ORIGINAL ARTICLE

An assessment tool to determine in-hospital newborn fall/drop risk

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ABSTRACT

Objective: Routinely collected quality improvement data identified the occurrence of newborn falls/drops as unacceptable. The purpose of this quality improvement project was to develop and implement a site-specific newborn fall/drop assessment tool.
Methods: Guided by data from the retrospective chart review data, results identified through the review of the literature, and the opinions of clinical experts, an 11-item risk assessment tool was developed. This tool includes three non-modifiable and eight modifiable variables.
Results: Summing the items on the tool identifies a scenario-specific newborn fall/drop risk. Once pilot testing was completed and revisions were made, the tool was implemented into clinical practice.
Conclusions: Site-specific patient demographics, including cultural preferences, along with plans of care decisions, impact the risk for a newborn fall/drop. Including the uniqueness of the clinical setting and family values in the fall risk assessment decreased the prevalence of newborn falls/drops at the study site.

Key Words: Newborn, Fall/drop assessment, Assessment development, Risk reduction

1. INTRODUCTION

Newborn drops, also described as newborn falls, have been defined by The Joint Commission (JC)[1] as a sudden and unintended descent, which may conclude in injury as a result of contact with any hard surface. These events are unwanted in maternal child clinical areas. There are three professional organizations who have developed care bundles aimed at decreasing incidences of newborn falls/drops. In 2018, publications from the American Academy of Pediatricians (AAP)[2] and the JC[1] identified risk factors and made safety recommendations. In 2020, The Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN)[3] updated their practice brief which provides recommendations aimed at preventing in-hospital newborn fall/drop events. Each of these professional organizations has contributed to the development of assessment tools and newborn care bundles (NCB) aimed at decreasing newborn falls.

The AAP[2] identifies a four-step approach to decrease newborn falls/drops. The activities described in these steps include: (1) reporting newborn falls/drops, (2) providing safe sleep training programs to hospital staff and parents, (3) enhancing the infrastructure toward greater support for new mothers and families, and (4) evaluating the system, environment, and equipment for the ability to provide optimal care. Guided by these steps, numerous NCB, as quality improvement projects, have been initiated. A synthesis of these activities, along with the specific interventions included in each and the outcomes have been provided by Duthie.[4]

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In 2010, the JC[5] identified four risk factors most associated with newborn falls/drops. These include: (1) a Cesarean birth, (2) the used of pain medication within four hours prior to the fall/drop, (3) the second or third postpartum night, specifically between midnight and the early morning hours, and (4) breastfeeding. Additionally, this recommendation includes seven processes aimed at preventing newborn falls/drops. These include: (1) developing an assessment tool to identify those at risk, (2) providing education to parents, guided by the results of the assessment tool, (3) hourly rounding by caregivers, (4) promoting maternal rest, (5) placing signage in clinical areas that articulate behaviors that prevent newborn falls/drops, (6) developing standardized reporting and debriefing tools so that incidences are captured, reported, and routinely analyzed, and (7) providing emotional support to the family or caregiver when a newborn fall/drop occurs and ensure that they are coping.

The AWHONN[3] updated their practice brief in 2020 which provides recommendations aimed at preventing in-hospital newborn fall/drop events. The AWHONN[3] categorizes risks into four categories: (1) parent/family, (2) environmental, (3) equipment, and (4) staff. Based on the belief that in-hospital fall/drop-related injuries are preventable, these events, together with risk-reduction strategies, are reportable in the National Database of Nursing Quality Indicators (NDNQI).[6] The AWHONN[3] reports that serious injury from a newborn falls/drops are infrequent, yet the emotional trauma and negative stigma associated with these events result in a decrease in reporting.

With incidences of newborn falls/drops estimated to be between 600 and 1600 annually,[7] Duthie[4] advocates for routinely challenging the paradigm and to abandon beliefs unsupported by science. The JC[5] recommends the development of an assessment tool capable of identifying those at risk for a newborn fall/drop. The AWHONN[3] recommends the development of standardized prevention strategies that include known factors that contribute to in-hospital newborn falls/drops. This article will describe the performance improvement activities which developed guidelines and best practices and resulted in the development of a site-specific newborn fall/drop assessment tool.

