



WHITE PAPER



Redefining Milk Management in the Neonatal Intensive Care Environment

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Hospitals increasingly seek milk management systems that include barcode scanning technology and electronic health record (EHR) integration. Software that was previously considered "nice to have" is now "must-have" technology in neonatal intensive care units (NICUs) nationwide. Along with centralized milk preparation and having an adequate number of registered dietitians on staff, barcode scanning is a critical component of state-of-the-art NICU feeding (Matous et al., 2019). Major healthcare organizations like the Academy of Nutrition and Dietetics, the Agency for Health Research and Quality, and the Healthcare Information and Management Systems Society also recommend scanning human milk as an essential patient safety practice (Steele & Collins, 2018; Dougherty, 2010; HIMMS).

Viewing infant feedings as "just food" has become an antiquated attitude as we grow to understand the importance of neonatal nutrition and the safety risks that stem from milk and formula mismanagement. Human milk is a bioactive and complex substance with life-saving qualities, such as immunological, neurodevelopmental, and gastrointestinal protection; meanwhile, it is also a substance that can transmit disease and cause illness if not properly handled (Cosey et al., 2016). As a result, several states have legislation treating milk as a human tissue (Campbell, 2016), and neonatal nutrition experts affirm this stance (Kim, 2018). Likewise, infant formula and additives are subject to contamination, misadministration, and recipe errors that pose a significant risk to patients (Steele & Bixby, 2021). Like other aspects of neonatal care, nutrition regimens are more complex than ever, so safety, accuracy, and precision are paramount.

As nutrition and feeding management processes demand more scrutiny, we face immense nursing workforce challenges, including staffing shortages and burnout. Nurses must deliver top-notch care despite limited physical and emotional bandwidth. In addition, nurses are tasked with integrating families into their infants' care in a meaningful way.

With this context in mind, we urge hospital leaders to consider thinking outside the "four walls" of the NICU regarding milk and formula management. Implementing a feeding management system that supports safety, efficiency, and family-centered care provides hospitals with an impactful force multiplier.

SAFETY & EFFICIENCY - WHAT WE ALREADY KNOW

Most hospitals' primary motivation for implementing a milk and formula management system is to increase patient safety. In addition, various professional organizations have recognized the importance of safe, accurate human milk handling (both maternal and donor milk) and have published guidelines accordingly. These organizations include the Academy of Nutrition and Dietetics, the American Society for Parenteral and Enteral Nutrition, the National Association of Neonatal Nurses, and the Human Milk Banking Association of North America (Steele, 2018).

The research underscores that scanning milk and formula throughout the feeding process is a worthwhile endeavor: every time feeding products are manipulated (including but not limited to collection, storage, fortification, or feeding), they're at risk for safety errors like contamination, inaccurate preparation, and misadministration (Cossey et al., 2016). Steele & Bixby (2014) determined 282 potential safety failure points exist throughout the milk and formula handling process in hospital environments.

Given these potential errors at every step of the process, it's necessary to verify ingredients and manage safety at multiple points - not just before administering a feed. Unfortunately, hospitals with bedside scanning through barcode medication administration technology (rather than a comprehensive feeding management system) still experience misadministration errors. Many organizations rely on staff self-reporting or identifying another staff member's near misses or errors through cumbersome reporting software or manual processes. However, depending on self-reporting does not quantify the true extent of safety errors that occur since this only captures errors that staff notice.

In their most recent publication, Steele & Bixby (2021) illuminated that the safety benefits of scanning apply to human milk and the formula and nutritional additives. For example, they found that 480 errors (an average of 3.7 per week) were prevented over 2.5 years in a Level IV NICU thanks to incorporating formulas and fortifiers into their scanning process; without this safeguard, patients in these instances would have received the incorrect product, possibly resulting in feeding intolerance, allergic reaction, overnutrition, or undernutrition.

Not only does scanning milk prevent misadministration errors, but it also helps hospital staff enhance recipe accuracy and prevent contamination. For example, feeding management software with built-in recipe calculators and EHR integration can help staff precisely prepare per nutrition orders, while inventory viewing features and scanning barcodes help staff prevent feeding expired milk (in which contaminants can multiply to harmful levels).

