ARTICLE

Patient Misidentification in the Neonatal Intensive Care Unit: Quantification of Risk

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ABSTRACT

OBJECTIVE. To quantify the potential for misidentification among NICU patients resulting from similarities in patient names or hospital medical record numbers (MRNs).

METHODS. A listing of all patients who received care in 1 NICU during 1 calendar year was obtained from the unit's electronic medical record system. A patient day was considered at risk for misidentification when the index patient shared a surname, similar-sounding surname, or similar MRN with another patient who was cared for in the NICU on that day.

RESULTS. During the 1-year study period, 12 186 days of patient care were provided to 1260 patients. The unit's average daily census was 33.4; the maximum census was 48. Not a single day was free of risk for patient misidentification. The mean number of patients who were at risk on any given day was 17 (range: 5–35), representing just over 50% of the average daily census. During the entire calendar year, the risk ranged from 20.6% to a high of 72.9% of the average daily census. The most common causes of misidentification risk were similar-appearing MRNs (44% of patient days). Identical surnames were present in 34% of patient days, and similar-sounding names were present in 9.7% of days. Twins and triplets contributed one third of patient days in the NICU. After these multiple births were excluded from analysis, 26.3% of patient days remained at risk for misidentification. Among singletons, the contribution to misidentification risk of similar-sounding surnames was relatively unchanged (9.1% of patient days), whereas that of similar MRNs and identical surnames decreased (17.6% and 1.0%, respectively).

CONCLUSIONS. NICU patients are frequently at risk for misidentification errors as a result of similarities in standard identifiers. This risk persists even after exclusion of multiple births and is substantially higher than has been reported in other hospitalized populations.

THE COMPLEX NATURE of NICU care and the vulnerability of the patient population served places NICU patients at extremely high risk for errors and adverse events related to these errors. A particularly common class of errors results from patient misidentification. Suresh et al[1] reported that errors related to patient misidentification represented 11% of all errors submitted to the Vermont Oxford Network's voluntary error-reporting system. Accurate patient identification is a necessary component of providing both safe and effective diagnostic and therapeutic services. As such, improving the accuracy of patient identification has been first among the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) national patient safety goals in 2003, 2004, and again in 2005. The purpose of the present project was to quantify the role that similarity in standard medical identifiers might play in misidentification among NICU patients.

METHODS

The Beth Israel Deaconess Medical Center (Boston, MA) maintains a 40-bed level III NICU that serves a predominantly inborn population. Patients are identified using standard identification bands from the Hollister Corporation (Libertyville, IL). In accordance with the JCAHO's national patient safety goal 1A, 2 patient identifiers are to be used whenever administering medications or blood products, taking blood samples and other specimens for clinical testing, or providing any other treatments or procedures.[2] The labels for these bands are created using an Addressograph card and contain a patient's last name, gender (infant boy or infant girl), birth order (in the case of multiple gestations), date of birth, and medical record number (MRN). Maternal last name is used throughout a newborn's hospital stay as the infant's last name. MRNs contain 8 digits and are assigned sequentially. Check digits are not present in the MRN used at the study NICU. A check digit guards against errors caused by the incorrect transcription of an MRN. It is an additional 1-digit integer appended to the end of an MRN to provide confirmation that the number is valid. The additional check digit is determined by applying a simple mathematical formula to the other digits of the number.

All patients who were cared for in the Beth Israel Deaconess Medical Center's NICU between January 1, 2003, and December 31, 2003, were identified from the census logs contained in the unit's clinical data archive (Carevue, Philips Medical Systems, Andover, MA). Demographic information, including patient last name, MRN, maternal identifiers, and dates of service, were downloaded to a database table in which separate records were created for each patient day of care provided. Each patient day then was categorized as to whether it was at risk for misidentification. A patient day was considered at risk when the index patient and another patient who was cared for in the NICU on the same calendar day (1) shared a last name, (2) shared a similar-sounding last name (names were considered similar when they had identical Soundexx or Metaphone codes,[3]), or (3) shared a similar MRN. MRNs were considered similar when they differed by only a single digit substitution (see Table 1 for examples). Categorization of risk was performed by a custom-designed computer program written in Visual Basic.NET (Microsoft Co, Redmond, WA). The study was approved by the Beth Israel Deaconess Committee on Clinical Investigation.

