

Abstract

Purpose: To evaluate content validity and interrater reliability for acuity tools developed for the antepartum and neonatal intensive care unit (NICU) patient population.

Study Design and Methods: Antepartum and NICU acuity tools were developed to better evaluate nurse staffing assignment equity and patient needs. Following several iterations with staff nurses and nurse leaders, content validity of the acuity tools was established via a panel of experts in each substantive area using the Content Validity Index. The final tools were then evaluated for interrater reliability using Intraclass Correlation.

Results: Content validity for the Antepartum Acuity Tool was S-CVI/Ave = 0.87 and for the NICU Acuity Tool was S-CVI/Ave = 0.98. Interrater Reliability for the Antepartum Acuity tool was ICC = 0.88, and the NICU Acuity Tool was ICC = 0.95.

Clinical Implications: These tools have established content validity and interrater reliability and are appropriate for use in the antepartum and NICU settings to determine patient acuity and promote appropriate nurse-to-patient assignments.

Key words: Hospitalization; Intensive care units; Neonatal; Nurse staffing; Patient acuity; Patient care; Perinatal; Workforce.

ACUITY TOOLS FOR THE ANTEPARTUM AND NEONATAL INTENSIVE CARE UNITS

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Determining patient acuity and making decisions about patient care priority are important nursing responsibilities. Nurses modify their care and the time they devote to bedside attendance based on frequent assessments of patient acuity. Patient condition and needs are dynamic and change over the course of their hospitalization. Nurse-to-patient assignments should be adjusted accordingly. Ideally, patient assignments are balanced in accordance with the appropriate number of nurses based on unit census and patient acuity. Competing factors such as tighter budgets, staffing metrics that are built on arbitrary numbers and fixed productivity targets, and requests to use fewer support services increasingly challenge nurses' flexibility to maintain this balance and support safe high-quality care.

Background Knowledge

The Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN) describes acuity as "the dose of nursing care required for safe and effective care" (AWHONN, 2022, p. 7), and the American Nurses Association (ANA) defines acuity as "the measurement of the severity or complexity of an illness or the resources required to treat an illness or injury" (Begley et al., 2020, p. 17). Acuity of a patient's condition is not static. It may change abruptly, and the nurse must be available to respond as necessary. Patient deterioration can occur subtly over time. On occasion, impending changes are predictable, but often they are not. Sudden changes in patient status in the maternity setting including the antepartum, and neonatal intensive care units (NICUs) require flexibility and advanced judgment, especially when making nursing care assignments.

The American Nurses Association notes that the expertise of the nurse must be matched to the needs of the recipient of care (ANA, 2020). Matching the nurse with the right experience and skill levels to the patient with identified acuity in the right circumstance is the core of what charge nurses, also called nursing supervisors, assistant directors, and other titles, do when making assignments. When patient status changes rapidly, adjustments to nurses' assignments must be made quickly. For example, a patient with preterm rupture of membranes may go from stable to preterm birth of an unstable baby in minutes. Care may be transferred from the antepartum team to the labor and birth team and the NICU team in this type of clinical emergency. A patient with placenta



Acuity-based nurse staffing is key to increased patient safety and optimal outcomes.

tics data (Agency for Healthcare Research and Quality, 2022). Although there is a clear need for nurses to be assigned by patient acuity to promote safe, high-quality nursing care, there are few tools available to guide nurses in making these decisions for the antepartum and NICU population.

The AWHONN 2010 *Staffing Guidelines for Professional Registered Nurse Staffing for Perinatal Units* contained information that could be used to create perinatal staffing acuity tools, including common situations in the perinatal setting (AWHONN, 2010). The updated AWHONN *Standards for Professional Registered Nurse Staffing for Perinatal Units* (2022) includes tools to help nurses make patient care assignments. These include a suggested perinatal acuity tool based on the AWHONN (2010), now AWHONN (2022) nurse-to-patient ratios (Simpson, 2013) and a tool to help predict nurse staffing needs for labor and birth in large volume settings (Simpson, 2015). There have

been acuity tools developed specific to obstetric triage, the most recognized and gold standard is the Maternal Fetal Triage Index, which was introduced by AWHONN in 2015 to define parameters for evaluation of perinatal triage patients, with reported content validity and reliability (Ruhl, 2015a; Ruhl, 2015b). This tool has been found to be effective in promoting safe and timely triage based on patient acuity and condition (Hoffmann et al., 2022; Mayberger et al., 2022). Jones and Hall (2022) showed assessing and predicting nurse staffing by acuity in labor and delivery units using electronic health record data was feasible. They were part of a team that successfully embedded the (AWHONN, 2010; AWHONN, 2022) nurse staffing standards in the electronic medical record of all four birthing hospitals in their health care system. Their work is very useful for establishing acuity for labor and delivery units but is not applicable for antepartum or NICU units.

