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The NICU Discharge Dilemma: How Leveraging Technology Can Support Care Teams, Empower Families, and Measurably Improve the Discharge Process

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Introduction

The transition from Neonatal Intensive Care Unit (NICU) to home represents a critical juncture in the continuum of care for newborns, their families, and their healthcare providers. This period often termed the "healthcare discharge dilemma," involves a complex set of challenges that includes a patient who is medically ready for discharge and an emotionally prepared family who has demonstrated the knowledge and skills to care for their baby safely at home. While the NICU's highly specialized and supportive environment meets the infant's immediate medical needs, it vastly differs from the home setting, where families must assume full responsibility for the infant's care. To prevent high rates of emergency department visits and readmissions after discharge from the hospital, a family must feel confident in their competence level to care for their baby's specific medical needs. A safe and successful discharge includes a multidisciplinary team approach. Coordinating the busy day-to-day patient caseloads while ensuring clear, consistent communication throughout the NICU stay adds complexity to the process.

Discharge planning varies widely across NICUs, often relying on outdated methods to track critical discharge criteria and milestones. Healthcare staffing shortages and inconsistent patient care providers further complicate the process. This often leads to triangulated and ineffective patient communication among healthcare team members and necessitates reliance on paper-based or less efficient methods to keep the care team aligned and informed. Such practices negatively affect the quality of education the family receives, prolong hospital stays, and delay coordination in follow-up care. Educating families and training them for home care is often compressed into the 48 to 72 hours before discharge, placing substantial pressure on the healthcare workers and leaving families ill-equipped to care for their infants at home safely.[1] These challenges are further intensified by data showing that 43% of NICU parents have low levels of health literacy and that regardless of health literacy levels, parents were unable to retain 80% of care instructions given to them before discharge.[2,3] The challenges are further intensified by a shortage of clinical staff and fragmented communication among healthcare professionals and families,

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which leads to misunderstandings and delays and places the infant's overall well-being at risk.

This paper introduces the common discharge challenges in healthcare and presents survey data on the significant gaps in the current discharge process, utilizing the Jobs to be Done (JTBD) methodology.[4] The need to leverage technology with solutions that support care teams and families with a successful, efficient, and safe transition to home from the NICU will also be reviewed.

Jobs to be Done Methodology

The Jobs to be Done (JTBD) framework is a research and product development methodology that deploys a user-centric approach that shifts the focus from the product's features to a more comprehensive understanding of the individual's needs and what drives their behavior.

Underpinning the JTBD framework is a set of core tenets that collectively build a foundation upon which organizations build a sustainable practice of innovation.[5] By identifying unmet needs, researchers can develop solutions that get the "job" done more accurately and efficiently. Additionally, the framework aids in uncovering more profound insights into the functional, emotional, and social determinants behind the user's preferred choices, behavior, and needs. Utilizing this approach shifts the focus from the product or the customer to the job itself, which remains consistent over time, thus offering a stable target for value-creation efforts.[6]

Table 1. Users Initially Identified in Supporting the Transition from NICU to Home Steps

User Role	Role Description
NICU Nurse	Offers specialized nursing care in the NICU and assists in preparing the family for home care.
Discharge Coordinator	Typically, a NICU nurse specializing in the NICU discharge process and ensuring that all necessary equipment and follow-up appointments are organized for a smooth transition to home care.
Parent/Caregiver	Plays the central role in providing care and ensuring a loving, stable home environment.
Case Manager	Coordinates different aspects of care and ensures smooth communication among all involved parties.
Social Worker	Helps the family navigate healthcare systems and access necessary resources for home care.
Provider/Neonatologist	Oversees the medical care of NICU patients and often in collaboration with a Neonatal Nurse Practitioner, will coordinate and plan the home-care transition.
Respiratory Therapist	Manages respiratory care needs, especially for infants who require home respiratory support.
Neonatal Therapists	
Physical Therapist	Assesses and aids in the infant's physical development and progress.
Occupational Therapist	Focuses on improving the baby's skills for daily activities and overall development.
Speech-Language Pathologist	Assess and follow the infant's oral feeding progression.
Dietitian	Provides nutritional guidance tailored to the infant's specific needs.
Lactation Consultant	Supports breastfeeding success and ensures proper nutrition for the baby.
Pharmacist	Manages and advises on medications the infant needs to continue at home.
Insurance Coordinator	Assists the family with insurance-related issues and coverage for required treatments.
Family Therapist/NICU Psychologist	Supports the family in coping with the emotional and psychological aspects during their NICU stay and as they transition home.
Pediatric Subspecialists	Specialized pediatric providers.
Pediatrician	Provides ongoing medical oversight and care for the infant after discharge from the NICU.
Home Health Nurse	Provides nursing care at home, ensuring continuity of care post-discharge.