Efficiency is another proven benefit of milk scanning systems (Steele & Bixby, 2021). The actions that support safety - like barcode scanning and EHR integration - simultaneously lighten staff's load. In addition, automating tasks like generating labels, charting feeding data, and eliminating two-nurse verification saves valuable time. Amid staffing shortages, nurses are expected to provide top-notch care despite having less bandwidth and energy than ever before. Efficiency is, therefore, more critical now than ever for staff retention and quality of work life.

REDEFINING MILK MANAGEMENT

The safety and efficiency features described above are undoubtedly meaningful benefits that milk/formula scanning systems offer hospitals. But what if we could ask for even more from these technologies?

As NICUs continue to embrace family-centered care, we must consider how every aspect of neonatal care can support that mission - and feeding management is no exception. We know that parents can be a vital part of a child's nutrition care plan, as the mother's own milk is the first-choice feed for many patients, and expressing milk can require an extensive commitment on the mother's part.

While mothers of NICU babies experience barriers to establishing and maintaining a milk supply (Lussier et al., 2019), receiving ongoing support and education can help overcome these barriers (Rossman et al., 2018). Supporting dyads in lactation is a crucial role for NICU clinicians. The National Association of Neonatal Nurses (NANN) takes the position that "it is essential to ensure that infants receive human milk through hospital discharge and that mothers have the opportunity to reach their personal breastfeeding goals" (Spatz & Edwards, 2015). A parent-facing component of a feeding management system can aid in just that.

FAMILY ENGAGEMENT: THE MISSING COMPONENT

Family-centered care has become an integral part of many NICUs' missions. Clinicians realize the importance of ensuring caregivers are engaged, educated, and emotionally supported during their child's hospitalization to yield a better experience. In addition, family-centered care interventions can improve infants' weight gain and parents' satisfaction, knowledge, and skills, while decreasing readmission rates and parents' stress/anxiety (Ding et al., 2019; Scheutz Haemmerli et al., 2020).

Technology can help us extend engagement beyond the hospital's walls. While we know that face-to-face time is invaluable for parents and their hospitalized infant(s), the reality is that parents cannot always be at the bedside. This is particularly true for parents with barriers related to transportation, traveling distance, limited work flexibility, and additional family responsibilities.

We recommend the features listed below as simple yet effective tools for engaging parents in the feeding process. These features can seamlessly exist as part of a hospital's milk and formula management system. It is worth noting that these features should be optional and not preclude the use of the system within the hospital itself, as parents should have the autonomy to participate at their comfort level.



Enhanced Transparency into Inventory

Providing human milk is one of the few processes in the NICU journey in which parents truly have ownership. Qualitative research has shown that while NICU mothers can feel resentment and disconnection from pumping, it is also a "link" to their hospitalized child and can feel like an ongoing act of love to pump (Hurst et al., 2013). Understandably, parents must stay informed about how much milk their child has available in the unit and when to bring in more.

Inviting parents to view expressed breast milk inventory at home and the hospital via an app empowers them with more visibility into the process. This transparency may reduce anxiety, promote trust, and facilitate communication, as parents have 24/7 access to this information. This

feature can also reduce unit calls, freeing up staff bandwidth. In addition, parents and the care team can be on the same page regarding the feeding plan when both parties better understand how much maternal milk is available, thus reducing potential frustration.

Virtual Pumping Logs

An array of experts recommend that healthcare teams encourage mothers to log pumping sessions, then actively monitor those logs for proactive lactation counseling (Blatz et al., 2017; Lucas et al., 2014; Spatz & Edwards, 2015). Per NANN, "pumping information can be used to make research-based decisions regarding the mother's pumping patterns" to inform the dyad's care plan (Spatz & Edwards, 2015).

App-accessible pumping logs should have an easy-to-use interface in which a parent can enter pumping date and time, volume pumped, and fresh versus frozen state. This information can then serve as data used in reports and graphs, through which both parents and clinicians can monitor milk production and pumping frequency over time. Studies have found that pumping patterns in the earliest days postpartum have a long-term impact on milk production among mothers of preterm infants (Hill & Aldag, 2005; Maastrup et al., 2014), indicating that timely lactation support is critical for a preterm dyad's breastfeeding success. Clinicians who can monitor pumping trends in this time-sensitive window can make clinically impactful decisions about parents needing encouragement and intervention.

