Background: The coronavirus disease 2019 pandemic has exacerbated staffing challenges already facing critical care nurses in intensive care units. Many intensive care units have been understaffed and the majority of nurses working in these units have little experience.

Objective: To describe how the skilled tele-intensive care unit nurses in our health system quickly changed from a patient-focused strategy to a clinician-focused approach during the coronavirus disease 2019 crisis.

Methods: We modified workflows, deployed home workstations, and changed staffing models with the goal of providing additional clinical support to bedside colleagues while reducing exposure time and conserving personal protective equipment for those caring for this highly contagious patient population. The unit changed focus and granted more than 300 clinicians access to technology that enabled them to care for patients remotely, added nearly 200 mobile carts, and allowed more than 20 tele-intensive care unit nurses to work from home.

Results: Tele-intensive care unit nursing provided clinical knowledge to the nurses covering current and expanded critical care units. Using technology, virtual rounding, and increased collaboration with nurses, tele-intensive care unit nursing minimized the risk to bedside nurses while maintaining a high level of care for patients.

Conclusion: Tele-intensive care unit nurses provided a proactive, holistic approach to caring for critically ill patients via camera as part of their routine workflow. In addition, during the coronavirus disease 2019 pandemic, these nurses created a new strategy in virtual health care to be implemented during a crisis. (Critical Care Nurse. Published online May 28, 2020)

In November 2019, China experienced its first human case of coronavirus disease 2019 (COVID-19). Unlike recent pandemics, this virus has wreaked havoc worldwide and has been especially challenging for the nursing profession, exposing fears about staffing issues and critical care nursing safety.¹ Our health system, Atrium Health, leveraged a tele-intensive care unit (tele-ICU) as a strategy to address these issues and support critical care nurses during the COVID-19 health care crisis.

Before COVID-19, ICUs struggled to recruit and retain skilled critical care nurses.² The pandemic has not only highlighted existing nursing shortages but also created unique concerns of its own as surge planning strained existing staffing resources.³ According to an internal survey of 164 ICU nurses in our health system in 2019, 39% of nurses at the bedside had less than 2 years of nursing experience and 73% had less
than 5 years of experience. With the potential surge, several non-ICU locations were reassigned to care for patients with COVID-19, thereby leaving nurses without ICU experience responsible to care for patients with complex care needs. Given the short time to prepare for the pandemic, it would have been a challenge to train the many nurses across multiple facilities. Supporting these frontline nurses with experienced tele-ICU nurses appeared to be a reasonable approach.

During the pandemic, nurses became increasingly concerned about the risk of acquiring the infection and transmitting it to others. As the number of COVID-19 cases increased, worldwide demand for personal protective equipment (PPE) climbed sharply, creating unease among the entire health care community. With nurses spending an average of 33% of their shift in patient rooms, the nursing profession grew especially concerned about the health and safety of its workforce and, specifically, the continued availability of critical care nurses throughout the pandemic. Our health system made tele-ICU expansion a priority because its leaders believed the tele-ICU was key in helping address these crucial issues centered on critical care nursing during the health crisis.

Atrium Health is a large, integrated, not-for-profit health care system in the southeastern United States. The tele-ICU in this system, called virtual critical care (VCC), has been providing care in 10 hospitals and 16 ICUs since 2013. The VCC uses real-time, 2-way audio and high-definition video communication to more than 335 critical care beds and via mobile carts in 2 emergency departments in our health system. With more than 80 board-certified tele-intensivists and 40 board-certified critical care nurses, the VCC team provides critical care coverage for adult patients 24 hours a day, every day. The additional layer of critical care expertise, monitoring, and communication aids bedside ICU nursing staff.

Methods

Infrastructure Expansion

Through Atrium Health’s Incident Command directive, a multidisciplinary team of physicians, nurses, information systems specialists, and administrators quickly assessed and prioritized needs for additional technology, including carts, laptops, headsets, and cameras. Consistent with the Society of Critical Care Medicine guidelines, surge preparation involved adjusting the distribution and use of existing hospital beds to meet critical care needs. The VCC coverage was quickly expanded in 3 facilities that were first to admit patients diagnosed with COVID-19 (Table 1). In one facility, an unused pediatric ICU located near the medical ICU was outfitted with carts containing a high-resolution camera, monitor, microphone, and speaker. Another facility expanded into endoscopy and postanesthesia care units that could support ICU patients using existing telemetry monitors. These areas were then given mobile carts supported by VCC nurses. The third facility reactivated a closed unit that was already equipped with VCC monitoring equipment. At these 3 facilities alone, the VCC enabled conversion of existing hospital beds into critical care beds, increasing the capacity to provide ICU level of care by 43% to 175%.