RESULTS

During the study period, 12 186 days of patient care were provided to 1260 patients. The NICUs average daily census was 33.4 (range: 21–48). Twins and triplets contributed 4063 patient days (33.3% of total).

There was not a single calendar day without at least 1 pair of patients at risk for misidentification. In fact, the minimum number of patients at risk on any day was 5; the maximum was 38. On average, 50.9% of patients were at risk on any given calendar day. As seen in Fig 1, the daily risk ranged from 20.7% to 72.9%.

The reasons for categorizing a patient day at risk for misidentification are seen in Table 2. The most common cause for a patient to be at risk for misidentification was the presence of similar MRNs (44.1% of patient days) followed by identical names (34% of patient days) and similar-sounding last names (9.7% of patient days). Of note, 33.3% of patient days were at risk for misidentification because patients shared both similar MRNs and similar-sounding/identical last name.

The presence of twins, triplets, and higher order multiple births dramatically affects the presence of similar patient identifiers because they share last names and may have consecutive MRNs. We therefore repeated the analyses while excluding infants whose multiple-gestation sibling(s) was(were) present on the same day. Here again, virtually all calendar days had at least 1 pair of patients at risk. Only 6 of 365 days had no singleton patients at risk. On average, 26% of patients were at risk for misidentification on any given day. The daily risk ranged from 0% to 56% (Fig 2). Similarity in MRNs remained the most common cause of misidentification risk, although it was much lower among singletons than the entire population (see Table 2).

TABLE 1 Examples of Misidentification Risk

Risk	Example	
Similar last names	McDonald, Baby Boy	MacDonald, Baby Boy
Similar MRNs		
Single-digit substitution	Smith, Baby Girl	Jones, Baby Boy
	MRN 1234568	MRN 1234567
Single-digit pair transposition	Smith, Baby Girl	Shen, Baby Girl
	MRN 1234568	MRN 1243568

FIGURE 1
Potential for misidentification as a result of similarities in MRNs and last names.
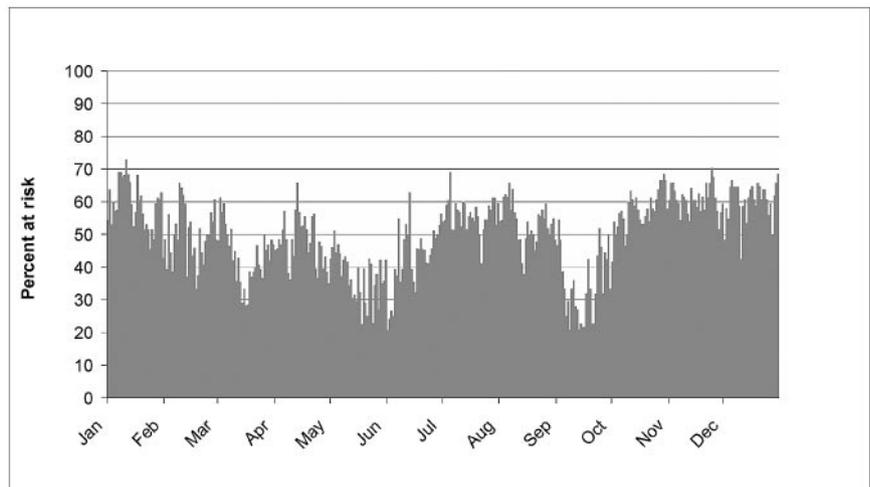
TABLE 2 Factors That Contribute to Misidentification Risk

	% of Days at Risk	
	All Patients	Singletons Only
Similar-sounding last name	9.7	9.1
Same last name	34.0	1.1
Similar MRN	44.1	17.6
At least 1 of the above	50.9	26.3

DISCUSSION

We have demonstrated that NICU patients frequently share similar identifiers with others who receive care in the unit concurrently. We believe that the potential confusion created by these similarities is a significant contributor to misidentification risk within the NICU.