previa may suddenly begin bleeding and need to be rushed to the operating room. The surgical team will need to respond immediately along with labor and birth nurses and NICU nurses in anticipation of neonatal resuscitation. A baby in the NICU may appear stable and in a short period of time exhibit signs of sepsis, requiring rapid intervention.

The AWHONN *Standards for Professional Registered Nurse Staffing for Perinatal Units* provide the best parameters available for the changing conditions of maternity and neonatal patients (AWHONN, 2022). These new standards reflect the complex and increasing acuity in the inpatient maternal and newborn population, with strong evidence-based context. A significant increase in the maternity population comorbidities and more complex patient acuity over the last decade were reported by AWHONN members in a 2021 online survey (Simpson et al., 2021) and are supported by United States vital statis-

Review of the Literature

A literature search was conducted via Google Scholar, PubMed, and the Cumulative Index to Nursing and Allied Health Literature, using keyword search terms acuity, acuity tools, antepartum units, and NICUs. Inclusion criteria were articles in English with no restriction on publication date.

No antepartum-specific acuity tools were found. Although tools for other nursing units were helpful, they were not perfectly applicable to antepartum units and did not include the individual categories of maternity patients that are part of antepartum care. Antepartum patients can be very different from one another based on their diagnosis and reason for hospitalization. They also vary significantly in their status. For example, a patient who is admitted for preterm labor and receiving intravenous magnesium sulfate for neuroprotection is going to be a high level of care for the first 24 to 48 hours of admission and then will significantly decrease in the care required once they are stable and awaiting birth. If they begin to show signs of labor or infection, care level may escalate very quickly. No articles were found on acuity tools for mother–baby units, an area that will need future focus.

Tools that predict neonatal morbidity and mortality are available such as Score for Neonatal Acute Physiology (SNAP), Score for Neonatal Acute Physiology with Perinatal Extension-II (SNAPPE-II), but these do not address acuity for nurse staffing (Harsha & Archana, 2015). Missed care, which may include late medications, late feedings, or missed daily care such as bathing, related to NICU nurse workload has been investigated (Tubbs-Cooley et al., 2019). Workload of the nurse in the NICU and other maternity care settings remains mostly unmeasured, although this area has high potential for intervention (Feldman & Rohan, 2022). No articles were found on NICU acuity that specifically determine acuity levels.

Acuity tools for antepartum and NICU units are clearly necessary to give nurses what they need for establishing the safest patient assignments to optimize patient outcomes for mothers and the babies. A framework for quantifying acuity objectively can assist charge nurses and other nurse leaders to make nurse-to-patient assignments

in real-time as well as plan for future staffing needs in the context of fluctuations in unit census and patient acuity.

Local Problem and Intended Improvement

This project was conducted in a community hospital with a history of multiple nursing research projects driven by nursing leaders and bedside nurses as part of the Magnet Hospital culture. Nurses are encouraged to ask probing questions about who, what, when, where, and why they take the nursing actions common to their practice. Need for an acuity tool to support patient assignments for a high-volume Level III high-risk antepartum unit and Level III NICU arose from a desire to ensure the optimal nurse-to-patient ratio. In a busy unit, it can be easy to continue assignments from one shift to the next without evaluating workload and evolving patient needs. On the antepartum unit, the charge nurses and staff nurses identified a need to better evaluate patient assignments and began the process of developing an acuity tool. In the NICU, a long-standing tool developed in-house by nurse experts was available in the electronic medical record (EPIC), but it required revision, and content validity and interrater reliability had not been established. The primary goal of the study was to establish content validity and interrater reliability for acuity tools for patients in the antepartum unit and NICU.