Across the system, 24 telemedicine mobile carts were initially deployed. An additional 200 were ordered, with more than 50 designated specifically for critical care support. Existing workstations were enabled with tele-ICU technology, giving the entire health care team virtual access to patients from the nursing stations of individual ICUs. In addition, more than 300 physicians, nurses, pharmacists, and respiratory therapists were granted access to tele-ICU software to facilitate team-based care of patients with COVID-19. The technology enabled virtual assessment of and communication with patients in isolation, decreasing time clinicians spent in these rooms.

Authors

Sandy L. Arneson is the program coordinator for virtual critical care at Atrium Health, Charlotte, North Carolina. Sara J. Tucker is a clinical nurse III for virtual critical care at Atrium Health. Marie Mercier is the nurse manager for virtual critical care at Atrium Health. Jaspal Singh is medical director of Critical Care Practice and Education at Atrium Health. Corresponding author: Sandy L. Arneson, RN, BSN, CCRN, Virtual Critical Care Program Coordinator, 11304 Hawthorne Drive, Suite 220, Mint Hill, NC 28227 (email: sandy.arneson@atriumhealth.org).

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Virtual critical care nurses played a critical role in reducing the risk of exposure by minimizing the amount of time bedside nurses spent in isolation rooms.

According to the Centers for Disease Control and Prevention,13 certain health conditions are deemed high risk for nurses in direct patient care. During our health care system’s reassignment of these individuals, the VCC team accepted and trained 9 nurses from ICUs throughout our system. The VCC served as a redeployment assignment for experienced ICU nurses who may have otherwise been furloughed, which further bolstered the infrastructure and experience of the VCC team.

**Workflow Modifications**

Traditional tele-ICU nursing workflows consist of a multilayered team of virtual and bedside clinicians proactively rounding on patients and reacting in real time to their needs.14 The structure and goals of the VCC align with the American Telemedicine Association’s Continuous Care Model15 and the American Association of Critical-Care Nurses’ consensus statement on tele-ICU nursing practice.16 The ability to support bedside teams with real-time patient care issues as well as compliance with evidence-based practice bundles are key components in creating quality outcomes for patients.14

During the pandemic, however, VCC nurses have shifted their focus to provide not only a proactive, holistic approach to caring for critically ill patients but also to support and protect bedside nurses caring for patients in isolation.7 Specific aims included reducing unnecessary time spent in rooms of patients with COVID-19,
By centering the critical care nursing strategy around VCC, non-ICU nurses at the bedside were supported by experienced ICU nurses at the push of a button. Minimizing bedside staff exposure, and facilitating communication among the health care team.

Workflow changes implemented to reduce unnecessary time spent in isolation rooms, and thereby reduce risk of exposure, included the following: The VCC nurse connects with bedside nurses at the start of each shift to establish a patient rounding schedule. The VCC nurse is responsible for visual patient rounding every other hour or more frequently, if needed. During typical camera rounds, VCC nurses assess intravenous sites, infusions, and equipment; any abnormalities are reported to the bedside team. During bedside procedures or significant events, the VCC nurse is present on camera to monitor the patient, document a preprocedure time-out, and take detailed notes of the event. Bedside nurses who are alone in an isolation room in full PPE may have difficulty communicating their needs to staff outside the room; the VCC nurse can communicate the bedside nurse’s needs to someone outside the room, allowing the nurse to maintain full PPE coverage and complete the patient care.

To practice high-risk procedures, such as prone positioning of patients with respiratory failure and managing procedural risks with aerosol-generating procedures (eg, endotracheal intubation, bronchoscopy, cardiac arrests), VCC nurses participated in clinical simulation education in conjunction with the bedside staff. Additional training on how to correctly don and doff PPE took place, along with practicing high-risk, low-frequency procedures. These experiences were designed to improve collaboration and trust between the VCC and ICU nurses.

The knowledge and practice methods for treating patients with COVID-19 were evolving rapidly; therefore, the VCC nursing team had to keep up with clinical practice adjustments across all our ICUs. To facilitate this communication, we held mid-shift huddles via teleconferencing at 2 pm and 10 pm daily. In these huddles, VCC nursing leadership presented system-level critical care information and tele-ICU–specific updates and changes. In addition, VCC huddles gave all team members the opportunity to ask questions, provide feedback, and recognize each other as well as their bedside colleagues. Because management of patients with COVID-19 changed rapidly, VCC nurses had to know the most current practice to accurately guide the bedside staff. To ensure they had access to the most up-to-date information, the VCC leadership maintained a repository of COVID-19 guidelines in an easy-to-access, shared online site universally available to nursing team members.

