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RESEARCH

Content Validity Testing of the Maternal Fetal Triage Index

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ABSTRACT

Objective: To describe the development and content validity testing of the Maternal Fetal Triage Index (MFTI), a standardized tool for obstetric triage.

Design: Online survey.

Participants: Participants included 15 registered nurses, 15 certified nurse-midwives, and 15 physicians from across the United States who provided maternity care.

Methods: A convenience sample of experienced clinicians was used as content validators for the MFTI. An item content validity index (I-CVI) was computed for the tool's items and a scale content validity index (S-CVI) was computed for the tool's scale based on the responses submitted via the online survey. Two rounds of content validation occurred.

Results: In the first round of testing, a total of 12 of 61 items in the MFTI did not meet the I-CVI threshold of greater than 0.78 because of disagreement about clinical condition (75%) or priority level placement (25%). In the second round of testing, all but 3 of the 69 content items in the revised version of the MFTI had I-CVI thresholds greater than 0.78. These 3 items were related to vital sign values. The overall S-CVI score calculated for Round 2 only was 0.95, which was greater than the threshold of 0.90.

Conclusion: The results of the content validity testing of multidisciplinary validators suggest that the MFTI is a valid tool for use in obstetric triage and evaluation settings.

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Triage in health care refers to the sorting of patients to prioritize their need for receiving care and resources. The practice of triage was formalized in the United States during the Civil War by Dr. Jonathan Letterman, who served as the Medical Director of the Union Army of the Potomac from July 1862 to the end of 1863. During his tenure, he formalized the Letterman Plan, which included a three-tiered system for prioritization of care and evacuation of wounded soldiers. The Letterman Plan was credited with reducing casualties of war, and modern military and civilian emergency medicine mirror this staged evacuation and treatment system (National Museum of Civil War Medicine, 2015).

Emergency triage based on the concepts of the Letterman Plan remains an integral, primary component of contemporary patient care, and systematic methods of triage are used to decide which patients will receive care first. For example, the standardization of triage in the emergency department (ED) improves communication among the health care team and if widely implemented facilitates benchmarking, public health surveillance, and research (Agency for Healthcare Research and Quality [AHRQ], 2012; Wuerz, Milne, Eitel, Travers, & Gilboy, 2000). The Emergency Nurses Association (ENA) and the American College of Emergency Physicians (ACEP) maintain that the quality of patient care is improved by the use of a standardized ED triage scale (ACEP, 2010).

The Women's Health and Perinatal Nursing Care Quality Refined Draft Measures Specifications of the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) included a definition of triage as part of the quality measure Triage of a Pregnant Woman and Her Fetus(es) (AWHONN, 2014a, 2014b). In the measure, AWHONN asserted that "the triage of a pregnant woman at 20 weeks or more gestation is a brief, thorough, and systematic method to quickly determine the disposition of a woman and her fetus(es)" (AWHONN, 2014a, p. 16). This definition of triage emphasized that triage is a verb or action done to prioritize

Recognition of the need to standardize how nurses triage pregnant women and their fetus(es) led to the development of the AWHONN Maternal Fetal Triage Index.

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care rather than a noun or location where care is performed. The definition clarified that triage is performed by the nurse and is separate and distinct from the evaluation, usually performed by the provider, that follows triage. Conventionally in U.S. obstetrics the term *triage* has been incorrectly used to refer to triage and evaluation. The AWHONN quality measure definition is consistent with the concept of triage or prioritization of care that dates to the late 1700s (Robertson-Steel, 2006). It is also consistent with how triage is performed in EDs in the United States, where it is a recognized responsibility of nurses.

Elements of obstetric triage include a brief history and initial nursing assessment. Vital signs, fetal heart rate, the woman's stated reason for presenting for care, and the current status of fetal movements, uterine contractions, and vaginal discharge, leakage, or bleeding should be assessed. A history of the woman's prenatal course should include location and number of prenatal visits, any complications, current medications, and substance use during the pregnancy. The woman's allergies and past obstetric, gynecologic, medical, and surgical histories should be assessed as well as mental status, pain rating, and if she is experiencing uterine contractions. The obstetric evaluation is a more detailed history and a physical examination that includes assessment of cervical dilation and status of membranes. Imaging and laboratory examinations may be indicated during evaluation. Further assessment of maternal vital signs and fetal heart rate may also occur.