Methods

Setting

The community hospital in which these two tools were developed is a Level IIIB High Risk Labor and Delivery and Level IIIB NICU (the highest levels awarded in this state), which averages 450 to 500 births per month and has a 28-bed NICU. Obstetric hospitalists, anesthesiologists, and neonatologists are in-house 24 hours a day, 7 days a week. The obstetrics unit has labor-delivery-recovery (LDR) rooms positioned in a somewhat circular pattern, allowing rooms to be flexed for labor or antepartum, as needed. Generally, the antepartum patients are assigned to rooms in close proximity to facilitate workflow for the nurse caring for them. All labor nurses are capable to care for antepartum patients, although some nurses prefer this assignment and work there more often. The NICU unit is on the same floor and has a separate neonatal nursing staff, organized in pods of four beds each. The design for the study was presented to the Nursing Research Council and the hospital Institution Research Board and was determined to be quality improvement.

Planning the Intervention for the Antepartum Unit

Development of the tool began with understanding the need from the viewpoint of the charge nurses and bedside nurses. Once the need was identified, a thorough literature review of the available tools was conducted. Expert opinions from across the country were sought to identify other tools being used. With none identified that had established content validity and reliability, the decision was made to move forward with development of an antepartum acuity tool.

TABLE 1. ITEM SCORING FOR CONTENT VALIDITY

1	Item is not relevant to the measured domain. This item should NOT be included in determining acuity or patient assignment.
2	Item is somewhat relevant to the measured domain. This item could be removed from the tool, its relevance is questionable/needs clarification.
3	Item is quite relevant to the measured domain. This item is applicable to determining acuity and assignment, it should be on the tool.
4	Item is highly relevant to the measured domain. This item is critical to determining acuity and assignments, it must be included in the tool.

Note. Adapted from Almanasreh et al. (2019) and Rodrigues et al. (2017).

FIGURE 1.
Antepartum Acuity Tool

Rm:

Patient Name:

Date:

Shift:

	0	0.5	1	2	3	4	6	8
MEWT Score (Vital signs)	0/within normal range		One parameter outside of normal range (BP>155/105 or <80/45, P>110, R>24, T>100.4, O ₂ Sats <93, FHR>160, altered mental status, disproportionate pain.)	Two parameters outside of normal range OR Severe Hypertension Protocol initiated	>2 parameters outside normal range or 1 severe trigger, BP>160/110, P>130, R>30, O ₂ Sats<90, MAP<55, nurse concern			
Respiratory	Routine	O ₂ Saturation monitoring	On O ₂ at 2 L or less	High-flow O ₂ to maintain saturations	Requires multiple Respiratory Therapy treatments			
Monitoring		Tones	Toco only or NST	Continuous	Difficult to monitor. Intervention often needed			
(Twins)			Fetal heart tones or toco only	NST	Continuous	Difficult to monitor. Intervention often needed		
Contracting	Rare	Irritability	> irritability or regular contractions	With decelerations	With cervical change			
Bleeding	No		Spotting/minimal	Moderate/stable		>1 pad per hour		
Uncontrolled Pain			Requires frequent assessment					
Medications # of administration times/shift	0 per shift	1-2 times per shift	4 times per shift	≥5 times per shift	Every 1-2 hr, increased nursing time at bedside			
IV lines	None	Saline lock	1 IV or PICC line	Multiple IV lines	Central line/port	Arterial line		
Magnesium (PEC)				Hours 2+ stable (hourly vital signs)		Hours 2+ unstable	Magnesium first hour	
Magnesium (PTL/NP)			Hours 2+ stable				Magnesium first hour	
Blood Products						Blood Administration		Massive Transfusion
Diabetes		Diet only - carb counting	BSBG routine	More frequent BSBG ordered	Insulin drip/hourly BSBG			
Labs	<4 draws/day		>4 draws/day					
Infectious Disease			PPE - minor	Complete gown and glove	COVID			
Other				Complex Social Issues		Direct Antepartum Admit		
Totals								
								Total Score

Key: MEWT: Maternal Early Warning Trigger Score, BP: blood pressure, BSBG: bedside blood glucose, FHR: fetal heart rate, MAP: mean arterial pressure, NST: nonstress test, O₂/O₂ Sats: Oxygen Saturations
 PEC: preeclampsia, PICC: peripherally inserted central catheter, PPE: personal protective equipment, PTL/NP: preterm labor/neuroprotection, P: pulse, R: respirations, T: temperature, toco: tocodynamometer

Staff nurses from the antepartum unit, charge nurses, the nurse senior clinical director, nurse educators, nurse informaticist, and the nurse practitioner met to identify the major categories of clinical care and conditions that would define patient care needs. Nineteen categories were identified, including vital signs, contraction status, and bleeding. Each category was then further delineated into specific elements of care from a score of zero (no intervention or care needed) to six (full one-to-one intervention needed).