1.1 Background

Although newborn fall/drops are infrequent, they have been associated with serious trauma. Bittle and associates[8] have identified cesarean birth, receiving opioids and/or sedating medications, exhaustion, maternal age between 18 and 28 years, and/or a history of substance abuse as maternal variables which increase the risk for a newborn fall/drop. Despite increasing recognition of the potential risks associated with in-hospital newborn falls/drops among health professionals, new parents are frequently unaware of the possibility of dropping their newborn, especially in the hospital.[9] Results from Slogar and colleagues[10] identified near misses as most likely to occur an average of 52.6 hours after birth. The emotional distress, as a consequence of a newborn fall/dop drop, to the parent and the primary care provider, should not be understated.[11]

Several tools have been implemented to identify the clinical scenario where the risk for a newborn fall/dop drop is present. The Stanford Sleepiness Scale[12] uses self-reported criteria, and a 7-point Likert measurement to describe one's state of alertness. The respondent is to describe their present degree of sleepiness, from: (1) feeling active, alert, and wide awake to (7) no longer fighting sleep, sleep onset soon, having dream-like thoughts. While not developed specifically for the post-partum person, the scale has a reported reliability of 0.88.

The Environmental Safety Survey[8] is an 11-item instrument which uses dichotomous responses to evaluate the environmental factors which increase a newborn fall/dop drop risk. Once implemented, data revealed that of the 101 participants in their project, 50 (49.5%) had at least one indicator of an unsafe environment requiring an intervention. The unsafe environment included: (1) the newborn being held by a sleeping adult, (2) a newborn left unattended, (3) less than two side rails on the hospital bed being in the up position, and (4) the hospital bed in an elevated position. While demographic and health information were collected as part of this project, these data were not used to identify risk factors associated with a newborn fall/drop. They were used only to describe the study population.

In addition to the assessment tools, two programs have been developed and implemented. The "Keep Me Safe" program[13] describes the ability of educational interventions, assessment, and a partnership agreement with the parent(s) to decrease incidences of newborn falls/drops. The program was implemented based on the results of the risk factor assessment tool. While the article provides scant information, interventions appear to include education, reassessment, and a partnership agreement with the parent(s).

Framed by five components, the "What a Catch" program[14] aims to develop a culture of safety, which would prevent in-hospital newborn falls/drops. The five components include: (1) maintaining a respite nursery, (2) visual management, (3) situational communication and actions, (4) safe and appropriate staffing, and (5) celebrating success. Within each component area are activities nurses can perform that, together, will prevent in-hospital newborn falls/drops.

Despite the identified risks described in the literature, there is a paucity of data identifying, or ranking the specific risk for an in-hospital newborn fall/drop. Activities in this practice initiative project included capturing evidence-based data specific to the clinical site and developing an assessment tool. The capability to identify those at risk allows care to be provided based on assessment results.

2. METHODS

The specific aim of this project was to develop and implement an assessment tool that identifies the clinical situation where there was a high risk for a newborn fall/drop. Then, interventions can be guided by these data. Specifically, we aimed to decrease incidences of in-hospital newborn fall/drop events.

2.1 Sample and setting

Activities for this project were completed within one clinical setting, a 451-bed health care facility which has just under 2000 births annually. The Maternal Child Health Services Department, which provides care using a couplet model, encompasses Labor and Deliver (L&D), with the couplet (mother and child) transferred to the Mother/Baby unit for the remainder of their stay. Staffing adheres to the AWONN guidelines,[15] and hourly rounding is a hospital-wide policy. The hospital has a designated Level 3 Neonatal Intensive Care Unit (NICU) and two surgical suites, staffed by L&D nurses. The care philosophy at the site utilizes "Baby Friendly" concepts. Activities are underway to receive a National Public Safety[16] designation as a Cribs for Kids® site. While the project was not specifically designed as a quality improvement activity, the Standards for Quality Improvement Reporting Excellence (SQUIRE) 2.0 guidelines[17] were used to frame the steps taken.