While nationally recognized triage acuity classification tools are available for use in the ED, no nationally accepted obstetric triage tools are currently available (Angelini & Howard, 2014). This is a concerning gap given the fact that approximately four million women give birth in the United States each year (Martin, Hamilton, Osterman, Curtin, & Mathews, 2015), and many women present for emergency care during pregnancy. Recognition of the need to standardize how nurses triage pregnant women and their fetus(es) led to the development of the AWHONN Maternal Fetal Triage Index (MFTI). The primary aim of this article is to describe content validity testing of each item within each priority level of the AWHONN MFTI (Figure 1).

Background

Obstetric triage was initially identified as an area of concern by perinatal nurses when an AWHONN task force asked them to provide information about perinatal nurse staffing (AWHONN, 2010). The issues identified were related to efficiency of triage and evaluation processes and effectiveness of nurse to provider communication in the face of increasing numbers of women presenting for care. Subsequently at three leadership summits sponsored by AWHONN in 2011, 2012, and 2013, attendees stated there was a need for acuity tools and a method to track patient length of stay in the triage and evaluation area.

In 2012, AWHONN staff held conference calls with nurse leaders of 10 different hospital systems that included approximately 550 hospitals in the United States. About half of these nurse leaders stated that their institutions used some type of method to classify pregnant women presenting for triage based on acuity; however, only two used a tool that was specific to obstetrics. In addition, data collected for AWHONN's perinatal data collaborative showed that only 38% of the hospitals that voluntarily participated in this collaborative met AWHONN's staffing guideline of one nurse to one woman for the initial triage assessment (Scheich & Bingham, 2015). These data suggested wide variation in how triage is performed in the United States by registered nurses (RNs). Based on this information and data, the need to perform more research on obstetric triage was identified.

Review of the Literature

At the outset of our work on triage, we searched the literature using the electronic databases PubMed and the Cumulative Index to Nursing and Allied Health Literature (CINHAL) for the years 1992 to 2012 with search terms *triage* and *obstetric*. The search yielded 27 articles. Triage of pregnant women was defined as the initial assessment made by nurses to assign priority based on degree of need in only three. In the other publications, the term triage was used to describe initial assessment and ongoing evaluation before patient disposition was determined. Best practices and successful models for organizing triage and evaluation, including use of advanced practice nurses, were described in 10 articles; management of clinical conditions during triage and