Daily interdisciplinary rounds are held on the antepartum unit and attended by staff nurses, charge nurses, and nursing directors from labor and delivery, the mother-baby unit and NICU, the OB hospitalist, the nurse practitioner, case manager and social services professional, nurse educators, nurse informaticist, and other available physicians (maternal-fetal medicine, obstetricians, and anesthesiologists). Each patient on the antepartum unit is discussed and their current plan of care reviewed so all team members are aware of each of the high-risk patient's status. Scoring the patients with the antepartum acuity tool became a part of the patient discussions during rounds.

Planning the Intervention for the Neonatal Intensive Care Unit

The NICU nurses attending the daily interdisciplinary rounds began to discuss their long-standing home-grown acuity tool and requested that their tool also be evaluated for updates, as well as content validity and reliability. The tool in use was scored from 1 to 4 in each category, with many variations in the way it was scored by the nurses. The total score for each baby determined their level of care (Level I, II, or III), and this level was used to develop the nursing assignments each shift. A thorough literature search was done to determine if there were other tools available, none were found that determined acuity. A team of nurses from the NICU was formed to make initial revisions and the first iteration of the tool was reviewed.

Content Validity

Content validity using the diagnostic content validity score model (Wieck, 1996) was established using expert panels and decisions were made based on established parameters. To assure general applicability, expert panel members from across the United States with expertise in each area were included. Bedside nurses, charge nurses, directors, nurse practitioners, and educators participated.

The initial evaluation of the antepartum tool was performed by charge nurses, rating patients on the antepartum unit each shift. They determined that the assignments for each nurse should total no more than 10 points. For example, a nurse might have three patients assigned, one who scored a total of 3 points, another who scored 3.5 points and another patient who scored 3 points, for a total of 9.5 points. Once established, this total point target did not change in further iterations. After several modifications, the staff nurse caring for each patient also scored that patient and the scoring was compared with

the charge nurse scores. Further modifications were made from suggestions by staff nurses. One early category was Stable or Unstable. Nurses felt it was too subjective, so that indicator was changed to Maternal Early Warning Trigger Score or Abnormal Vital Sign Triggers. This portion of the work lasted approximately 4 months.

For the content validity index (Almanasreh et al., 2019; Rodrigues et al., 2017), the expert panel for each unit was identified and asked to participate. Those who consented were sent instructions for how to evaluate content validity, scoring each category for degree of relevance (Table 1).

Content validity was then determined using the standard Universal Agreement scores (UA; Rodrigues et al., 2017):

- Item-Level CVI (I-CVI)—the experts in agreement divided by the total number of experts;
- Scale-Level CVI (S-CVI)/Ave—the average I-CVI scores across all items; the average of proportional relevance scores across all experts; and
- S-CVI/UA—the average universal agreement scores across all items.

For the antepartum tool, 13 content experts from across the United States reviewed it for degree of relevance. All invited experts participated. The experts included bedside staff, charge nurses, directors, educators, clinical nurse specialists, and nurse practitioners. Using primarily the I-CVI, items that scored >80% were kept, items that scored 70% to 80% were modified as suggested by the content experts, and items that scored <70% were eliminated. The items were reviewed again by the experts who scored elements as a 1 or 2, and final consensus was reached with all retained items scoring >80%. This process took 1 month and two iterations.

For the NICU tool, as it was already established and had been used for many years in the NICU, it was sent directly to a group of 12 content experts from across the United States to establish content validity for the 16 categories. All invited experts participated. The experts included bedside staff, charge nurses, directors, developmental specialists, and educators. The experts made many comments about the tool, and a subgroup met to make revisions according to their suggestions. The tool was sent again with the updated version, and content validity was established, using two iterations over 6 weeks.