The JTBD framework offers a lens through which we can better understand the specific needs and challenges NICU families and care teams face throughout the discharge process. Our team followed the following process:

1. **Identify the JTBD. "**Coordinating the care transition from NICU to home" was the ultimate JTBD that emerged through interviews and surveys with clinicians and caregivers.
2. **Identify the customers.** Sixteen functional roles were identified as directly involved with the job and varied across a continuum of healthcare providers (Table 1).
3. **Narrow focus to a specific market.** More than any other functional role, NICU bedside nurses are the executors of this job. The primary beneficiary of their efforts is the patient's family, often their parents, reinforcing the collaborative approach needed between families and bedside nurses for a successful discharge.
4. **Create and validate the job map.** Ten core job steps (listed below) were identified into a job map, outlining the steps required to accomplish the job.[7] Feedback was received from clinicians on the job map.
5. **Confirm the desired outcomes for each job step.** Outcomes represent the set of metrics that customers use to evaluate the successful completion of any given job step. Once desired outcomes were established, unmet customer needs that stabilized over time were identified, regardless of the products or services used.
6. **Assess the importance and difficulty of each outcome.** Using a questionnaire, each outcome linked to every job step was assessed for its difficulty level and importance to the bedside nurse executing the job.
7. **Synthesize the data.** Analyze the data and employ opportunity scoring to pinpoint unfulfilled customer needs. Organize the results based on scores and illustrate them on an opportunity map.
8. **Identify innovation opportunities that align with our mission.** The team assessed which outcomes aligned with our mission statement, 'Equipping care teams and empowering families of neonatal and pediatric patients to improve outcomes.' and could be influenced by technology and services in a measurable and user-centric approach.

Survey & Analysis

A comprehensive questionnaire was developed to gain insight into the needs of bedside nurses when coordinating the care transition from the NICU to home. The opportunity to participate in the survey was posted on several social media groups for NICU nurses. All participants were required to practice actively as neonatal nurses in the United States. Respondents who provided complete data were awarded a $50 Amazon e-gift card for their participation. They were instructed to base their survey responses on the last NICU they worked in if they had experience in multiple institutions. Each respondent was asked to rank the level of difficulty and importance of outcomes corresponding to the ten job steps on a 5-point Likert scale. The job steps included:

1. **Formulate a Detailed Care Plan.** The ability to develop a comprehensive care plan tailored to the newborn's specific health needs and their parent/caregiver's unique needs.
2. **Engage with Family and Caregivers.** The ability to effectively communicate with the newborn's family, providing updates and involving them in the care process.
3. **Collaborate with NICU Team.** The ability to work closely with a multidisciplinary team, including doctors and therapists, to ensure integrated care for the newborn.

Table 2. Average Opportunity Score Across the Ten Job Steps

Job Step	Average Opportunity Score
Educate Family for Home Care – The ability to prepare the family for the newborn's care post-discharge, including training in special care techniques and medication management.	**11.9**
Engage with Family and Caregivers – The ability to effectively communicate with the newborn's family, providing updates and involving them in the care process.	**11.6**
Collaborate with NICU Team – The ability to work closely with a multidisciplinary team, including doctors and therapists, to ensure integrated care for the newborn.	**11.4**
Coordinate Post-NICU Care – The ability to organize follow-up medical care and support services for after the newborn leaves the NICU.	**10.9**
Provide Post-Discharge Support – The ability to offer follow-up support and resources to the family, ensuring ongoing care and addressing any post-discharge challenges.	**10.7**
Implement Discharge Plan – The ability to oversee the execution of the discharge plan, ensuring a smooth transition from the NICU to home.	**10.4**
Formulate a Detailed Care Plan – The ability to develop a comprehensive care plan tailored to the newborn's specific health needs and their parent/caregiver's unique needs.	**10.3**
Monitor Patient's Progress – The ability to continuously observe and record the patient's health status, responding to changes and adjusting care as necessary during their stay in the NICU.	**10.3**
Adjust Care Plan Based on Patient's Response – The ability to modify the care strategy in response to the patient's progress and new medical information, ensuring the most effective treatment approach.	**10.1**
Prepare for Discharge – The ability to manage all aspects of the newborn's discharge process, including documentation and logistics, in the days leading up to discharge.	**9.7**

