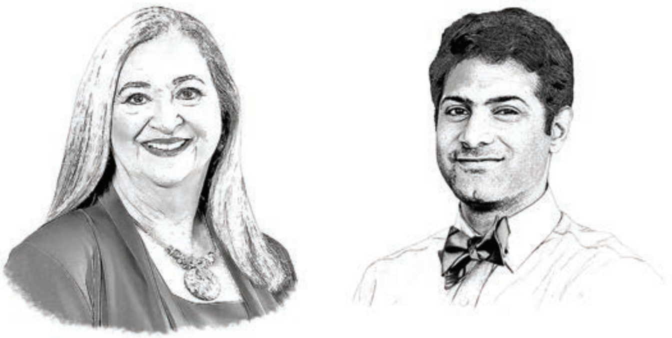
Documentation, Data, and Decision-Making

By Cindy L. Munro, PhD, RN, ANP, and Lakshman Swamy, MD, MBA



The intensive care unit (ICU) is a uniquely data-rich environment in health care. An average of 1300 data points are generated each day by each ICU patient, which is up to 10 times more data per patient than in other hospital settings.[1] The data range from concrete objective findings (eg, ventilator settings) to more qualitative but no less important data (eg, subtle changes in clinician assessment, patient and family concerns). Some data are of shared importance to the ICU team as a whole, while others are of greater relevance to particular disciplines within the team. Data may be relevant for certain patients, or at certain times, or data may be largely irrelevant. Processes to make data meaningful are complex and can be challenging. Data must be collected, documented, retrieved, categorized, summarized, synthesized, analyzed, and applied to inform decision-making and team activities. The primary purpose for individual patient data is to improve that patient's outcome, but patient data also serve many other purposes, including demonstrating regulatory compliance, justifying billing for services, quality assurance, and research.

doi:https://doi.org/10.4037/ajcc2024617

The collection and sharing of patient data among the ICU team members has always been integral to care. Practices of shift-change reporting, bedside rounds, and other direct communications persist even as paper charts have been replaced by electronic health records (EHRs). When first introduced, EHRs and clinical decision support (CDS) tools and systems held promise of radical improvement in documentation and use of clinical data. In the real world of ICU practice, EHRs and CDS tools have both benefited and challenged ICU providers. There are persistent concerns related to the ongoing complexities of EHRs and CDS tools and systems, and new research is underway to improve them.

Electronic health records began as digital representations of the paper medical chart and often replicated the redundancies, siloing, and workflow issues that bedeviled paper documentation. Over time, layers of regulation and organizational needs for secondary use of the data further expanded the required elements for documentation, increasing clerical burden for providers with little identifiable direct benefit to patient care. Documentation burden did not originate with EHR use, but current research indicates that EHR use exacerbates rather than alleviates documentation burden. A recent systematic review documented that time spent in EHR use was a significant predictor of burnout across studies

> Novel approaches to reducing documentation burden and to enhancing the accessibility and utility of the electronic health record are being investigated.

that focused on nurses, physicians, or teams of health care providers.[2] Importantly for ICU clinicians, the review further indicated that high patient volume and high acuity further contributed to EHR related burnout. Unit factors such as high admission rates and patients' severity of illness also affect the ICU team's decision-making and cognitive function, as measured by changes in prescribing patterns in periods of high volume and high acuity.[3]

Both the National Academy of Medicine[4] and the American Academy of Nursing[5] recently hosted dialogues focused on negative effects of documentation burden on burnout among health care providers. The dialogues reflected that current EHRs are dense, which makes finding relevant information challenging, and are prone to gaps in consistency of documented information. Current EHR documentation may not articulate clinical reasoning and diagnostic certainty (or uncertainty) clearly[6] and may not contain important elements to allow monitoring of care processes.[7] The unique and rich contributions of nursing and other nonphysician health disciplines may also be underrepresented and undervalued in EHRs.[8,9]

Unfortunately, some of the workarounds used to ease documentation burden have resulted in unintended consequences, making the record more dense and less relevant. One example is the use of copying and pasting previous text notes with minimal changes[4,10]; this practice increases both the repetitive nature and the volume of unnecessary and potentially irrelevant data. This ubiquitous practice has developed in response to pressures to meet documentation requirements for billing and reimbursement in the current health care system, rather than from providers' preferences or indolence. The use of scribes or dictation to reduce documentation burden for physicians has been instituted in some health care settings, but the practice has not been well studied in critical care. Such services are rarely considered for nurses (who usually bear the largest documentation burden) or other nonphysician members of the health care team.