Interrater Reliability

To establish acceptable power for interrater reliability (IR) testing, the hospital statistician was consulted and agreed to the planned study of all antepartum patients on the unit, which averaged 4 to 12 patients per day, each shift, over a 2-week period. He was consulted again for the NICU IR testing and agreed that scoring 8 or 9 babies each shift for 2 weeks would provide sufficient data to power the study.

All patients on the antepartum unit were scored on the antepartum acuity tool by two bedside nurses and one to two charge nurses or directors each shift (twice daily) for 2 weeks. Nurses were instructed that to maintain integrity

FIGURE 2.

NICU Acuity Tool Room: Patient Name:

Date:

Shift:

	0	1	2	3	4
Respiratory Status	*Room Air		*Hood *Post CPAP x 24 hr *High-flow nasal cannula <2 L *Nasal cannula *Stable tracheostomy care	*CPAP/SiPAP *NAVA *High-flow nasal cannula >2 L *NAVA/NiPPV *Stable conventional vent *O ₂ adjustment >2/hr	*High frequency/ Oscillator *Vent (x24 hr post removal) *Unstable conventional vent *iNO *Chest tubes *Trach post-op days 1-7
Cardiac Status	N/A				*Cardiopulmonary resuscitation or acute pulmonary cardiac arrest *Post-code care/cardiac arrest x 24 hours *Invasive monitoring (art line BP monitoring, external ventricular drain) *Arrhythmia requiring IV medications, defib or cardioversion
IV Monitoring	No IV	*PIV - TKO or Saline lock	*1-2 peripheral lines *TPN	*Titration of IV drips *Hypoglycemia requiring dextrose infusion rate >8 mg/kg/min	*PICC, Broviac Umbilical lines *>3 solution changes in a 12-hr period
Medications (not to include scanning for breastmilk or formula)	None	*1-2 oral/other medications in 12 hours	*3-4 oral/other medications in 12 hr *1-2 IV medications in 12 hr	*1-2 boluses in 12 hr *>5 oral medications in 12 hr *3-5 IV medications in 12 hr *3-5 boluses in 12 hr *IVIG infusion	*>5 medications/boluses in 12 hr *Vasoactive/sedation drips (ie: hypotension on vasopressor support such as dopamine, dobutamine, epinephrine) *Prostaglandin or insulin drips
Apnea/Bradycardia/Desaturations	None	*Resolving apnea, bradycardia, desaturations with self recovery	*Requires intervention every 2-3 hr	*Requires intervention every hour	*Frequent apnea, bradycardia, desaturations requiring stimulation
Nutrition		*All gavage (starting to nipple/ 90% gavage feeding)	*Nipple feed <15 min or gavage feed (>50% oral and remainder gavage)	*Nipple feed >15 min or gavage feed (<50% orally and remainder gavage feeding) *Nurse-assisted breastfeeding/ oral feed for <30 min or 1-2 times in 12 hr	*Repogle to suction *NPO
Teaching Support (with parent at bedside)	None	*1-2 hours in 12 hours	*2-3 hr in 12 hr	*3-4 hr in 12 hr	*>4 hr in 12 hr
Lab Draws	None		*1-2 in 12 hr	*3-4 in 12 hr	*>4 in 12 hr
Transfusions	N/A			*1 transfusion in 12 hr for acute etiology	*>2 transfusion in 12 hr *transfusion of blood products in setting of severe acute etiology or manifestation (eg: exchange transfusion, DIC)
Infant Weight Gestational Age	Term AGA	35-37.6 week	*≤1,500 g 31-34.6 weeks	*≤1,000 g 27-30.6 weeks	*≤700 g 22-26.6 weeks
NAS/ESC	N/A		*Declining dose of oral medication in a clinically stable neonate (taper of opioid replacement therapy) *NAS score average <8	*NAS score average >8 *Initiation or escalation of opioid replacement therapy	*Rescue dose therapy *NAS >12
Procedures	N/A		*Assist with procedures totaling <1 hr (admission, septic workup, multiple IV starts)	*Assist with procedures totaling >1 hr (admission, septic workup, multiple IV starts)	

(Continues)

FIGURE 2. (CONTINUED)