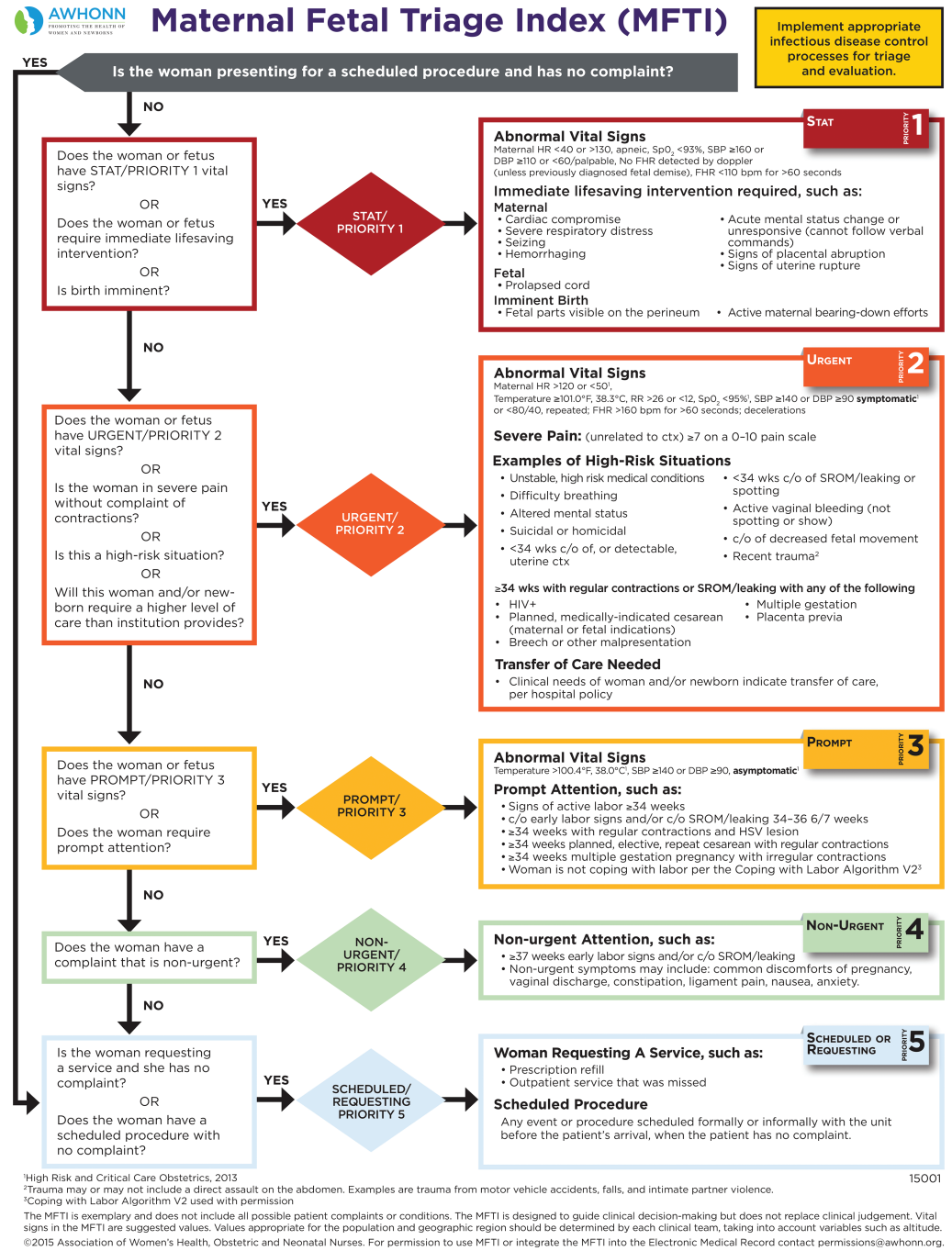

Figure 1. Maternal Fetal Triage Index.

evaluation was described in six articles; liability issues were described in three articles; nurse staffing was described in two articles; acuity classification tools were described in two articles, and access, resident education in triage, critically ill patients, and quality improvement were described in one article each. Additionally, using the Google search engine, we identified three obstetric triage practice guidelines from women's health professional organizations and two exemplary policies from health systems. In these documents, the term triage was used to describe initial assessment and ongoing evaluation before determination of patient disposition.

Acuity Classification Tools for Obstetric Triage

Paisley, Wallace, and DuRant (2011) described a classification tool used for obstetric triage at a multi-campus hospital system. This tool was developed by a multidisciplinary team to improve timeliness of triage. The process for achieving consensus on the tool's items is not described nor is interrater reliability testing. However, the tool was shown to improve efficiency of triage. The other tool identified in our review was an Australian algorithm for triage of preeclampsia and antepartum hemorrhage with management decision aids; this tool was shown to improve assessment and documentation for these conditions (McCarthy, McDonald, & Pollack, 2013).

Subsequent to our literature review, the Canadian Obstetric Triage Acuity Scale (OTAS) was published (Smithson et al., 2013). The OTAS is based on the Canadian Triage and Acuity Scale and was developed for the perinatal program of a large hospital system. An expert panel of nurses and physicians reviewed the descriptions of obstetric presentations to triage included in the OTAS. The process these experts followed for achieving consensus on each of these presentations, or items, is not described. The initial validity of the OTAS was established by evaluating the relationship between OTAS acuity level and resource use. This approach to establishing validity does not involve testing the validity of the individual items of the tool. The surrogates used for resource use were length of stay and admission. The authors identified a limitation of the study: "the validity should be confirmed by assessing use of laboratory and ultrasound investigations" (Smithson et al., 2013, p. 6). The authors also noted that the validity of the OTAS should be confirmed in a community hospital setting. The OTAS successfully demonstrated distribution of patient acuity and patient flow in the setting where it was tested with the goal to improve inter-disciplinary communication and team response. Its use to standardize assessments was presented as a strategy to improve quality and allow comparisons of patient flow across organizations.

Emergency Severity Index

The Emergency Severity Index (ESI) is a validated, five-level, acuity classification system. Level 1 is the most urgent level used for patients requiring life-saving measures, and level 5 is assigned to patients who are anticipated to need the least resources (AHRQ, 2012). The ESI is not an obstetric tool, but it was reviewed because its reliability and validity have been tested, and it has been implemented in more than half of the EDs in the United States (McHugh, Tanabe, McClelland, & Khare, 2012). The development and structure of the ESI informed the initial draft of the MFTI. The ESI has limited obstetric content; signs of ectopic pregnancy and spontaneous abortion for women early in pregnancy and abruption or placenta previa for women in late pregnancy are mentioned, but no content related to other obstetric complications, fetal assessment, or labor is included.

