Telemedicine Intensive Care: How and Why It's Efficient, Effective, and Essential

Ann Marie Huffenberger, DBA, MBA, RN, NEA-BC 07 February 2018

Summary

State, federal, and commercial payer policies have been enacted to reward organizations who meet the Triple Aim by providing better care, better health, and lower costs. Healthcare organizations have adopted technology with aim to advance the delivery of care. Some of the largest costs incurred in healthcare are associated with the delivery of care in intensive care units (ICUs). Telemedicine intensive care (teleICU) has emerged as a technological advance to improve clinical outcomes by reducing variation and clinical complication in ICU populations. Healthcare organizations are strategically achieving scalable and sustainable teleICU programs with innovative approaches to healthcare delivery by strengthening clinician relationships across telemedicine platforms to ensure efficient and effective resource utilization that is essential in a value-based care environment.

Article

As healthcare organizations move from fee-for-service reimbursement models to value-based care models, expeditiously, clinicians are feeling the downstream effects of the realization that the healthcare sector in the United States is changing. Clinicians who provide hospital services, and every point of clinical service along the care continuum thereafter, are mindful of emerging themes -- improving the health of populations, enhancing the patient experience of care, and reducing the per capita cost of healthcare -- these and other transformational changes are essential to ensuring healthcare organizations attain fiscal sustainability in the 21st century.

To meet the demands of a growing, medically-complex, elderly population in the United States, a challenge that is compounded by an anticipated shortage of physicians that coincides with an anticipated shortage of registered nurses, hospital organizations are collaborating to leverage resources and implement clinical support strategies. Care models have evolved to endorse advanced practice registered nurses and other clinicians practice to the fullest extent of their education, training, and licensure. Telemedicine intensive care (teleICU) has emerged as a technological advance to improve clinical outcomes in critical care populations. TeleICU services are well-positioned to meet broad demands for intensivist physician coverage, expert critical care nurse

reconnaissance, compliance with best practice protocols, and thereby uphold efficient utilization of ICU resources within a healthcare organization.

In a centralized operation room (COR), distant from the bedside operations, board certified intensivist physicians and critical care registered nurses (CCRNs) remotely monitor clinical activities in real time using audio, video, and electronic means. Cameras and monitors are installed at the bedside in the ICU rooms and teleICU software is interfaced with patient's electronic medical record (EMR). The software enhances teleICU efficiencies for real time monitoring of physiological, laboratory, pharmaceutical, and radiological data. The objective is relentless surveillance to identify and avert impending or worsening conditions that may benefit from earlier intervention. From an organized and focused office setting (See Figure 1), the teleICU team can detect trends that may otherwise be missed by bedside clinicians who work in a challenging environment often fraught with high-priority competing demands. TeleICU services have shown to be effective in reducing ICU mortality, reducing hospital length of stay, and lowering rates of preventable complications by reinforcing timely response to physiological trends and adherence to critical care best practice protocols. [1, 2]

From a technology standpoint, there are three information systems (IS) components necessary. First, teleICU clinicians require full access to the clinical information at the bedside, which includes the EMR, the physiological

waveforms, and any handoff information that may be communicated outside the EMR. Second, teleICU software is essential in conducting real time enterprise-wide surveillance by organizing the clinical details so that intellectual processing can occur in rapid logical sequence. Two vendors predominately hold the market for teleICU software, the Philips VISICU technology and the InTouch Health Remote Presence technology. However, in a time of high demand for systems integration, EMR vendors such as Epic Systems are gaining market share by offering an integrated teleICU module solution. Third, a connection network is essential for the remote clinicians to communicate with the bedside clinicians. While older systems provide one-way camera functionality where remote clinicians can be heard but not seen, more robust video platforms have become the clinical standard with two-way camera functionality, essentially a bidirectional audio-video experience, where colleagues see each other when they are communicating. Two-way camera functionality is far superior in building the interactive, collaborative relationships that are necessary for teleICU programs to succeed.