NICU Acuity Tool Room: Patient Name:		Date:		Shift:	
	0	1	2	3	4
Neuro	N/A	*Mild neonatal encephalopathy that is stable (not actively monitoring or treating) *Seizure precautions (including for NAS/withdrawal)	*Mild neonatal encephalopathy that is acute requiring monitoring (EEG) *Declining dose of antiseizure medications in a neonate no longer having seizures	*Moderate-to-severe neonatal encephalopathy that is stable (not actively cooling) *Rewarming after whole body cooling *Seizures requiring initiation or escalation of antiseizure treatment	*Moderate-to-severe neonatal encephalopathy that is acute and needing treatment (aEEG, whole body cooling) *Seizures or treatment of seizures that necessitates continuous monitoring (aEEG/EEG)
Other	N/A	*Language Barrier	*Phototherapy (bank OR blanket) *Wound care minutes or *G-tube care	*Phototherapy (both bank AND blanket) *Ostomy care (any type) *Wound care major	
1:1	N/A				*Peritoneal dialysis *CRRT (possible 2:1) *ECMO (possible 2:1) *Bereavement *Post-op care x 24 hr *Whole body cooling x 24 hr
Developmental	N/A	*Developmental bath *Child life involvement/term playtime assistance	*Kangaroo Care (1 person assist)	*Kangaroo care (2 person assist)	*4 handed care
Totals					Total Score

LEVELS	TOTAL POINTS	STAFFING RATIO
Neonatal 2 (Low Acuity)	0-12 points	1:3-4 ratio (Continuing Care)
Neonatal 3 (Medium Acuity)	13-17 points	1:2-3 ratio (Intermediate Care)
Neonatal 4 (High Acuity)	18-25 points	1:2 with low or medium as second patient (Intensive Care)
	>26 points	1:1 status

Key: aEEG: amplitude integrated electroencephalography, CPAP: continuous positive airway pressure, CRRT: continuous renal replacement therapy, DIC: disseminated intravascular coagulopathy, ECMO: extracorporeal membrane oxygenation, EEG: electroencephalography, G-tube: gastrostomy tube, INO: inhaled nitrous oxide, IV: Intravenous, IVIG: IV immunoglobulin, NAVA: neurally adjusted ventilatory assist, NAS: Neonatal abstinence score, NIPPV: nasal intermittent positive pressure ventilation, NPO: nothing by mouth, O₂: oxygen, PICC: peripherally inserted central catheter, PIV: peripheral IV, SiPap: bilevel nasal CPAP, TKO: to keep open rate, TPN: total parenteral nutrition, Trach: tracheostomy, Vent: ventilator.

of the scoring tool, they could ask questions such as “Does the patient have an IV?” but were not allowed to ask, “What score did you give the patient on item x?” Tools were collected and placed in a secure box on the unit each shift.

Data from each acuity tool completed were entered into a password-protected spreadsheet by the nurse practitioner who coordinated the study. A patient identifier was assigned to each patient, known only to the nurse practitioner; names were not included. These data were exported to the SPSS statistical program version 28, in which analyses were performed. Intraclass correlations (ICC) were calculated using a two-way random, single-measure, consistency approach. Values of the ICC less than 0.5, between 0.5 and 0.75, between 0.75 and 0.9, and greater than 0.90 were interpreted as of poor, moderate, good, and excellent reliability, respectively (Koo & Li, 2016).

For the NICU tool, eight or nine babies were evaluated by two bedside nurses and one charge nurse or director each shift for 2 weeks on a paper form. Nurses were encouraged not to share scores and tools were collected each shift and maintained in a secured box on the unit. The same data evaluation practice was used for the NICU data as was previously described.

Results

Antepartum Acuity Tool

Twenty categories were evaluated for content validity. Four items scored less than 70% and were eliminated. Five items scored 70% to 80% and were adjusted or changed to accommodate suggestions, adding one item. Ten items scored >80% and were retained. A total of 15 items were retained for the final content validity (S-CVI/Ave = 0.87, S-CVI/UA = 0.60).

Interrater reliability was evaluated with three nurses (two staff nurses and one or two charge nurses or directors) scoring all patients on antepartum independently on each shift ($n = 160$ observations). Data across all observations showed good reliability between nurse raters ($ICC = 0.88$). Reliability among the two nurses and charge nurse was good ($ICC = .77$). An additional analysis was performed between ratings by the charge nurse and director (available on a limited basis, 28 observations) and was excellent, $ICC = .97$. See Figure 1 for the final version of the antepartum acuity tool.