Development of the MFTI

The AWHONN Obstetric Triage Task Force was organized in the fall of 2012 to develop an obstetric triage tool to be used by nurses to determine a pregnant woman's priority for provider evaluation. The task force included four nurses who were not AWHONN's staff members and who had experience improving obstetric triage. They were geographically distributed throughout the United States and worked in hospitals of various sizes and types (e.g., military and nonmilitary). The task force also included four AWHONN staff members: two RNs, a statistician, and a project manager.

Based on the literature review of existing tools used for ED and obstetric triage, the task force decided to draft a five-level triage index. The index was named the Maternal Fetal Triage Index to clearly indicate that triage includes the pregnant woman and her fetus(es). Five levels were chosen for the MFTI because investigators of the ESI found that compared to three-level triage acuity scales, the five-level ESI was more reliable (AHRQ, 2012). RNs comparing the ESI to three-level acuity scales reported that the ESI was easier to use, provided more useful information, and facilitated communication of acuity (AHRQ, 2012). Additionally, the task force members were asked to develop triage case scenarios based on actual pregnant women who presented for care at the hospitals where they worked. Consideration of how the MFTI would be used to triage the women in these case scenarios further substantiated the recommendation for the tool to include five levels.

The task force first developed the key questions the nurse will ask based on the initial assessments of a pregnant woman presenting for care, and these key questions guided the task force's determination of exemplary clinical conditions for each priority level. Once the task force developed the initial key questions and clinical conditions, the

index was reviewed and revised based on the comments of four other RNs who work for AWHONN and one RN with expertise in triage who is not on the AWHONN staff.

Description of the MFTI

The five priority levels of the MFTI include 1-Stat, 2-Urgent, 3-Prompt, 4-Nonurgent, and 5-Scheduled or Requesting a Service (Figure 1). The MFTI is a one-page algorithm that shows key questions and corresponding examples of clinical conditions for each of the five priority levels to assist the nurse in determining a priority level for provider evaluation. Clinical conditions for priority level 1-Stat require immediate, lifesaving intervention for a woman or her fetus. Clinical conditions for priority level 2-Urgent are severe pain unrelated to labor, high-risk clinical conditions, and/or recognition of the need for transfer to a higher level of care. Clinical conditions for priority level 3-Prompt include women ≥ 34 weeks gestation who are in active labor and/or women who are assessed to not be coping with labor per the Coping with Labor Algorithm, version 2 (Roberts, Gulliver, Fisher, & Cloves, 2010). Clinical conditions for priority level 4-Non-urgent include women ≥ 37 weeks gestation with signs of early labor and women with common discomforts of pregnancy. Clinical conditions for Priority level 5-Scheduled or Requesting a Service include women who present for scheduled procedures. Suggested values for abnormal vital signs are included in the stat, urgent, and prompt priority levels with the advice that the clinical team in each setting should determine what is most appropriate for their geographic regions and the populations they serve.

Methods

Design

This project was reviewed by the Western Institutional Review Board (WIRB) and deemed exempt. After the initial draft of the MFTI was developed, the content was validated through the formal content validation process outlined by Polit, Beck, and Owen (2007). The first step in this process was to develop an electronic survey in Survey Monkey that the content validators would use to validate every item on the MFTI. The questions were modeled after the Polit et al. (2007) recommendations. A sample question on the survey follows: *In prioritizing the woman and fetus as Priority 1, rate the relevance of "seizing" as a maternal condition used to assist the nurse in answering yes to the question "Does the woman or fetus require immediate lifesaving intervention?"* Content validators were asked to select one of the following answers in relation to the question: *1) Not relevant; 2) Somewhat relevant; 3) Quite relevant; 4) Highly relevant.*

Participants/Content Validators

Content validators were recruited based on convenience and snowball sampling. For Round 1, the AWHONN Obstetric Triage Task Force members identified a list of physicians, RNs, and certified nurse-midwives (CNMs) they met while serving on national committees or attending other national forums or who published on the topic of obstetric triage. For Round 2, the content validators were recruited based on recommendations from the Round 1 content validators. The clinicians chosen to participate in Round 2 of testing did not participate in Round 1 testing, nor did they participate in discussions with the researchers prior to completing the survey.

