


# Virtual Nursing Initiatives in an Urban Hospital System: A Discussion of Successful Interventions and Future Directions

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## Abstract

The implementation of virtual nursing enables remote support, which reduces the workload of bedside nurses and enhances patient care. Its use expanded in response to workforce shortages during the COVID-19 pandemic, and it has since gained approval from bedside staff and patients while helping mitigate staff burnout. Virtual nursing interventions have shown to improve patient safety and quality of care. At Houston Methodist Hospital, virtual nursing is facilitated through an artificial intelligence-assisted care platform, delivered via mobile carts equipped with tablets or two-way wall-mounted cameras with audio and visual capabilities. This discussion highlights virtual nursing initiatives across our academic flagship hospital and seven satellite hospitals, which commenced in June 2022. This article concludes with the authors' vision of future goals for expansion.

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Virtual nursing supports bedside nurses to create a more balanced workload that enhances patient care.<sup>1</sup> The COVID-19 pandemic led to the implementation of virtual nursing initiatives to address workforce shortages. One example at Houston Methodist Hospital was the implementation of virtual nursing to facilitate patient admission and patient discharge.<sup>2,3</sup>

The long-term outlook for bedside nursing needs projects a shortage that is expected to worsen over time.<sup>4</sup> These considerations support the need for initiatives to address workforce shortages in nursing. In addition, virtual nursing has the advantage of improving nursing job satisfaction, with the advantage of this approach as it relates to hiring external travel nurses who may report signs and symptoms of chronic fatigue from the substantial workload.<sup>5</sup> Our institution is dedicated to integrating virtual nursing to complement bedside care. This discussion highlights past and current initiatives, demonstrating the diverse ways this approach can enhance patient care. Virtual nursing and other telehealth initiatives discussed here are made possible

using either wall-mounted cameras in patient rooms or mobile carts with tablets that contain applications that use artificial intelligence (AI) to assist in the delivery of care from a remotely located nurse to the bedside.

## Delivery of Virtual Nurses to the Bedside

Our flagship academic hospital and all seven of our satellite hospitals have incorporated this technology to date. The technology allows for active patient monitoring, hourly documentation, verbal communication with patients, tele-sitting, and response to critical alarms such as patients mobilizing unassisted or demonstrating acute vital sign changes on telemetry. Virtual observation can occur with one technician per 12–16 patients. At our institution, the patient care load by bedside nurses has historically been around 1 per 4 patients. Although still in progress, the integration of the AI-assisted virtual nursing platform into our electronic medical record system is underway to support order management and patient list organization.

### The Role of the Tele-Sitter in Virtual Nursing

A tele-sitter system employs remote patient observation technology to facilitate two-way audio and visual monitoring while ensuring patient privacy. At one of the community hospitals in our health system, this system is integrated with AI-assisted technology to provide tele-sitter services for all 11 medical-surgical hospital beds. A light indicator informs the patient that monitoring is active, although the device does not record audio or video. The program primarily serves patients at risk of falls, such as those with delirium (47%) or dementia (24%). To date, no adverse events have been reported.

The program has contributed to reduced fall rates and lessened the burden on bedside staff, allowing them to focus on tasks critical to high-quality care delivery. However, some patients with altered mental status may not respond well to virtual monitoring, which remains a notable limitation of the program and may be due to a lack of orientation to their situation.

### Patient Admission and Patient Discharge

Our feasibility and outcomes studies for virtual admission and discharge are described in previous publications.<sup>2,3</sup> Our full virtual nursing program for patient admissions and discharges began in June of 2022 and now covers 55 units (1,490 hospital beds). Since implementation of the full program, 173,979 total encounters have occurred, with 63.9% (1,111,193) of encounters completed for admission and 36.1% (62,786) encounters completed for patient discharge. The admission process included completion of our standard nursing profile by the virtual admission nurse. Upon completion, a secure message is sent through the electronic medical record and delivered to the bedside team.<sup>6</sup> Patient discharges included a standard review of a patient's after-visit summary that provides discharge instructions for the virtual nursing team to review with the patient. The average duration of a tele-nursing call for admission is 13 minutes, 26 seconds, and discharges 14 minutes, 55 seconds. Both are decreased from our in-person times that could take as long as 1 hour.

### Virtual Intensive Care Unit Nurses

During the COVID-19 pandemic, our institution implemented virtual intensive care unit (vICU) nursing along with virtual critical care staff physicians.<sup>7</sup> Virtual nursing staff support reduced the need for personal protective equipment, reduced bedside nursing staffing shortages, and decreased the risk of patient-to-provider transmission with the virtual platform. We believe this intervention represents a sustainable solution that will allow for retention of hired staff and improve staff retention.