The importance of misidentification errors in the NICU has been demonstrated by several authors. Simpson et al[4] recently reported that 25% of the serious medication errors that were seen during a 6-month study period in a British NICU were caused by patient misidentification. Similarly, Suresh et al[1] reported that 11% of errors that were submitted to the Vermont Oxford Network's NICQ.org voluntary error-reporting system involved patient misidentification. The data from NICQ.org demonstrates that misidentification errors are not limited to medication errors. These errors affected both diagnostics and therapeutics (25% of reports).

A particularly common misidentification error in the NICU involves feeding a mother's expressed breast milk (EBM) to the wrong infant. One quarter of misidentification errors that were reported to the Vermont Oxford Network involved EBM.[1] Contributing factors to these events included incorrectly labeled specimens, difficult-to-read handwritten specimen labels, errors in verification of patient/aliquot identification, and systematic problems with the way EBM aliquots are stored. Other investigators have also documented the occurrence of wrong patient breast milk administration errors. In describing their experience in Toronto, Dougherty and colleagues[5,6] noted 12 breast milk errors in 18 months in their 48-bed NICU. In addition, these authors present results from a survey of 15 Canadian NICUs. Two thirds of the surveyed units reported experiencing similar events.

The occurrence of breast milk feeding errors is not surprising given the frequency with which EBM feeds are given. In the study NICU, >40 000 EBM feeds will be administered each year. In many ways, the processes needed for the administration of EBM parallel those used with blood transfusion. Despite the safeguards required during the transfusion process, 1 out of 16 000 to 20 000 transfusions are complicated by a patient's receiving blood intended for another.[7] Applying these same rates to the often less rigorous processes of EBM administration suggests that at least several events per year can be expected in a large, busy unit. The frequency of EBM feeds along with the already high demands placed on NICU clinicians dictates that interventions that are designed to decrease this rate be extremely time efficient.

Misidentification errors are not only restricted to diagnostics and therapeutics but also may affect documentation. Carrol et al[8] found frequent discrepancies in resident progress notes that were written using an electronic medical record system. These discrepancies included errors in documentation of medications (27.7% of notes), vascular lines (33.9%), and patient weight (13.3%). In 1 type of documentation error, the wrong information may be written in the correct patient's chart. In another type, the correct information may be written in the wrong patient's chart. The authors do not provide sufficient information to distinguish between these possibilities. Computer systems, such as that in the study by Carroll et al,[8] require clinicians to select patients by either recognizing or searching by patient identifiers

FIGURE 2
Potential for misidentification (multiples excluded).
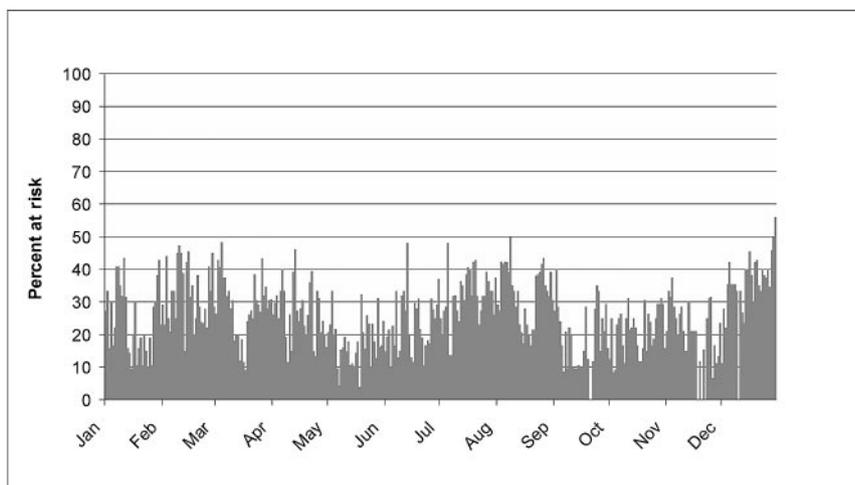
such as name or MRN. When these identifiers are similar or identical, errors in selection may be more likely. Although the errors reported by Carroll et al[8] involved documentation, similar errors in identification also could occur with computerized provider order entry systems.

