning team. This strategy allowed us to utilize the available staff to support and stretch

GENERAL COMPETENCIES *PATIENT POPULATION* *(Neonate, Pediatric, Adolescent, Adult, Geriatric, Bariatric, LGBTQ)*	ORIENTEE SELF ASSESSMENT Place√		
	NO EXPERIENCE	UNSURE/ NEED ASSISTANCE	CONFIDENT/ INDEPEN-DENT
Utilizes the 4 P's of rounding/check-ins; **P**ain, **P**ositioning/Mobility, **P**roactive Toileting, **P**ossessions/Environmental Safety			
Patient Education			
Direct Patient Care			
Nursing Process			
Mobility			
Pain Management			
End Of Life			
Neurological System			
Respiratory System			
Cardiovascular System			
Integumentary System			
Gastrointestinal System			
Genitourinary System			
Teamwork and Collaboration			
Safety			
Specimen Collection and Reporting			
Infection Prevention			
Point of Care Testing			
Equipment Safety			
Medication Administration			
Vascular Access			
Informatics			
Supportive Care			

Figure 1. Scaled-down nursing competency checklist. A comprehensive competencies checklist was utilized to assess nurses to determine their redeployment assignment.

our ICU nursing resources to provide oversight to larger numbers of patients.

Keys to Success

Emergency preparedness necessitates quick planning to address operational challenges. The goal of our tier-based model was to provide safe, quality patient care during a national pandemic. This was achieved by defining roles, increasing space, and maximizing the skills of our staff members. An important factor that facilitated our ability to deploy staff was the suspension of elective surgery. Development of a self-assessment skills-based checklist allowed targeted, rapid training of staff that identified leaning needs and gaps in knowledge. This process prevented duplication of previously mastered skills. Importantly, we were able to leverage staff so they were able to practice within the full scope of their license. Repurposing nontraditional spaces to accommodate capacity included adding negative-pressure rooms and converting single-bed ICU rooms to double occupancy.

Communication is an important part of the working environment, which, when used effectively, can lead to staff satisfaction. Staff communication was enhanced through daily huddle messages, which included pertinent information about hospital unit COVID-19 conversions, PPE updates, and responses to concerns presented by staff. Staff support was provided by proactive physician and nurse leader rounding, which allowed opportunities for staff to raise concerns and leaders to remove barriers. Some examples of staff

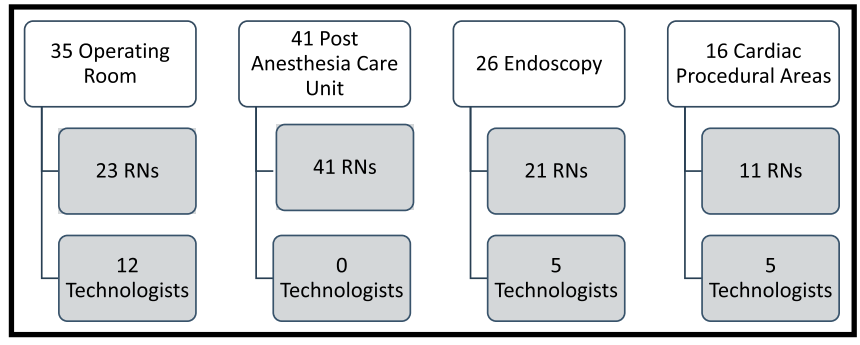

Figure 2. Breakdown of where the redeployed staff members originated.

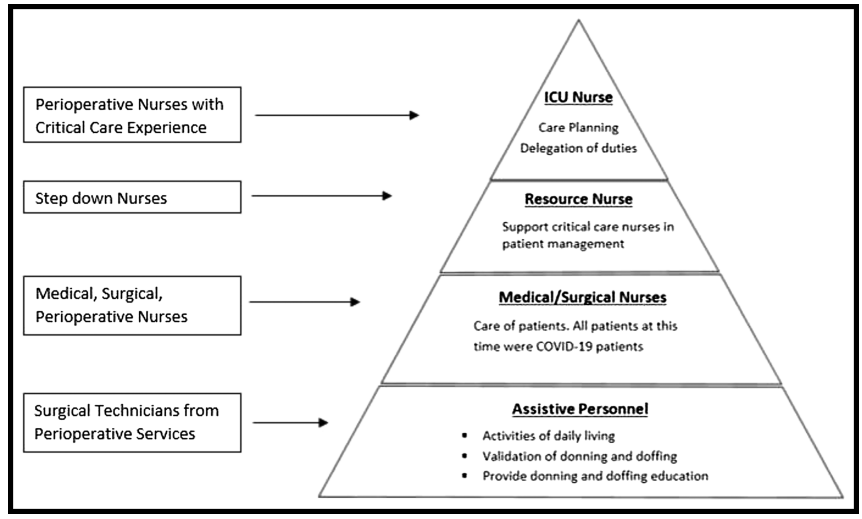

Figure 3. Roles in the tiered staffing strategy of nurses.

requests included free scrubs, 24-hour PPE hotline, hotel accommodations, parking, and meals. Response to concerns and provision of these benefits built trust and enhanced communication between staff and leaders.

Conclusion

Using a tier-based staffing model provided a structure for ICU nurses to oversee a greater number of patients. Likewise, staffing was enhanced by deploying a surplus of procedural and perioperative nurses to ICUs to care for critically ill patients. Innovative ideas to address space and resource management enhanced our ability to accommodate a greater number of patients. Notably, we believe our success was founded in open and frequent communication, as well as interdisciplinary collaboration, which leads to effective process while addressing staff concerns. Flexibility in emergency response such as pandemic response including tiered staffing must be an ongoing competency of nurse leaders in the future.

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