During implementation of the vICU as a whole, a 20% decrease in code blue events from quarter 1 of 2020 to

quarter 2 of 2022 was observed. Patients also had the benefit of being able to communicate with friends and family through a similar application by utilizing two-way audio and visual technology. The program continues to be an integral part of digital health solutions to enhance patient care at our institution.

### Considerations and Future Directions

Our ongoing implementations include remote patient monitoring of all admitted patients using wearable devices that continuously monitor vital signs, with the aim of demonstrating feasibility and improving the effectiveness of our active monitoring programs.

The primary goal is to leverage monitoring data and care algorithms to identify patients at risk of clinical deterioration and facilitate timely communication with the bedside team. In addition, we have implemented a one-to-one intentional nurse rounding program for deep vein thrombosis prevention utilizing virtual nursing. We believe these initiatives have the potential to further improve patient care and serve as models for other institutions looking to integrate virtual nursing into their standard patient care practices.

The described interventions require ongoing refinement in collaboration with information technology and adjustments to the physical infrastructure necessary for such initiatives. To ensure effective implementation, patient and provider feedback should be collected at various stages. Post-implementation, nurse rounding, and reassessments have proven essential for refining these processes. Evaluating both the experience of each group and the initiative's impact on patient outcomes is critical. Engaging unit leaders, such as nurse managers, can help gather qualitative feedback, which can be used to further improve satisfaction and patient care quality.

Our experience indicates that both patients and bedside nursing staff are satisfied with these initiatives. For those considering a pilot or feasibility program, it is important to address potential challenges related to technology and infrastructure before scaling the project. Establishing proven, repeatable methods can facilitate broader implementation. Monitoring for adverse events is essential to mitigate any unintended consequences; however, our experience shows that virtual nursing initiatives have generally led to a reduction in adverse events for the relevant service line.

Carefully planned virtual nursing interventions can offer significant benefits for both patients and healthcare providers in large academic hospitals and smaller satellite facilities. By leveraging advanced technology, these interventions address potential workforce shortages and enhance bedside nurse job satisfaction, reduce burnout, and improve patient outcomes.

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## Conflicts of Interest

No relevant disclosures.

## Contributors

All authors made substantial contributions to the conception or design of the work and data acquisition, analysis, or interpretation, as well as drafting and revising the manuscript for publication.

## Data Availability Statement (DAS), Data Sharing, Reproducibility, and Data Repositories

Any data generated or referenced in this manuscript is a preliminary statistic that is not publicly available until completion of the study or implementation.

## Application of AI-Generated Text or Related Technology

Not applicable.

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## References

1. Ball J. American Nurses Association- Innovation. 2024.
2. Bruce CR, Klahn S, Randle L, Li X, Sayali K, Johnson B, et al. Impacts of an acute care telenursing program on discharge, patient experience, and nursing experience: retrospective cohort comparison study. *J Med Internet Res*. 2024;26:e54330. <https://doi.org/10.2196/54330>
3. Schwartz RL, Hamlin SK, Vozzella GM, Randle LN, Klahn S, Maris GJ, et al. Utilizing telenursing to supplement acute care nursing in an era of workforce shortages: a feasibility pilot. *Comput Inform Nurs*. 2024;42(2):151–7. <https://doi.org/10.1097/CIN.0000000000001097>
4. U.S. Bureau of Labor Statistics. Registered nurses. Washington, DC, USA: United States Department of Labor; 2024.
5. Twigg DE, Kutzer Y, Jacob E, Seaman K. A quantitative systematic review of the association between nurse skill mix and nursing-sensitive patient outcomes in the acute care setting. *J Adv Nurs*. 2019;75(12):3404–23. <https://doi.org/10.1111/jan.14194>
6. Scott C. Identifying Social Drivers of Health and Connecting Patients with Community Resources That Can Help. Epic Share. 2024. Accessed: September 30, 2024. Available at: <https://www.epicshare.org/share-and-learn/houston-methodist-sdoh>
7. Dhala A, Sasangohar F, Kash B, Ahmadi N, Masud F. Rapid implementation and innovative applications of a virtual intensive care unit during the COVID-19 pandemic: case study. *J Med Internet Res*. 2020;22(9):e20143. <https://doi.org/10.2196/20143>

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