Successful teleICU programs capture robust returns on investment (ROI) by focusing on measures to reduce ICU mortality and ICU length of stay, increase compliance with best practice protocols, decrease time on the ventilator, decrease rate of ICU complications, and synchronize ICU bed management to include triaging patients in-and-out,

thereby augmenting throughput and tendering an increased capacity for admissions, ultimately driving revenue[3, 4, 5]. Despite the lack of a direct reimbursement model, there are significant indirect financial benefits of deploying teleICU services as a cost avoidance, cost savings approach. Fifer et al. demonstrated that the capital investment and first year operating cost of teleICU was recoverable in approximately one year[6]. Franzini et al. confirmed that teleICU services were cost-effective in caring for the sickest of patients[7]. Deslich & Coustasse showed the implementation of teleICU to be more beneficial than costly and denoted the strategic advantage to providing telemedicine services[8]. Kahn & Rubenfeld reflected using teleICU to sustain best practice compliance[9].

The University of Pennsylvania Health System (UPHS) commenced PENN E-LERT® teleICU program in 2004 as one of the first programs in the nation. By 2017, UPHS completed a multimillion dollar expansion of corporate IS infrastructure to support teleICU services enterprise-wide. Today, collectively, PENN E-LERT remotely monitors 245 ICU beds within the Hospital of the University of Pennsylvania, Penn Presbyterian Medical Center, Pennsylvania Hospital, and Good Shepherd Penn Partners. As a world-class academic university health system, a major differentiator for PENN E-LERT is the mission, which is uniquely founded on guiding principles of excellence in quality, and merit in quality improvement,

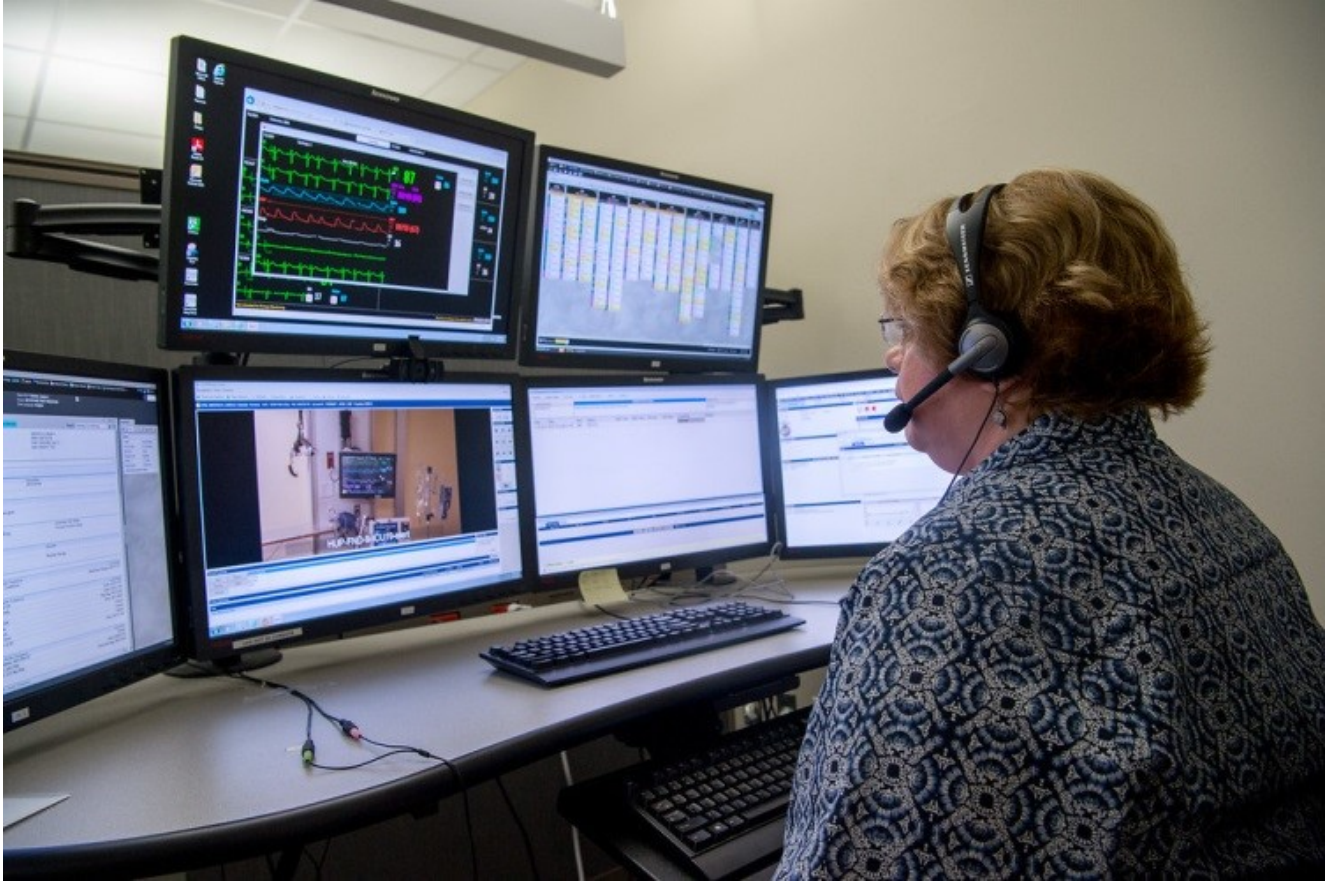
thereby supporting safer and higher-value outcomes that benefit patients, families, clinicians, and payers. Beyond the active and engaged remote monitoring of physiological trends, PENN E-LERT team provides real time clinical decision-making support. Some bedside clinicians utilize PENN E-LERT more than others but the teleICU service is available 24/7/365 for all clinicians. For example, advanced practice providers (APPs) such as a nurse practitioners (NPs) or a physician assistants (PAs), interns, residents, and/or physicians in fellowship can conduct an “on demand” consult with the teleICU intensivist physician overnight. New to practice registered nurses or experienced registered nurses can conduct an “on demand” consult with the teleICU nurse. In essence, at the push of an e-Lert button from the ICU room, bedside teams can connect immediately via telemedicine with the PENN E-LERT team who is well versed in the finer intricacies of critical care operations at UPHS.