**Results**

We found that the expansion and modification of VCC in our health system helped address key nursing issues pertaining to the COVID-19 pandemic. This expansion can be scaled quickly to augment bedside support of critically ill patients; can promote clinician safety, especially by minimizing exposure and PPE use; and can serve as an important resource to bedside nurses with less ICU experience. Using technology, virtual rounding, and increased collaboration with nurses, VCC nursing minimized the risk to bedside nurses while maintaining a high level of care for patients.

**Discussion**

**Clinical Support**

During the COVID-19 pandemic, there was a real potential to strain an already stressed critical care nursing workforce caring for many extremely ill patients. Because of surge planning and significant ICU bed expansion, nurses without ICU experience were called on to care for critically ill patients. By centering the critical care nursing strategy around tele-ICU, non-ICU nurses at the bedside were supported by experienced ICU nurses at the push of a button. This button, located either on the wall of a patient room or on a mobile cart, alerted the VCC nurses to a need at the bedside and connected them via 2-way audio and video.

The Society of Critical Care Medicine recommends a tiered staffing strategy whereby ICU patients are cared for by a mixed nursing staff consisting of experienced ICU nurses alongside redeployed non-ICU nurses. In the case of the repurposed postanesthesia care unit, critical care patients were cared for by postanesthesia care unit and emergency department nurses, with experienced ICU nursing support provided by VCC nurses via mobile cart and camera. This ease of access to an additional layer of clinical support was reassuring to bedside nurses.

**Conclusion**

Because of surge planning and significant ICU bed expansion, nurses without ICU experience were called on to care for critically ill patients. By centering the critical care nursing strategy around tele-ICU, non-ICU nurses at the bedside were supported by experienced ICU nurses at the push of a button. This button, located either on the wall of a patient room or on a mobile cart, alerted the VCC nurses to a need at the bedside and connected them via 2-way audio and video. This strategy helped address key nursing issues pertaining to the COVID-19 pandemic, such as minimizing bedside staff exposure, and facilitating communication among the health care team.
clinicians and to leadership as they developed staffing models in anticipation of a large patient surge.

The VCC team has a system-level view of all ICU beds, so tracking the escalating number of patients being tested or testing positive for COVID-19 was a natural clinical and strategic transition, and was more efficient than creating a separate structure or process. This process helped Incident Command remain aware of patient surge and ICU bed capacity, leading to more informed decision-making regarding allocation of supplies and equipment.

Psychosocial Support

The COVID-19 pandemic escalated personal concerns and apprehension among all members of the health care team. Early in the pandemic, fears of not having adequate PPE available for the duration of the pandemic were concerning because of the potential impact on nursing morale, which, in turn, was likely to intensify nursing shortages.

Virtual critical care nurses played a critical role in reducing the risk of exposure by minimizing the amount of time bedside nurses spent in isolation rooms. Assistance with proper PPE management reinforced best practice in real time to ease anxiety related to exposure risk. Once the bedside nurse was in the room, the VCC nurse was immediately available via camera for collaboration. The VCC nurses virtually rounded on isolation patients frequently to give the bedside nurses peace of mind, knowing that problems would be brought to their attention quickly, even when they were not in the room. A VCC nurse could also perform clinical documentation while the bedside ICU nurse performed a physical assessment, which could be challenging in full PPE. The bedside nurse could then concentrate on the patient, perform care needs, and potentially provide more accurate documentation.

Having additional peer support via camera provided a layer of psychological safety to bedside nurses, and the results of this nursing collaboration during the pandemic were encouraging (Table 2). Testimonials from frontline

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<th>Table 2 Examples of VCC nursing assistance with patients with COVID-19</th>
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<td>An ICU patient newly diagnosed with COVID-19 had rapidly worsening acute respiratory failure. The bedside nurse contacted the VCC nurse for assistance. The VCC nurse contacted a physician, relayed orders to the bedside nurse, contacted the laboratory and blood bank to get needed information, and called the anesthesiologist for urgent intubation. Coordination of these tasks allowed the bedside nurse to stay in full PPE, assemble emergency medications and equipment, and support the patient’s immediate bedside needs.</td>
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<td>Because of isolation rules, many patients feel alone with less clinical contact. A VCC nurse provided comfort and conversation to an alert patient who had limited interaction with the bedside nurse. The bedside clinician appreciated that less of her time was needed in the room. Also, with less need to enter the room, PPE was preserved.</td>
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<td>An inexperienced ICU nurse called the VCC to ensure that the PPE was worn correctly. The VCC nurse educated the ICU nurse on the guidelines for donning and doffing PPE and reassured the bedside nurse who, in turn, voiced appreciation for the support.</td>
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<td>The bedside nurse was busy in a patient’s room and was unable to find time to call the patient’s family. The VCC nurse spoke directly with the family to give them an update on their loved one and communicated back to the bedside nurse. The VCC nurse became an important conduit of communication and compassion for a patient who otherwise was isolated and whose family felt removed by the visitor restriction rules.</td>
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<td>A bedside nurse was concerned about her patient and asked for assistance from the VCC. A VCC nurse remained on camera for more than an hour to monitor the patient. As the patient decompensated, the VCC nurse was able to communicate requests for equipment during intubation and arterial and venous catheter insertions with staff outside the room. By minimizing room entry and exit, PPE use was also minimized.</td>
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<td>During scheduled hourly camera rounds, the VCC nurse noted worsening trends in oxygenation for a patient receiving mechanical ventilation. After coordination with the bedside team, the patient was placed in the prone position. The VCC nurse coached the bedside team to perform prone positioning, because bedside nurses were less familiar with the mechanics of proning in this ICU.</td>
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<td>A patient was noted to be in respiratory distress and anxious. The VCC nurse stayed on camera with the patient until the bedside nurse was able to come into the room after assisting with a code in another room. The bedside nurse verbalized appreciation because this additional oversight of her patient provided her reassurance that her patient was being cared for while she tended to a more critically ill patient.</td>
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<tr>
<td>Abbreviations: COVID-19, coronavirus disease 2019; ICU, intensive care unit; PPE, personal protective equipment; VCC, virtual critical care.</td>
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nurses reflected similar reactions. A nurse from the surgical trauma ICU who had less than a year’s experience said,