2.2 Data collection

A retrospective chart review of the previous eight instances where an in-hospital newborn fall/drop occurred were reviewed. Data within this review included variables identified and not identified in the research literature. Table 1 displays the variables identified in the literature, the status of its inclusion in the study tool, and the rationale for the decision. Anecdotally desired information requested by the project team members was included in the chart review. The results of this review identified risk factors that varied from the published research. Guided by these results, a risk assessment tool was developed (see Table 2). The tool, labeled the North Kansas City Newborn Falls Risk Assessment Tool (NKCNFRAT©) included two subscales, which separated the variables into non-modifiable and modifiable categories. This allowed the risk factor to be a consequence of variables that could not be altered, such as maternal age and delivery method, from variables that can be altered, such as sleep practices and mother's level of awareness. Each item was scored, dichotomous responses were used for items in the non-modifiable subscale; items in modifiable subscale allowed multiple responses. The scores on both subscales were summed, then combined, which provided the ability to rank the risk for an in-hospital newborn fall/drop and determine the source of the risk. While dichotomous responses (yes/no) were used for two items (medical equipment tethered to the newborn and the placement of the newborn in an isolette), a positive response to the item which assessed safe sleeping practices or a previous in-hospital newborn fall/drop automatically resulted in a high risk for an in-hospital newborn fall/drop, regardless of the score on any other item. Possible summed responses range from 1 to 26.

Once developed, the tool was piloted by comparing 44 assessments, performed simultaneously, by nurses involved in the development of the tool and paired with one unfamiliar with this project. This was done to determine inter-rater reliability of the tool and to guide content for staff education. The nurses who provided data for the unfamiliar group were individuals, identified by nurses involved in the project, who agreed participate.

2.3 Data analysis

Comparative data analyses documented agreement, except for the item assessing "mother's level of awareness." In one instance, the nurse familiar with the tool rated the level of awareness one-point higher than the nurse unfamiliar with the tool. The vagueness surrounding the response options, and/or the desire to error on the side of caution, was believed to be the cause of this discrepancy. Relative risk was operationalized as low, if the assessment scores were between 1 and 5, moderate if the scores were between 6 and 10, and high if the summed assessment scores were 11 or higher. Thus, unsafe sleep practices or a previous newborn fall/drop experience automatically resulted in a high risk for a newborn fall/drop scenario.

Staff education was provided to all nurses. These sessions focused on the value of the tool to identify scenarios where there is a risk for a newborn fall/drop, the purpose of the assessment tool, and what variables are included in the tool. Each section of the tool automatically appears in the electronic medical record at the appropriate interval. Possible responses appear, and the drop/fall risk score is automatically calculated once all fields are complete. A fall/drop score will not be produced if any field is ignored. Hands-on practice was included in the educational sessions. Exemplars of the medical record screen shots are displayed in Figures 1 and 2.

2.4 Ethics approval

When considered as a performance improvement project, research oversight approval was not required. Despite these projects being outside the research domain, the activities were reviewed by member of the Nursing Research and Innovations Council. Medical record data were used to identify, develop, and evaluate the assessment tool. All data and analyses were performed and maintained on password protected computers.

Table 1. Professional organization identified variables and impact on tool development