You may ask, what are some examples of real time clinical decision-making support? An exemplar for the PENN E-LERT intensivist physician may be evaluating an admission that arrives overnight, answering a clinical question during an emergency, consulting on a complicated critically ill case, reviewing a radiology image, overseeing a procedure, collaborating on an end-of-life discussion, or appraising a newly published best practice research article. From the PENN E-LERT nursing perspective, real time clinical decision-making support may be guiding the

titration of an infusion drug, interpreting, evaluating, or advocating a physician order, troubleshooting a crucial piece of equipment, discerning a waveform, consulting alarm management, responding to a request to keep an extra set of eyes on a restless patient, or answering to an emergency when bedside resources are busy with another emergency on the unit. The PENN E-LERT team effectively and efficiently supports the healthcare system's essential critical care operations, they are an added layer of clinical support who uphold Penn Medicine's commitment to excellence.

The second major differentiator for UPHS is that PENN E-LERT clinicians are UPHS employees who are centrally located on campus in Philadelphia. Many of the PENN E-LERT intensivist physicians are the medical directors of the ICUs in the health system, which helps to drive the collaborative, collegial, cohesive relationships between the teams. As well, many of the PENN E-LERT nursing team, who are CCRN prepared and have an average 15 plus years' critical care experience, have transferred to teleICU after a long-standing ICU career in the health system. By contrast, there are ICUs in the nation who receive teleICU services from programs that are located out-of-state, or even out-of-country, which adds an additional challenge -- that is, how to ensure there is systematic integration of the teleICU operations into the broader quality initiatives of the enterprise wide ICU operations.