As noted by Chassin and Becher,[9] many factors may contribute to misidentification errors. These may include issues related to workflow, materials used in the identification process, or the approach taken by staff to confirm the identity of individual patients. The NICU environment and patient population also present additional unique challenges. Unlike many pediatric or adult wards, NICU patients are not able to participate actively in the identification process. In addition, many of the commonly used methods to identify individuals in everyday life, such as physical appearance (size, age, hair color, and gender), are often not immediately apparent or distinguishable within the NICU population. As such, NICU clinicians must rely on standardized patient wrist bands for identification purposes.

Unfortunately, reports from general hospital and NICU populations demonstrate that errors in wristband content or use are frequent. A study of 217 volunteer hospitals by Howanitz et al[10] found wristband errors in up to 7.4% of inpatients. Most (71.6%) errors involved missing wristbands. Incorrect, conflicting, or incomplete information was found in the remainder. Missing wristbands can be especially common in the NICU. Recent reviews of experience within the 34 NICUs of the Vermont Oxford NICQ 2002 Quality Improvement collaborative found that standard identification bands are not present on 20% to 80% of NICU patients (K Leahy, RN, Vermont-Oxford Network, personal communication, May 30, 2003). Instead, identification bands are often affixed to a patient's bedside or chart. In part, this practice is related to concerns regarding the fragility of a premature infant's skin that can lead to skin lacerations and erosions when standard plastic-coated identification bands are placed around arms or legs. In addition, the need to rotate intravenous lines frequently between limited sites often requires identification bands to be removed.

Even when identification bands are present and contain the correct identifying information, these identifiers may not be recognizably unique to busy NICU clinicians. The sequential nature by which MRNs are assigned in many hospitals means that patients who are admitted to the NICU within a relatively short time frame are at highest risk for sharing similar MRNs, a problem exacerbated by multiple births.

Shojania[11] found that 28% of calendar days on the University of California, San Francisco adult medical service were at risk for misidentification as a result of the sharing of identical last names; this situation was found in 100% of days during our year-long survey. Indeed, when considering misidentification risk as a result of similar MRNs or last names, no fewer than 5 patients were at risk on any given calendar day in this NICU. Certainly, the presence of multiples within the NICU obviously contributes dramatically to the risk attributable to identical names. That this particular misidentification risk pertains mainly to one's own siblings provides little comfort as these patients often do not share the same diagnostic and therapeutic needs. Confusion between patients, even related ones, can have disastrous effects.

CONCLUSIONS

We have demonstrated that the information that is used routinely in NICU patient identification is frequently similar and often not recognizably unique. We believe that these findings demonstrate a need to reconsider the methods that are used for NICU patient identification. The use of point-of-care bar coding systems is a frequently cited technology for reducing patient identification errors.[6] Similarly, radio frequency identification sys-

tems, which do not require line-of-sight access to patient identification bands, may prove valuable. Despite the potential benefits of these auto-identification technologies, clinicians must ensure that such technologies are tested adequately in the unique environment of the NICU and that they are implemented in a manner that avoids disruption of workflow.

ACKNOWLEDGMENT

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