Organization	Variable	Included in Tool	Rationale	Tool Variable
AAP (Seahorse and Tully, 2018)				
	Infant location (bed or couch)	No	Chart review data identified both sites as risks (bed n = 5; chair n = 3)	Location is not specifically assessed, but maintenance of safe sleep practices is
	Overnight hours	No	Newborn falls/drops occurred between 1,200-1,600 (n = 5); 601-1,159 (n = 3)	The chart review data indicates that the risk is always present
	Lack of support person with the mother	No	Three newborn fall/drop occurred while the father was holding the infant	The presence of a supportive person did not decrease the risk for a newborn fall/drop
	Breastfeeding	Yes	Breastfeeding was present in 7 of the 8 instances	Breastfeeding is a risk variable for a newborn fall/drop
AWHONN (2020)				
	Stigma (decreases reporting)	Yes	Using objectively assessed variables, stigma and implicit bias is reduced	Assessing the variables of pain management, health status of the mother, health status of the newborn, the need for medical equipment, and placement of the newborn in an isolette assesses the fall/drop risk objectively
	Maternal exhaustion	Yes	Person holding the newborn was asleep in 4 of the 8 instances.	Maternal exhaustion and health status of mother included in the tool.
	Breastfeeding	Yes	Breastfeeding was present for 7 of the 8 instances	Breastfeeding is a risk variable for a newborn fall/drop
	Miscalculation of newborn's placement	Yes	Newborn was sleeping in 5 of the 8 instances.	Documentation of safe sleep practices required to ensure safety
	Sedation medications	Yes	Epidural medication was provided in 7 of the 8 instances.	Tool expanded this category to identify all sedative medications
	Early morning hours	No	Newborn falls/drops occurred between 1,200-1,600 (n = 5); 601-1,159 (n = 3)	The chart review data indicates that the risk is always present
	Cesarean birth	No	Only 1 instance in the chart review was a Cesarean birth	Our data did not identify a Cesarean birth as a specific risk factor. This situation can be assessed using pain management, level of awareness, and health status of the mother
tJC (2018)				
	Cesarean birth	No	Only 1 instance in the chart review was a Cesarean birth	Our data did not identify a Cesarean birth as a specific risk factor. This situation can be assessed using pain management, level of awareness, and health status of the mother
	Use of pain medication within four hours		Epidural medication was provided during delivery in 7 of the 8 instances.	The assessment tool expanded this category to identify all sedative medications
	Second or third postpartum night, specifically around midnight to early morning hours	No	Of the 8 instances, 4 occurred within the initial 24 hour after birth and the remaining 4 between 25 and 40 hours after birth	The chart review data indicates that the risk is always present
	Breastfeeding	Yes	Breastfeeding was the feeding method for 7 of the 8 instances	Breastfeeding is a risk variable for a newborn fall/drop

Table 2. North Kansas City Newborn Falls Risk Assessment Tool (NKCIFRAT)©

Demographic Data (Collected at initial assessment only)		
Medical Record Numbers	Mother	
	Newborn	
Non-Modifiable Variables		
Mother Age Range	Teens	1 point
	Twenties	2 points
	Thirties or more	0 points
Para Status (after delivery)	Para 1	2 points
	Para 2	0 points
	Para $\geq$ 3	1 point
Modifiable Variables		
Day Post-Partum	One	2 points
	Other days	1 point
Breastfeeding	Yes	1 point
	No	0 points
Pain Management	PCA (presently)	1 point
(identify all that apply)	Epidural (within previous 4 hours)	1 point
	Spinal (within previous 24 hours)	1 point
	Pain/Sedation medication (presently)	1 point
Level of Awareness (mother)	Alert/Aware/Easily Roused	0 points
	Drowsy	1 point
	Difficult to arouse	2 points
Health Status of Mother	Post-partum medical complication	1 point
Health Status of Newborn		NAS score
Maintenance to Sleep Practices	Yes	0 points
	No	11 points
Previous History of Infant Fall/Drop	Yes	11 points
	No	0 points
Medical Equipment Tethered to Newborn	Yes	1 point
	No	0 points
Is the Newborn in an Isolette?	Yes	1 point
	No	0 points

3. RESULTS

Upon initiation of a piloting the intervention technical issues were identified related to the calculation of the final score, which required recalibrations. Once adjusted, and checked for accuracy, the intervention went live. Data were captured across the electronic medical record of the mother and newborn. Thus, assessment results from either individual were used to determine the risk factor. The overall risk factor, together with the identification of any clinical situation that elevated the risk for a newborn drop, guided any intervention. Interventions included education, providing care-giver respite, and opportunities to provide psychological support. Using a consistent and supportive script, respite care is offered without bias. Sharing the assessment score which identifies fatigue or the need for self-care, makes recommending the newborn spend some time in the nursery a healthcare concern, rather than a judgement. Fatigue was identified as an unintended consequence of rooming-in, family centered care, and breastfeeding demands. Reviewing safe sleep practices and other fall/drop prevention behavior are assessment results, rather than personal opinion, perspective, or experience.