The research team used the work of Lynn (1986) as guidance in selecting sample sizes for Round 1 and Round 2. The target was to have at least 30 content validators for Round 1 (10 RNs, 10 MDs, and 10 CNMs) and at least 12 content validators for Round 2 (4 RNs, 4 MDs, 4 CNMs); this threshold was met. Table 1 displays the demographic characteristics of all content validators.

Round 1

The survey and a copy of the MFTI tool were emailed to the Round 1 content validators. The completed survey data for Round 1 were compiled, and the Item Content Validity Index (I-CVI) was calculated for each item on the MFTI tool. MFTI items with I-CVI values of 0.78 or greater were considered excellent in agreement evaluation and were included in Round 2 of the content validation process. Items with values less than the I-CVI threshold of 0.78 were reviewed and discussed with the validators via conference calls. Based upon these discussions, items were revised, deleted, or added to the MFTI tool.

Round 2

The survey and revised MFTI tool were emailed to Round 2 content validators using the same process as Round 1. As the goal of Round 2 was to test the revisions and the overall scale of the tool, a smaller group of content validators was needed (Polit et al., 2007). In Round 2, the survey data were collected and I-CVI metrics were calculated for each item. In addition, an overall metric, the Scale Content Validity Index (S-CVI) was

The Maternal Fetal Triage Index met content validity testing thresholds for all but three vital sign items among content validators who were registered nurses, physicians, and nurse-midwives.

calculated. The S-CVI was used to gauge the overall level of agreement for all items on the MFTI tool and represented the average (mean) of all individual I-CVI metrics for the revised MFTI tool. The I-CVI threshold was again set at 0.78 for Round 2, and items that fell below this threshold were reviewed by AWHONN staff. As recommended by Polit et al. (2007), the threshold of the S-CVI was set at 0.90. After the two rounds of content validation, the tool was finalized and preparations were made to begin interrater reliability testing.

Data Analysis

Data from the online survey were analyzed in R version 3.0 and Microsoft Excel 2010. The research team coded each item answered by each content validator as *Relevant for the Index* if the content validator scored the item as *Quite relevant or Highly relevant* and *Not relevant for the index* if the content validator scored the item as *Not relevant* or *Somewhat relevant*, which was consistent with the protocol described by Polit et al. (2007). For Round 1, an I-CVI was calculated by counting the total number of *Relevant for the Index* responses for an item divided by the total number of content validators. For example, if 27 out of 33 content validators in Round 1 rated an item as *Quite relevant* or *Highly relevant*, the I-CVI score for the item would be 0.82.

For Round 2, an I-CVI and an S-CVI were calculated. The I-CVI score was calculated in the same method as Round 1. To determine the S-CVI score, we calculated the mean of the 69 I-CVI scores for the items on the Round 2 MFTI tool. Items were considered to meet study thresholds if they achieved an I-CVI of greater than 0.78 and an S-CVI threshold of greater than 0.90 (Polit et al., 2007). In addition to calculating the I-CVI and S-CVI scores, all comments were reviewed and considered by the research team.

Results

In Round 1, 61 items were evaluated by the three groups of clinicians (Table 2). A total of 12 (20%) item did not meet the I-CVI threshold of greater than 0.78. Eight of the 12 items (75%) did not meet the threshold because there was disagreement about the clinical condition, and four of the 12 items (25%) did not meet the threshold because there was disagreement about the priority level placement. For Round 2, 69 items were evaluated (Table 2). The increase in the number of items from Round 1 to Round 2 was a result of the content validation review and discussion process that occurred during Round 1. Of the 69 items evaluated in Round 2, 66 (96%) met or exceeded the I-CVI of 0.78. The three (4%) items that did not meet the I-CVI were related to vital sign values. The S-CVI for the Index after Round 2 was 0.95, which was greater than the minimum threshold of 0.90 for a valid scale.

Discussion

The initial draft of the MFTI went through development and review by experts, and the experts reached consensus that the tool was likely to improve care. However, after Round 1 of content validity testing we found that that 20% of the items did not meet the I-CVI threshold of >0.78. In addition, there were serious concerns raised by the content validators regarding the 12 items that did not meet this threshold. The majority of concerns were related to the description of clinical conditions (75%). For example, an item originally described as *placental abnormalities* was changed at the suggestion of the content validators to *placenta previa*; the item *severe psychological distress* was changed to *suicidal or homicidal*. Twenty-five percent of the items in Round 1 did not meet the agreement threshold because there was disagreement about the priority level placement. These results demonstrated that the expert consensus of the AWHONN task force used to draft the MFTI did not produce a tool in Round 1 that met content validity testing thresholds. These results also indicated that it should be the standard, whenever possible, that tools developed by expert consensus undergo formal content validity testing of the sort described herein.

