Information Technology to Support Handoffs in Neonatal Care

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Abstract
Communication failures during physician handoffs represent a significant source of preventable adverse events. Computerized sign-out tools linked to hospital electronic medical record (EMR) systems and customized for neonatal care can facilitate standardization of the handoff process and access to clinical information, thereby improving communication and reducing adverse events. It is important to note, however, that adoption of technological tools alone is not sufficient to remedy flawed communication processes.

Objectives After completing this article, readers should be able to:
1. Identify key elements of a computerized sign-out tool.
2. Describe how an electronic tool might be customized for neonatal care.
3. Appreciate that technological tools are only one component of the handoff process they are designed to facilitate.

Introduction
Communication errors are a leading underlying cause of adverse events and patient harm, and handoffs in patient care represent one source of such errors. (1)(2)(3) The quantity and complexity of handoff information is increased in the intensive care environment, escalating the potential for errors in a process already described as a haphazard “precarious exchange.” (4)(5)(6) The problem is exacerbated in the academic setting for two reasons: 1) residency work hour restrictions necessitate more frequent handoffs, increasing the risk of an incomplete or incorrect transfer of information, (7)(8)(9) and 2) handoffs are conducted most commonly between junior trainees who frequently have not been given a formal structure or training for this process. (10)

The communication issues implicated as a root cause in greater than 80% of reported sentinel events represent an opportunity for the development of technological tools designed to improve the exchange of information. (2)(11)(12) Specifically, computerized sign-out tools can facilitate standardization of the handoff process and access to clinical data. (13)(14) Such electronic sign-out applications have the potential to improve communication and reduce preventable adverse events. (15) The benefits of using computerized sign-out tools to facilitate the handoff process have been demonstrated in various medical disciplines, (16)(17)(18) including pediatrics (19)(20) and the neonatal intensive care unit (NICU). (21)
Electronic Sign-out Tools

Electronic sign-out tools can take several forms, including word processor or database manager documents, web-based systems, and tools integrated within a hospital’s EMR. Regardless of the sign-out system used, certain essential information should be included. Patient demographics (name, medical record number, and location) are required for patient tracking. Information such as weight, medications, allergies, pertinent laboratory data, and clinician-entered patient details (e.g., a prioritized problem list, brief narrative comments) are needed to summarize a patient’s clinical status and management. Information classified as either a “to do” or an anticipatory guidance item is more likely to be communicated effectively, so these categories should be included as well. Finally, instructions to covering colleagues and shorthand commentary that suggest methods to adapt the care plan are not typically included in progress notes and are more accessible to covering clinicians when aggregated in a sign-out system.

Although standalone sign-out systems such as manually updated word processor documents may improve workflow over paper processes, they can contain troublesome inaccuracies due to the significant effort required to transcribe and manually update information that often is available electronically. It is beneficial, therefore, to combine clinician-entered clinical information with data automatically populated from the EMR. (5)(22) Frank and colleagues (19) at the Alfred I. DuPont Hospital for Children demonstrated that integration of a sign-out tool within the hospital’s EMR to automate the retrieval of demographic and clinical information improved efficiency and accuracy. In addition to using data already present within the EMR, an EMR-integrated approach allows recording of clinician-entered sign-out information in the EMR. Improved access to sign-out information has been shown to benefit communication by allowing the asynchronous transfer of information between members of the care team. (23) Another potential benefit of EMR integration is the development of automated checklists that provide clinical decision support using specific patient information to promote adherence to best practice guidelines or other protocols.

Customization for Neonatal Care

When an EMR-integrated sign-out tool adopted in the medical and surgical wards at Lucile Packard Children’s Hospital at Stanford failed to gain usage in the NICU, (20) Palma and associates (21) documented the...
development and acceptance of a sign-out tool specific to neonatal care (Fig. 1, Fig. 2). Following its introduction, the neonatal EMR-integrated sign-out tool was adopted rapidly, and clinician satisfaction and perceptions of sign-out accuracy were improved compared with the NICU’s previous standalone sign-out tool, a Microsoft Access™ database.

The experience at Lucile Packard Children’s Hospital underscores how the handoff process varies across different clinical settings. (24) To support communication in a particular setting, an electronic tool must be tailored to the needs of that area. A primary reason that the previously cited EMR-integrated medical/surgical sign-out document was not adopted in the NICU was its length: each page of the printed document contained 2 to 3 patients, making the complete document cumbersome for rapid information retrieval in the 40-bed NICU. The neonatal sign-out tool was designed for each page to include up to 10 patients. Despite modification of the document’s layout, the representation of clinician-entered sign-out information within the EMR is consistent with that of the medical/surgical sign-out. Because the information is patient-centric, when NICU patients are transferred to other units, their sign-out information automatically populates the sign-out document used in the receiving unit.

Electronic sign-out tools provide flexible layouts and alternative data views that permit powerful customization of the contained information. The same system used throughout an institution can be adapted to fill the specialized needs of a neonatology service. In addition to standard demographic information, a neonatal sign-out tool should include an infant’s estimated gestational age. During the first several days following birth, inclusion of the time of birth may aid in management decisions such as the treatment of hyperbilirubinemia. The birthweight also should be part of the sign-out document because it is often used for medication dosing and fluid calculations during the first 1 to 2 weeks after birth. Laboratory data (eg, total bilirubin) included on the sign-out could be annotated with the patient’s age in hours when clinically appropriate. At some point, perhaps at 1 week after birth, automating the calculation of postmenstrual age lends context to an infant’s clinical status. Whereas the medical data in sign-out systems are typically the patient’s own data, including key medical details about the mother may be useful for the purposes of neonatal care.

Beyond Technology

Although this review focuses on technological approaches to improving communication, nontechnical methods must be employed to address flawed handoff processes; computerization alone is not sufficient to improve communication in the setting of a poor process. (5)(25) The process itself must be examined for communication failures, which define the steps required for improvement. (24) Several authors have described methodologies for refining the handoff process, (26)(27) one of which evaluates handoffs in nonmedical settings with high consequences for failure, such as nuclear power plants and the NASA Johnson Space Center. (28) Only after the handoff process has been defined can a computerized tool be designed to support it effectively.

References


9. Van Eaton E. Handoff improvement: we need to understand what we are trying to fix. *Jt Comm J Qual Patient Saf.* 2010;36:51

10. Coiera E. When conversation is better than computation. *J Am Med Inform Assoc.* 2000;7:277


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