Neonatal Intensive Care Unit Acuity Tool

There were initially 15 items evaluated for content validity, using the content validity criteria described previously. Feedback from the group identified five areas that needed to be discussed, and a group of six content experts met to make changes and reevaluate items included. The resulting tool included 16 items, and was reevaluated by 12 experts, with resulting S-CVI/Ave = 0.98 (excellent), S-CVI/UA = 0.75.

Interrater reliability was evaluated on nine babies over a 2-week period. Two staff nurses and one charge nurse scored each baby each shift (254 observations). The interrater reliability both between the two nurses ($ICC = .95$) and among the two nurses and the charge nurse ($ICC = .95$) were excellent. See Figure 2 for the final version of the NICU acuity tool.

Discussion

Content validity and interrater reliability were established for an antepartum acuity tool and NICU acuity tool. Following the development of the tools, they continue to be used every day, every shift, by the nurses and charge nurses together to determine the best nurse-to-patient assignments available. Nurses and charge nurses report high satisfaction with this new process within the unit-based patient care council as they can more easily make assignments based on patient acuity and nursing care needs. There are times when, because of census, nurses must be given an antepartum patient assignment that totals more than 10, but nurses feel there is more equity in those assignments. NICU assignments must occasionally be altered due to census. Although there are daily rounds on both these patient populations, using the acuity tool has helped charge nurses understand the complexities of each patient in a more robust manner.

The antepartum acuity tool is scheduled to be placed in the electronic medical record (EPIC) as a tool scored by the nurse caring for the patient. An acuity tool currently used in the NICU was already present in the electronic medical record but will be changed to reflect the most current iteration. Further evaluation is needed for test of change and timing. Jones and Hall (2022) reported effective and productive integration of their labor and birth acuity tool into EPIC and we anticipate similar success.

Limitations

Limitations to our study were related to possible scoring-related errors by the nurses conducting the evaluations,

SUGGESTED CLINICAL NURSING IMPLICATIONS

- The antepartum acuity tool and the NICU acuity tool are valid and reliable tools to establish acuity and required nursing care of the antepartum and NICU hospitalized patient.
- Nurses can be instrumental in developing and refining tools to improve nursing practice through quality initiatives, research, and evidence-based practice programs.
- Assessing acuity is key for establishing the right nurse-to-right patient ratio to promote patient safety and optimal outcomes.
- Understanding the complexities of individual patients with an acuity scoring tool promotes informed decisions about nurse staffing assignments.
- When establishing nursing assignments, the 2022 AWHONN *Standards for Professional Registered Nurse Staffing for Perinatal Units* should be a guide for these decisions.

differences in understanding of patient's needs, and the volume of patients on the floor which sometimes did not lend itself to adding another task to the nurses. The COVID-19 pandemic changed the antepartum acuity tool by adding COVID-19 status as a scored item in the tool. Our hospital does not use travel nurses, so that was not a factor in this study but could potentially be a variant in hospitals that use nurses from staffing agencies.

Clinical Implications

The 2022 AWHONN *Standards for Professional Registered Nurse Staffing for Perinatal Units* (AWHONN, 2022) indicate that patient assignments should be based on acuity. Very few tools have been made available to assist in that process, especially in the inpatient antepartum and NICU setting. We tested and established content validity and interrater reliability for each of these tools, confirming they can assist nurse leaders in making assignments that consider patient acuity and demands on nursing care. The tools will need further validation in the clinical setting and may need to be adapted to individual hospital settings. When doing so, the 2022 AWHONN *Staffing Standards for Professional Registered Nurse Staffing for Perinatal Units* should be a guide for these decisions.

As with any tool, these acuity tools may not fit every hospital's situation or unit design. Some maternity services do not have a large volume of antepartum patients such that a nurse assignment can be limited to antepartum patients. Some hospitals do not have a Level III NICU. Nurse leaders may need to make amendments that are specific to their population or model of care. Altering these tools may affect the content validity and interrater reliability of the tool as published. ❖

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The authors declare no conflicts of interest.

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DOI:10.1097/NMC.0000000000000875

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