Novel approaches to reducing documentation burden and to enhancing the accessibility and utility of the EHR are being investigated. Templates are already in use to reduce the need for free-text entry and save time in documentation processes; as a next step, integration of artificial intelligence (AI) into EHR templates could further reduce manual data entry and enhance documentation by guiding and prompting the entry of important data relevant to diagnostic reasoning.[6] Integration of medical devices with the EHR could also reduce documentation burden.[11] Direct connection between the EHR and point-of-care devices such as infusion pumps and vital sign monitors would eliminate the need for bedside providers to act as scribes for ICU equipment. Artificial intelligence may have a useful role in serving as a translator to convert the variety of data languages into usable EHR information. Bar codes used in patient care (eg, in medication administration) that directly interface with the EHR could further reduce the need for manual or text-based data entry.[7] As wearable technologies advance, data from these sources could also be directly incorporated into EHR patient data. Wearable data sensors are already publicly available for individuals to access physiologic data; examples include heart rhythm analysis, sleep monitoring, and continuous glucose monitoring. It is interesting that use of wearable sensors has lagged in ICU care, given critical care's long history of early adoption of monitoring technology.

Data organization and presentation in the EHR influence clinicians' evaluation and decision-making. Summarization and data visualization may facilitate understanding of the data, reduce cognitive fatigue and information overload, and improve clinical decision-making.[10] Integration of AI into the EHR could provide simplified, trended data of vital signs, laboratory values, or other parameters to inform clinicians' assessment of patients' trajectories and evaluation of plans of care. A qualitative study of ICU providers indicated that all disciplines would welcome synthesized views of vital signs, interventions,

About the Authors

Cindy L. Munro is coeditor in chief of the *American Journal of Critical Care.* She is dean and professor, School of Nursing and Health Studies, University of Miami, Coral Gables, Florida. **Lakshman Swamy** is coeditor in chief of the *American Journal of Critical Care.* He is an instructor in Medicine at Harvard Medical School, Boston, Massachusetts, and a practicing physician in Pulmonary and Critical Care Medicine at Cambridge Health Alliance, Cambridge, Massachusetts.

"Visualization of data patterns has real potential to improve clinicians' decision-making in real time at the bedside."

and risk trends, although they were cautious about the use of AI in CDS.[12] Several research groups are investigating redesign of the EHR interface in order to improve interpretability. A recent project compared cognitive loads experienced by medical students using a standard EHR interface or a novel data visualization interface[13]; when medical students used visualized patient data, they were more likely to use fast, intuitive system 1 diagnostic reasoning rather than slow, deliberative system 2 reasoning. System 1 reasoning is more characteristic of experienced clinicians and is believed to have less cognitive burden and be associated with fewer errors. Another research group designed a hexagonal data visualization that described conflicting goals of mechanical ventilation (optimal ventilation; overventilation, underventilation, and pressure support; and overoxygenation in both control and support modes of mechanical ventilation).[14] These patterns were identifiable by clinicians and useful in choosing treatment plans to address individual patient data. As demonstrated by this research, visualization of data patterns has real potential to improve clinicians' decision-making in real time at the bedside.

Clinical decision support tools and systems offer protocol-driven supports for clinical management and can improve patient safety, cost containment, documentation, and clinical workflow.[11] When integrated into the EHR, patient-tailored recommendations can be generated. In their earliest versions, CDS tools and systems were focused primarily on warning systems for clinical deterioration or potential drug-drug interactions and facilitation of physician orders for specific patient populations or clinical situations. A CDS tool or system provides guidance and options, but it is not a replacement for the clinician's expertise and judgment; final decisions about care rest with the clinician. Most systems require justification if the clinician overrides the CDS tool's recommendations; this may provide insight into clinical reasoning but also adds to documentation burden.

Inappropriate or excessive notifications by the CDS system may lead to alert fatigue, resulting in a high rate of alert overrides and inattention to relevant alerts that should be acted upon. In the ICU, about 90% of potential drug-drug interaction alerts are overridden by the prescriber, and 84% of overrides are appropriate responses to alerts that are false or insignificant in the context of ICU care.[15] In a rigorous multisite clinical trial, Bakker and colleagues[15] examined whether a CDS alert system using a truncated list of high-risk ICU drug combinations resulted in better clinical decisions than a standard CDS system that included notifications of more (but less important) drug combinations. They found that the ICU-tailored alert system resulted in a significant reduction in the number of high-risk drug combinations administered compared with a standard alert system. Their strategy for tailoring CDS alerts based on clinical relevance is a novel way to reduce alert fatigue and improve attention to the most relevant data in the ICU setting.

Thus far, much of the focus of the EHR and CDS tools has been on use for individual patients. In reality, the ICU team is responsible for the care of multiple critically ill individuals at the same time and in the same proximity. Ede and colleagues[8] note that work-as-prescribed (protocol-driven care) and work-as-done (care that is actually delivered) differ in the everyday environment of the ICU. As discussed earlier, unit-level factors such as the number, mix, and acuity of patients affect providers' cognitive load, care processes, and clinical decisions. Balancing competing demands in the complexity of the ICU requires clinicians to prioritize, adapt, and improvise.