4. **Monitor Patient's Progress.** The ability to continuously observe and record the patient's health status, responding to changes and adjusting care as necessary during their stay in the NICU.
5. **Adjust Care Plan Based on Patient's Response.** The ability to modify the care strategy in response to the patient's progress and new medical information, ensuring the most effective treatment approach.
6. **Educate Family for Home Care.** The ability to prepare the family for the newborn's care post-discharge, including training in special care tecÚiques and medication management.
7. **Coordinate Post-NICU Care.** The ability to organize follow-up medical care and support services after the newborn leaves the NICU.
8. **Prepare for Discharge.** The ability to manage all aspects of the newborn's discharge process, including documentation and logistics, in the days leading up to discharge.
9. **Implement Discharge Plan.** The ability to oversee the execution of the discharge plan, ensuring a smooth transition from the NICU to home.
10. **Provide Post-Discharge Support.** The ability to offer follow-up support and resources to the family, ensuring ongoing care and addressing any post-discharge challenges.

The nurses ranked the difficulty level and importance of 130 outcomes across the ten job steps. Traditionally, responses are analyzed utilizing opportunity scoring, a method designed to analyze the gap between the importance of associated customer outcomes and their satisfaction with the current solution.

Our team surveyed on 'difficulty' instead of 'satisfaction' to keep the survey context agnostic of existing products and solutions. For the purposes of opportunity scoring, difficulty values were set to correlate to satisfaction: "Very Difficult" was assigned a value of 1 (i.e., Very Dissatisfied), "Very Easy" was assigned a value of 5 (i.e., Very Satisfied), and so on.

The percentage of respondents who responded with a 4 or 5 was computed for each outcome. For example, if 90% of the respondents rate an outcome a 4 or 5 for importance, the Importance value entered into the algorithm is 9.0, and if 30% of the respondents rate an outcome a 4 or a 5 for satisfaction, the satisfaction value entered into the algorithm is a 3.0. The formula below was then used to determine the opportunity score:

Market Opportunity =
Importance + max (0, Importance – Satisfaction)

Finally, the outcome scores were graphed on an opportunity landscape (Figure 1).

Figure 1. Opportunity Landscape: Bedside Nurses Coordinating the Care Transition from NICU to Home

Survey Results

A total of 100 US-based, practicing NICU nurses responded to the survey, 64 of whom completed it. The nurses represented 33 states and level II-IV NICUs across rural, urban, and academic settings. Across all job steps, the average computed scores for each measurement were 8.3 (importance), 5.8 (satisfaction), and 10.7 (opportunity).

Table 3. Top 10 Outcomes Directly Connected with AngelEye Health's Mission

Rank	Outcome	Importance	Satisfaction	OppScore
1	Ascertain that the family is prepared for the long-term care requirements, e.g., chronic condition management, ongoing therapies, etc.	9.38	3.13	15.63
2	Confirm the family's understanding of long-term care requirements for chronic conditions, e.g., medication management, therapy continuation, etc.	9.38	4.53	14.23
4	Determine the family's understanding of the baby's medical condition, e.g., diagnosis, prognosis, etc.	9.38	5.47	13.29
5	Determine the family's ability to recognize signs of illness or distress in the baby, e.g., fever, unusual crying, etc.	9.69	6.25	13.13
9	Determine the family's preparedness for managing potential health complications, e.g., allergic reactions, respiratory issues, etc.	9.22	5.63	12.81
10	Ascertain the family's readiness to handle the emotional aspects of caring for a baby from the NICU, e.g., anxiety management, emotional support, etc.	8.75	4.84	12.66
11	Know that the family is informed about the signs of normal versus concerning behavior in the baby, e.g., sleep patterns, feeding habits, etc.	9.84	7.03	12.65
12	Avoid overwhelming the family with too much technical information, focusing on practical and essential care aspects.	8.13	3.75	12.51
14	Confirm the arrangement of regular follow-up appointments with healthcare providers, e.g., pediatric check-ups, therapy sessions, etc.	9.22	5.94	12.5
15	Avoid any lapses in the baby's care during the transition from hospital to home, ensuring a smooth and continuous care plan.	9.06	5.63	12.49