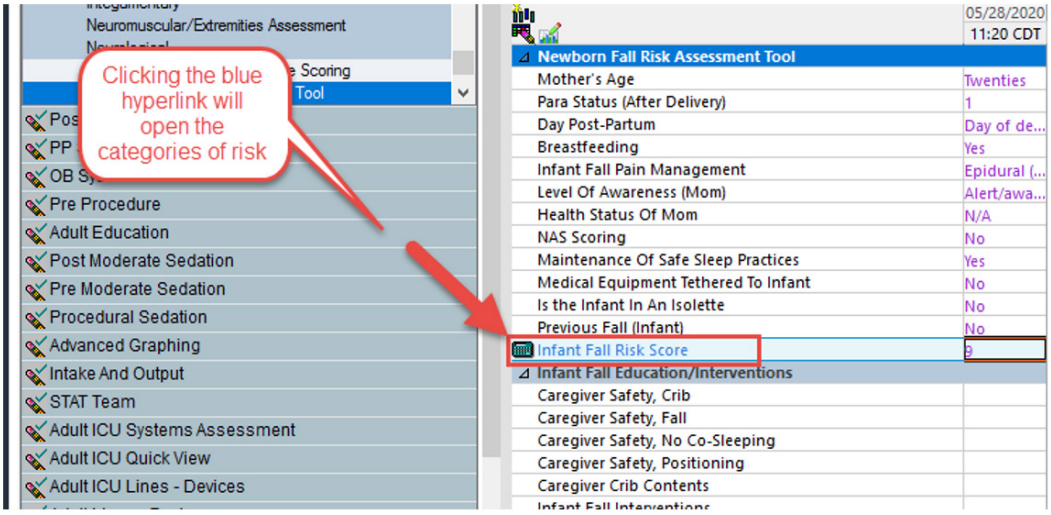

Figure 1. Screenshot of assessment tool

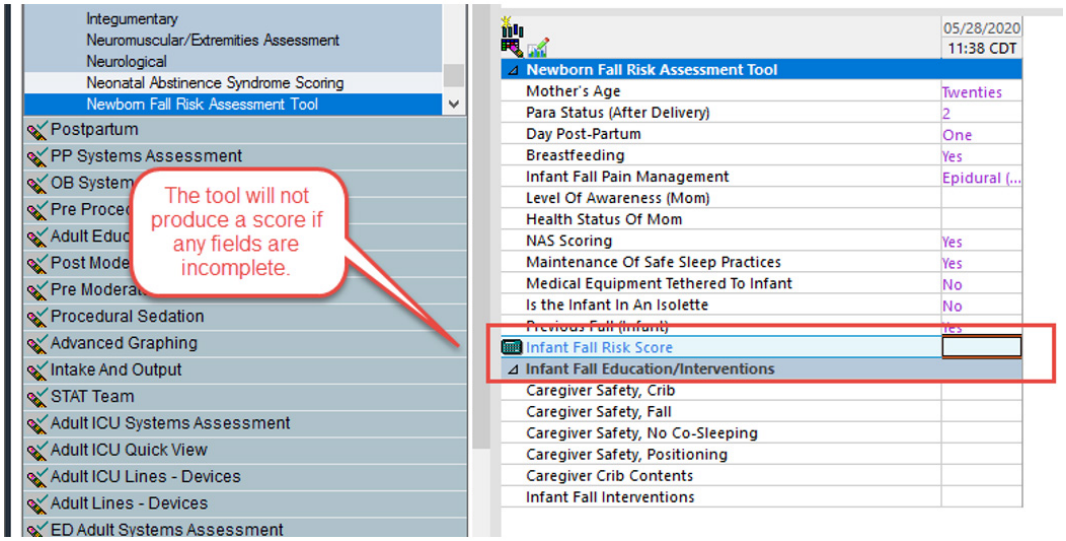

Figure 2. Screenshot of assessment tool within the electronic medical record

Once implemented, an on-going assessment if its usability was monitored. Newborn drop assessment data were reviewed from 150 births that occurred after the assessment tool was implemented. Assessment scores ranged from 3 to 12 indicating pre-defined low, moderate, and high risk for a newborn fall/drop. In circumstances where the risk was determined to be moderate or high, an intervention was provided, and documented. Thus, the use of the assessment tool has the capability of guiding practice.