Perhaps the next frontier is using electronic data and decision support tools to optimize care for groups of ICU patients in real time. Herasevich and colleagues[1] designed an acute care multipatient viewer (AMP) that acts as a unifying layer for all of the EHRs in an ICU. The AMP presents an electronic dashboard of high-priority information for groups of patients that combines advanced analytics, visualization, and alerts. Clinicians can view data at the unit level or at the level of each patient. The researchers found that, when compared with the standard individual-level EHR, AMP significantly reduced time to assessment for the entire ICU, total time to clinical task completion, and clinician task load.[1] The addition of an AMP to EHR systems offers a promising possibility to improve situational awareness of the ICU team, as well as unit-level prioritization of care and decision-making.

As we move forward to optimize the use of patient-level and unit-level data, it is important to remember that the primary purpose of clinical data is to direct and improve the care of patients. Patient care, safety, and the experience of delivering care must be treated as higher priorities than optimizing coding and billing; otherwise, we will not see the changes we need to optimize care of critically ill patients and support clinicians.

The statements and opinions contained in this editorial are solely those of the coeditors in chief.

FINANCIAL DISCLOSURES
None reported.

REFERENCES

1. Herasevich S, Pinevich Y, Lipatov K, et al. Evaluation of digital health strategy to support clinician-led critically ill patient population management: a randomized crossover study. *Crit Care Explor.* 2023;5(5):e0909. doi:10.1097/CCE.0000000000000909
2. Alobayli F, O'Connor S, Holloway A, Cresswell K. Electronic health record stress and burnout among clinicians in hospital settings: a systematic review. *Digit Health.* 2023;9:20552076231220241.
3. Park J, Zhong X, Dong Y, Barwise A, Pickering BW. Investigating the cognitive capacity constraints of an ICU care team using a systems engineering approach. *BMC Anesthesiol.* 2022;22(1):10.
4. Reducing documentation and administrative burden for clinician well-being. National Academy of Medicine's (NAM) Action Collaborative on Clinician Well-Being and Resilience (Clinician Well-Being Collaborative). Accessed February 19, 2024. https://nam.edu/event/reducing-documentation-administrative-burden-for-clinician-well-being
5. More than documentation burden creating burnout: what systems must do to achieve safe, efficient patient care using technology. American Academy of Nursing. 2023-2024 Policy Dialogues. Accessed February 19, 2024. https://www.aannet.org/events/upcoming/2023-policy-dialogues/itep-policy-dialogue
6. El-Kareh R, Sittig DF. Enhancing diagnosis through technology: decision support, artificial intelligence, and beyond. *Crit Care Clin.* 2022;38(1):129-139.
7. Schutijser BCFM, Klopotowska JE, Jongerden IP, Wagner C, de Bruijne MC. Feasibility of reusing routinely recorded data to monitor the safe preparation and administration of injectable medication: a multicenter cross-sectional study. *Int J Med Inform.* 2020;141:104201. doi:10.1016/j.ijmedinf.2020.104201
8. Ede J, Hutton R, Watkinson P, Kent B, Endacott R. Improving escalation of deteriorating patients through cognitive task analysis: understanding differences between work-as-prescribed and work-as-done. *Int J Nurs Stud.* 2024;151:104671. doi:10.1016/j.ijnurstu.2023.104671
9. Hants L, Bail K, Paterson C. Clinical decision-making and the nursing process in digital health systems: an integrated systematic review. *J Clin Nurs.* 2023;32(19-20):7010-7035.
10. Keszthelyi D, Gaudet-Blavignac C, Bjelogrlic M, Lovis C. Patient information summarization in clinical settings: scoping review. *JMIR Med Inform.* 2023;11:e44639. doi:10.2196/44639
11. Withall JB, Schwartz JM, Usseglio J, Cato KD. A scoping review of integrated medical devices and clinical decision support in the acute care setting. *Appl Clin Inform.* 2022;13(5):1223-1236.
12. Helman S, Terry MA, Pellathy T, et al. Engaging multidisciplinary clinical users in the design of an artificial intelligence-powered graphical user interface for intensive care unit instability decision support. *Appl Clin Inform.* 2023;14(4):789-802.
13. Cheng L, Senathirajah Y. Using clinical data visualizations in electronic health record user interfaces to enhance medical student diagnostic reasoning: randomized experiment. *JMIR Hum Factors.* 2023;10:e38941. doi:10.2196/38941
14. Rees SE, Spadaro S, Dalla Corte F, et al. Transparent decision support for mechanical ventilation using visualization of clinical preferences. *Biomed Eng Online.* 2022;21(1):5. doi:10.1186/s12938-021-00974-5
15. Bakker T, Klopotowska JE, Dongelmans DA, et al. The effect of computerised decision support alerts tailored to intensive care on the administration of high-risk drug combinations, and their monitoring: a cluster randomised stepped-wedge trial. *Lancet.* 2024;403(10425):439-449.