I know the pandemic is serious and I am fearful to be at the bedside, because I worry a patient might be positive for COVID-19 and not know it and have been exposed without proper PPE. However, I am comforted knowing another nurse is in the room with me, even if it’s virtually.

Another nurse from a medical ICU stated she felt the VCC nurse was “right next to me during a 4-hour ordeal in a patient’s room.”

Conversely, caring for our bedside teammates via camera could create fear, frustration, and helplessness for VCC nurses as the pandemic unfolded. One VCC nurse described watching a patient decompensate while the provider, nurse, and respiratory therapist donned PPE as quickly as possible outside the room. Although there was a feeling of helplessness, the VCC nurse was able to support the patient’s emotional needs via camera and assured the patient that help was on the way.

Throughout the COVID-19 health care crisis, the VCC leadership has made team member self-care a priority. Debriefings during VCC mid-shift huddles allowed leadership to learn about difficult situations and provide support when needed. Music therapy, meditation sessions, formal debriefing with pastoral care, and other resources were available to support resiliency and self-care. Behavioral health resources and employee-assistance programs were encouraged for those needing additional support. As indicated in Table 3, frontline and VCC nurses experienced apprehension unique to their role in the delivery of patient care. Virtual critical care nurses implemented strategies to ease apprehensions experienced by the bedside nurses, and VCC leadership worked to ease the apprehensions of the VCC nursing team.

### Conclusion

The COVID-19 pandemic has put excessive limitations on the delivery of critical care across the globe. Providing care that improves patient outcomes has always been the goal of the collaboration between VCC nurses and nurses at the bedside, but the COVID-19 pandemic has added new challenges and stressors. Virtual critical care nurses, with the support of VCC leadership, have implemented strategies to ease apprehensions and support the well-being of all nurses involved in patient care.
pandemic required VCC nurses to modify their care delivery goals to include measures to safeguard the well-being of their bedside colleagues. By increasing the availability of technology and modifying VCC nursing support, Atrium Health could manage shortages of critical care nursing staff while maintaining the care standards that define the profession.

Given the overall rapid expansion of telemedicine across the country, the tele-ICU nursing role will continue to evolve to meet the changing health care system’s needs, even after the pandemic has subsided. Early anecdotal feedback from bedside nurses, physicians, and leaders of this process has been favorable, and this experience has shown the versatility of the tele-ICU, including the ability to adapt to situations ranging from everyday tele–critical care support to crisis management and, most importantly, the value tele-ICU nurses can provide to their bedside colleagues. Additional research is needed to assess the effectiveness of this strategy, especially in long-term events.

Acknowledgments
The authors acknowledge Noelle Hartley, virtual critical care (VCC) clinical nurse program coordinator; Deena Dennman and Rodney Wilson, VCC clinical supervisors; and Alfred Papali, critical care physician, for their collaboration. The authors thank the nurses who work in the VCC unit and their bedside colleagues for their work during the pandemic, and the VCC intensivists, virtual respiratory therapists, e-pharmacists, and information and analytics and critical care leadership teams for their clinical support.

Financial Disclosures
Jaspal Singh has received consulting fees from Medtronic and Sonnomware Sleep Solutions. All other authors declare no conflicts of interest.

See also
To learn more about tele-ICU, read “Telemedicine Intensive Care Unit Nursing Interventions to Prevent Failure to Rescue” by Williams et al in the American Journal of Critical Care, 2019;28(1):64-75. Available at www.ccnonline.org.

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