Once the assessment tool was fully implemented data were captured electronically, within the maternal and newborn electronic medical record. Thus, some of the non-modifiable assessment items were recorded automatically. These included demographic data (age of the mother, para status, and day post-partum). A complete assessment was performed at least every 12-hour shift, and as needed, guided by nursing judgement.

Ongoing evaluation of the assessment tool and associated policy continues. These data provide the opportunity to identify variables not included in the present assessment tool and identify trends that impact newborn fall/drops. Once implemented, any newborn fall/drop was prevented for 14 months. A post-incident review of this event revealed that the causative variables were unique and not accessed by the NKCNFRAT©. Variables identified by all routine reviews of any newborn fall/drops will be used to amend the tool, if

appropriate.

Evaluative data from users have identified an area in need of refinement. Nurses who provide care only to the newborn encounter challenges in completing the assessment due to the lack of access to the mother's demographic data. Clinical informatics is exploring ways to share these data without having to navigate out of the documentation portal.

4. Discussion

Summing of the subscales results in a total risk score. Cut-off scores are used to place a patient in a low, medium, or high risk for a newborn fall/drop. Interventions are guided by both the score and the subscale. For example, an educational intervention occurs if there is a failure to adhere to appropriate sleep habits and placing[8] the newborn in the nursery may be the intervention if pain medication has been administered within the previous four hours and another caregiver is not available to care for the newborn.

The identification of an unacceptable newborn fall/drop rate resulted in the desire to identify and implement interventions aimed at mitigating these events. Conclusions from the review of the literature differed from the clinical experience described by direct care providers. Results from the retrospective chart review of previous newborn falls/drops identified unique clinical differences. Bittle and associates[8] identified exhaustion as a risk variable, whereas our data indicated a higher risk within the first 24 hours after delivery. Previous history of substance abuse did not correlate to any increased risk among our study population. Our data also identified an increased risk for the first, or third newborn. Newborn fall/drops occurred equally when the mother, or father, was holding the newborn, and significantly more likely when the newborn was sleeping. Neither day of the week, nor time of day, increased the risk factor.

Based on these data, the development of a site-specific newborn fall/drop assessment tool was developed. Once staff education and a pilot implementation of the tool was completed, the assessment tool was included in the routinely done assessments. Thus, results from these practice initiative activities resulted in the identification and development of an assessment tool, specific to this clinical setting, capable of mitigating newborn falls/drops.

4.1 Clinical implications

The need to identify the clinical situation which places a newborn at risk for a fall/drop seems to have global and specific variables. These variables may be inconsequential to other clinical settings, thus the need to adapt any assessment tool to the uniqueness of a specific setting.

The global variables which increase the risk for a newborn fall/drop include inappropriate sleep practices, a maternal age between 20 and 40 years, exhaustion, and the presence of opioids and/or sedating medications. Beyond these, the identification of site-specific variables is necessary to provide evidence-based care. The assessment needs to include maternal and organizational items and undergo routine evaluation for appropriateness. Including results of the assessment tool to any post-fall/drop evaluation provides the opportunity to amend the tool, as needed.

4.2 Limitations

Activities for this project were completed within one clinical setting. The COVID-19 pandemic was underway during each step of this activity. While it is not posited that this had any impact on the project, the pandemic has impacted the ability to provide healthcare that may have influenced this project. Implementation of our assessment tool should be done with caution, and only after site-specific data supports its use.

5. Conclusions

The results of this performance improvement project describe, and highlight, the unique variables that are present in any healthcare setting. The research literature identified maternal age, para status, and post-partum data that differed from our experience. While laborious, performing a chart review, assuring that the assessment tool is reliable, and ongoing evaluation are critical to provide care that is appropriate, valued, and reflective of the needs of the population. The use of this assessment tool may provide a non-judgmental method of identifying the newborn at-risk for a fall/drop. The addition of site-specific variables, guided by the chart review and input from clinical experts, enhances results from reviews of the literature. While generalizability is this limited, specificity is enhanced.

Conflicts of Interest Disclosure

The authors declare they have no conflicts of interest.

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