Breastfeeding Education

A core part of supporting lactation is providing mothers with evidence-based education. Education ultimately helps support a sense of self-efficacy, in which parents are more likely to feel prepared to take care of their newborns despite the stress and anxiety that comes with hospitalization. Lee et al. (2012) concluded that NICU parents need information to be delivered at the right time and in an individually tailored manner to minimize stress and feeling overwhelmed.

Feeding management systems with a parent-facing app can provide a hub for reliable education. We recommend the ability for healthcare providers to send photos, videos, and educational resources through this application so that the healthcare team can provide mothers with the correct information at the right time. NICU educational platforms like [OnlineEducation](#) can serve as another user-friendly way for information transmission. Receiving materials via computer, mobile, or tablet is a better fit for most modern parents than paper formats.

Communication with In-Hospital Lactation Resources

It's well-established that breastfeeding rates increase when parents have greater access to hospital lactation consultants (Hallowell et al., 2014). However, lactation consultants may be thinly spread across multiple units and not encounter mothers on the NICU floor when help is needed. The need for lactation support is great: Lucas et al. (2014) found in their review that NICU mothers who perceived positive support and feedback from the healthcare team developed greater motivation, knowledge, and perseverance for pumping and transitioning to breastfeeding. They also found that even though a majority of mothers reported receiving some positive support, most still desired more help.

While technology cannot be a complete substitute for hands-on positioning and guidance from a lactation professional, incorporating lactation-related messaging into a parent-facing app can be a force-multiplier for lactation staff.

GOING LIVE WITH BETTER MILK MANAGEMENT

Comprehensive feeding management systems that leverage barcode scanning and EHR integration support hospital staff in feeding their patients more safely and efficiently. It's an exciting opportunity for NICUs when these systems also support family-centered care; features like virtual pumping logs, breastfeeding education, and communication with lactation resources encourage lactation among NICU mothers.

For hospital leadership seeking to install a feeding management system, carefully considering what features you'll have access to is vital. It's also important to consider what project management and ongoing support will entail, as these components support safety, efficiency, and engagement long-term.

AngelEye Health has found that a key strategy for successfully supporting hospitals with new technologies is to embed NICU clinicians (rather than laypersons) every step of the way. When a vendor has a dedicated clinical team to provide training, onboarding, and software implementation, hospital partners can speak peer-to-peer, leading to an optimal experience. In addition, vendors utilizing clinical experts can uniquely facilitate staff buy-in and smoother transition to new processes in the unit.

Every unit is different regarding feeding workflows - for which physical layout, feeding protocols, acuity level, and unit culture (among others) influence how the system is configured and implemented. Therefore, it is best practice to begin feeding management system implementations with an on-site clinical assessment and gap analysis to understand the unit's current practices thoroughly. Ideally, these can inform decisions on how technology can best support the individual needs of the unit while implementing the most efficient workflows informed by clinical best practices.

After a feeding management system is live, ongoing support and data review facilitate smooth adoption and continued safety. We recommend seeking a vendor that offers data review sessions at regular intervals so that hospitals can track metrics like user adoption, "near miss" reports, and inventory usage. In exploring human milk errors in their NICU, researchers Luton et al. (2015) found that a "culture" of ongoing commitment to quality improvement was paramount for safe feeding processes. Having data and spending time to review it on an ongoing basis with your vendor helps hospitals inform quality improvement projects that align with their priorities.

PREVENT A MISSED OPPORTUNITY

Hospitals today have several feeding management systems available to choose from. NICU nursing, lactation, and nutrition leaders should strongly consider a system that supports and engages parents as integral members of their child's care plan, while also ensuring patient safety and clinical efficiency. Given mothers' central role in milk production, it is a missed opportunity to invest in software that lacks the ability to support family engagement and lactation during such a critical time period. Features such as enhanced transparency into inventory, virtual pumping logs, breastfeeding education, and communication with hospital lactation resources are available and should be leveraged to support and improve the feeding experience for families while ensuring the safe passage of patients for the highest quality of care.



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