In summary, healthcare organizations across the nation are contending with intensified scrutiny. State, federal, and commercial payer policies have been enacted to reward organizations who provide better care, better health, and lower costs. Some of the largest costs incurred in healthcare are associated with ICU care delivery. Healthcare organizations have adopted technology with aim to advance the delivery of care in ICUs. TeleICU programs have acclaimed the opportunity with aim to reduce variation and clinical complication. While there is mounting support for teleICU services as an ICU standard of care, there is work that remains to discern the full advantages and potential consequences of services. Regardless, it is clear that critical care medicine is operationally high stakes and an ICU culture who embraces the technical and human capital available will successfully leverage resources to attain superior outcomes. Healthcare organizations are strategically achieving scalable and sustainable teleICU programs with innovative approaches to healthcare delivery by strengthening relationships across telemedicine platforms to ensure efficient and effective resource utilization that is essential in a value-based care environment.



Critical care registered nurse (CCRN) reconnaissance at PENN E-LERT® Telemedicine Intensive Care Unit,
a division of Penn Medicine Center for Connected Care.
Photo Credit: Penn Medicine Department of Marketing Communications

Works Cited

[1] Lilly, Craig M., Shawn Cody, Huifang Zhao, Karen Landry, Stephen P. Baker, John McIlwaine, M. Willis Chandler, and Richard S. Irwin. "Hospital mortality, length of stay, and preventable complications among critically ill patients before and after tele-ICU reengineering of critical care processes." *Jama* 305, no. 21 (2011): 2175-2183.

[2] Lilly, Craig M., John M. McLaughlin, Huifang Zhao, Stephen P. Baker, Shawn Cody, and Richard S. Irwin. "A multicenter study of ICU telemedicine reengineering of adult critical care." *CHEST Journal* 145, no. 3 (2014): 500-507.

[3] Rogove, Herb. "How to develop a tele-ICU model?." *Critical care nursing quarterly* 35, no. 4 (2012): 357-363.

[4] Kruklitis, Robert J., Joseph A. Tracy, and Matthew M. McCambridge. "Clinical and financial considerations for implementing an ICU telemedicine program." *Chest Journal* 145, no. 6 (2014): 1392-1396.

[5] Lilly, Craig M., Christine Motzkus, Teresa Rincon, Shawn E. Cody, Karen Landry, and Richard S. Irwin. "ICU Telemedicine Program Financial Outcomes." *CHEST Journal* 151, no. 2 (2017): 286-297.

[6] Fifer, Sheila. *Critical care, critical choices: the case for Tele-ICUs in intensive care*. New England Healthcare Institute; Massachusetts Technology Collaborative, 2010.

[7] Franzini, Luisa, Kavita R. Sail, Eric J. Thomas, and Laura Wueste. "Costs and cost-effectiveness of a telemedicine intensive care unit program in 6 intensive care units in a large healthcare system." *Journal of critical care* 26, no. 3 (2011): 329-e1.

[8] Deslich, Stacie, and Alberto Coustasse. "Expanding technology in the ICU: the case for the utilization of telemedicine." *Telemedicine and e-Health* 20, no. 5 (2014): 485-492.

[9] Kahn, Jeremy M., and Gordon D. Rubenfeld. "The myth of the workforce crisis. Why the United States does not need more intensivist physicians." *American journal of*

respiratory and critical care medicine 191, no. 2 (2015): 128-134.

Author bio

Ann Marie Huffenberger, DBA, MBA, RN, NEA-BC

As Director of the Penn Center for Connected Care, and principal advisor to the senior executive team, Ann's a visionary leader who has tactically instituted telemedicine operations to support patients across the care continuum at Penn Medicine. She oversees business development to ensure financial integrity and superior clinical outcomes, and holds multi-program, multi-entity, and multi-state accountability. As chief implementer in operationalizing one of the largest connected health centers in the nation, Ann's an expert in deployment of technologies, processes, and actions to advance strategic initiatives and promote prosperities in a value-based care environment. Ann's passion for clinical excellence is the driving force in fostering her dynamic and efficient workforce who embraces the changes necessary in achieving the Quadruple Aim. Ann's presented nationally on connected health operations and innovative change management, she's received a range of awards and honors, and has contributed to many academic committees. Moreover, she's a peer-reviewed published author. Holding a bachelor's degree in nursing, a master's degree in business administration, and a doctorate in business administration, Ann is prepared to lead the organizational,

transformational changes necessary in achieving healthcare sustainability in the 21st century.