Nine of the ten job steps had average opportunity scores > 10, reflecting a vastly underserved market. The job step 'Educate Family for Home Care' had the highest opportunity score of 11.9, followed by 'Engage with Family and Caregivers' at 11.6 and 'Collaborate with NICU Team' at 11.4 (**Table 2**).

The opportunity score of 101 of the 130 outcomes was in the 'underserved' category. Two of the 130 were 'overserved,' and the remaining 27 were 'appropriately served.' These results underscore the significant unmet needs faced by bedside nurses in the NICU when coordinating discharge. (**Figure 1**)

Twenty-four of the 130 outcomes had an opportunity score >12, representing a 'high opportunity.' The outcome with the highest opportunity score was 'Ascertain that the family is prepared for the long-term care requirements," followed by 'Confirm the family's understanding of long-term care requirements for chronic conditions.' **(Table 3).**

The Role of Technology in Addressing the Discharge Dilemma

This research identifies numerous underserved needs of NICU nurses that are crucial to the successful transition of care from NICU to home. Seventy percent of those underserved needs were correlated with the job steps 'Educate Family for Home Care,' 'Engage with Family and Caregivers,' and 'Coordinate Post-NICU care.' Targeted interventions in the research setting have positively impacted the discharge process, including the ability to reduce the length of stay. However, these solutions have yet to be incorporated into clinical practice in a sustained and scalable manner. Better developed tools are needed for nurses to successfully prepare families for the safe transition from NICU to home.

Advancements in healthcare technology present a unique opportunity to address the discharge dilemma in the NICU. Digital platforms can help bridge the gap between the hospital and home, providing families access to educational resources, care plans, and direct communication with healthcare providers.

For care teams, technology can streamline the discharge processes, improve communication, optimize clinical time and resources, reduce administrative burdens, and facilitate more success in post-discharge care. Foundational needs that technology can positively impact include:

1. **Surveys:** By utilizing targeted surveys, education and support are tailored to each family's needs, enhancing the clinicians' ability to offer personalized care. This strategy improves patient outcomes and family satisfaction.
2. **Education and Resource Delivery:** We equip families with easily accessible essential education and resources relevant to their baby's health and transition to home, increasing their confidence and readiness for discharge.
3. **Flexible Scheduling:** Our coordination system enhances care team collaboration and family involvement, streamlines care activities, and improves neonatal health outcomes.
4. **Integrated Communications:** Our communication system ensures families are informed and engaged throughout the NICU stay, enhancing the care experience and supporting positive patient outcomes.
5. **NICU Roadmap:** A dynamic visual roadmap integrates care and communication between all stakeholders, offering customized guidance for families and care teams, facilitating smoother transitions from NICU to home and better overall long-term neonatal health.

Conclusion

Transitioning from the NICU to home is a pivotal moment for infants and their families, marked by significant challenges that necessitate comprehensive support from all healthcare team members. Embracing technological solutions can transform the discharge process into a more manageable, less stressful, and empowering family experience while optimizing the efficiency and effectiveness of care teams. Moving forward, healthcare innovators and leaders must prioritize developing and implementing technologies that provide the care team members with the tools they need to safely and effectively help families transition from NICU to home.

AngelEye Health is developing the first evidence-based NICU navigation and discharge coordination software that leverages the power of your EHR and cultivates confident families. This new solution can improve staff efficiency, save staff time, and proactively identify and support at-risk families to improve long-term health outcomes. Furthermore, it represents additional steps to a more integrated, family-centered approach essential for successful outcomes and advances AngelEye's goal and mission. With the help of technology to support the individual jobs required by each stakeholder involved in the transition from NICU to home, we can create the pathway for a more supportive, efficient, and, most importantly, safe discharge for our patients and their families. Visit AngelEyeHealth.com to learn more.

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