

Clinical Pearl: The Clinical Relevance of Neonatal Informatics

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“In our previous clinical pearl, we discussed the clinical relevance of artificial intelligence (AI) to neonatal acute kidney injury (1). Our primary responsibility in the neonatal intensive care unit (NICU) and the nursery is to care for newborn infants, and with that, we try to keep up with new technology.”

In our previous clinical pearl, we discussed the clinical relevance of artificial intelligence (AI) to neonatal acute kidney injury (1). Our primary responsibility in the neonatal intensive care unit (NICU) and the nursery is to care for newborn infants, and with that, we try to keep up with new technology. Technological advancements via clinical informatics have made electronic health records (EHR) mainstream and continue to lead to its evolution. New clinical informatics tools have equal potential to become critical resources for clinicians. In caring for the neonate, a very specialized set of data is required to track their health – for example, maternal labs and history, including labor and delivery, daily weights and fluid balance, and titrated support are only a few of the data points very specific to the newborn's care. Meeting these specialized data needs led to the development of neonatal informatics and neonatologists being among the first pediatric subspecialists to adopt EHRs in 1992 (3). NeoData (Isoprene Corp, Lisle, IL) is one of the first EHRs designed explicitly for the NICU (3).

Even with these many efforts to use neonatal informatics to improve our EHR, the question remains: is clinical informatics helpful in understanding all the information we accumulate as we care for critically ill term and preterm infants? That question can be broken down into two parts: 1) how helpful is clinical informatics in the daily, real-time management of our patients (i.e., practice), and 2) does clinical informatics help us improve care through research and quality improvement? Stepping back even further, what exactly is the definition of clinical informatics? One definition found in AIMA, which we found helpful, is that informatics is information science and involves the storage and retrieval of data (2). When one adds clinical information to informatics, it also includes computer science, algorithms, and healthcare data that improves communication, understanding, and management of medical information to help support both arms of practice and research and quality improvement (2).

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While significant progress has been made in developing the EHR in the NICU, we still have a long way to go to refine this system. According to a 2023 commentary by Patel et al. (3), progress notes in the United States are four times longer than those of other developed countries, frequently including daily lab values and test results duplicated from other EHR areas (3). The authors suggest that the progress note “captures the patient's clinical status and the decision-making for that day” (3). They believe that there should be a separate “hospital course” section in the chart and a “succinct patient review screen” that can be used for daily rounds (3). The failure of many EHRs to streamline access to the most immediately relevant clinical data has led to many neonatologists and/or trainees continuing to use a paper version of the “patient review screen in the NICU.

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et al. studied the differences between paper flowsheets and EHR flowsheets and how these differences affected clinical reasoning among pediatric intensive care unit clinicians during the hospital's transition to an EHR (4). They noted that, unlike paper flowsheets, data were frequently "chronologically and contextually isolated" and that clinicians reported difficulty understanding their patient's constantly changing status, which is necessary in any intensive care unit. The efficiency of a compact paper flowsheet allowed the clinician to make assessments from disparate pieces of data (4). For example, a clinician can see that several days after discontinuing diuretics, an infant has rapidly increased weight, increased FiO2 requirement, and decreased urine output. The clinician can reason that the infant is in a state of fluid overload. To review the same data in an EHR flowsheet, the clinician must review the growth parameters in the growth chart or vital flowsheet, the medication list in the medical administration record (MAR), the intake and output summary, and the ventilator flowsheet. The compartmentalization of data hinders the formation of connections that support reasoning.

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Before attempting to find solutions to these problems, we should ask ourselves: *what is the goal of clinical informatics?* We would argue that the goal is to facilitate acquiring information and knowledge. According to "Biomedical Informatics," 4th Edition by Shortliffe and Cimino (Editors), they

*"Refer to a **datum** as a single observational point that characterizes a relationship. It generally can be regarded as the value of a specific parameter for a particular object (e.g., a patient) at a given point in time. The term **information** refers to analyzed data that have been suitably curated and organized to have meaning. Data do not constitute information until they have been organized in some way, e.g., for analysis or display. **Knowledge**, then, is derived through the formal or informal analysis (or interpretation) of information that was in turn derived from data (5)" (bolding is theirs)."*

EHRs do a great job storing data but do a poor job of cultivating information and knowledge. Thus, you have very long notes with last month's CBC but no clear summary of the patient's status or electronic flowsheets that do not optimally support clinical reasoning. EHRs can potentially improve our practice by facilitating data entry, data visualization, and user experience. Clinical decision support systems can provide clinicians with the right data at the right time to make the best decision (6). EHRs can also potentially improve research and quality by combining individual granular

data, identifying cohorts of interest (e.g., extremely preterm infants or those with bronchopulmonary dysplasia), extracting data, and providing analysis. Advances in research can then flow back to our practice, truly "bench to bedside." Perhaps AI can augment these tasks by supporting clinicians in writing lengthy discharge summaries that require a high-level narrative of infants who may have been in the NICU for months or by accessing more data for research by deciphering free-text data.

Before we can expect more from the EHR, however, we need to take an active role in their design by ensuring that EHRs have an intimate knowledge of the end user (nursing, physicians, and others involved in documentation), their roles, how they chart, and what information is essential to them. We should also ensure that products are backed by evidence. The evidence could be accumulated from trials evaluating which note template or style conveys and communicates the patient's status the best or which flowsheet format generates the most information and knowledge or produces the best decisions. Rather than working for the EHR, the EHR could work for us and our patients.

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