Multidisciplinary Consensus on MFTI Triage Items

Although performing triage is the responsibility of the RN (AWHONN, 2014a; ENA, 2011), we decided to expand the study population to better represent the typical care team, which also includes physicians and may include CNMs or certified midwives (CMs) and other advanced practice nurses (e.g., nurse practitioners and clinical nurse specialists). This meant that consensus had to be reached among the RNs, physicians, and CNMs who participated in the study. Having content

Table 1: Demographics of Content Validators of the Maternal-Fetal Triage Index

Round 1	Nurses *n* (%)	Physicians *n* (%)	Certified Nurse-Midwives *n* (%)	Total *n* (%)
Total	11 (100)	11 (100)	11 (100)	33 (100)
Years caring for women in OB triage				
3-6 years	2 (18)	2 (18)	1 (9)	5 (15)
7-10 years	3 (27)	0 (0)	0 (0)	3 (9)
11-20 years	0 (0)	4 (36)	4 (36)	8 (24)
More than 20 years	6 (55)	5 (45)	6 (55)	17 (52)
Region				
East	1 (9)	3 (27)	7 (64)	11 (33)
Midwest	2 (18)	3 (27)	2 (18)	7 (21)
South	5 (45)	0 (0)	2 (18)	7 (21)
West	3 (27)	5 (45)	0 (0)	8 (24)

Round 2	Nurses *n* (%)	Physicians *n* (%)	Certified Nurse-Midwives *n* (%)	Total *n* (%)
Total	4 (100)	4 (100)	4 (100)	12 (100)
Years caring for women in OB triage				
3-6 years	0 (0)	0 (0)	1 (25)	1 (8)
7-10 years	0 (0)	0 (0)	1 (25)	1 (8)
11-20 years	0 (0)	1 (25)	0 (0)	1 (8)
More than 20 years	4 (100)	3 (75)	2 (50)	9 (75)
Region				
East	1 (25)	2 (50)	2 (50)	5 (42)
Midwest	0 (0)	0 (0)	0 (0)	0 (0)
South	2 (50)	0 (0)	0 (0)	2 (17)
West	1 (25)	2 (50)	2 (50)	5 (42)

validators who represent different clinical specialties may also improve acceptance and adoption of the MFTI among all members of the clinical team. Acceptance of the tool among all members of the team is a necessary component of realizing the benefits of standardizing triage prioritization processes.

The multidisciplinary content validation process also yielded rich feedback about the relevance, wording, and appropriate level of certain clinical conditions from different perspectives. Recommendations provided in the survey to remove, clarify, add, or change the level for a condition were discussed on the two conference calls with Round 1 content validators. For example, in the original draft of the MFTI, a woman not coping with labor based on the Coping with Labor Algorithm version 2 (Roberts et al., 2010) was classified as priority level 2. This item did not meet the I-CVI threshold and the consensus of the content validators was that it should be changed to priority level 3. After this item was changed to priority level 3 in Round 2, it met the I-CVI threshold.

Items That Did Not Meet CVI Thresholds

Only three of the 69 items in Round 2 did not meet the I-CVI threshold of >0.78. Two of these items were peripheral capillary oxygen saturation

Our findings support the content validity of the Maternal Fetal Triage Index for obstetric triage.

(SpO2) levels for priority levels 1 and 2 and maximum fetal heart rate for priority 2. Determining a standard recommendation for these vital signs will vary based on populations served and geographic factors such as altitude. As a result, there were robust discussions among members of the task force, the researchers, and select content validators regarding whether these specific vital sign values should be included in the MFTI. Given the general recommendation that having some specific guidance would be more helpful than harmful, it was decided to include these specific values in the MFTI with a cautionary note. The note indicates that the vital sign values are *suggested,* and clinical teams should determine what is most appropriate for their populations and geographic regions.

Implications for Future Research

Content validity testing of each item was determined to be a foundational step in developing the MFTI, a tool designed to improve the emergency care of pregnant women and their fetus(es). Validation of the MFTI in clinical settings with different populations of patients and in a range of settings (e.g., those with small, medium, and large volumes of patients; teaching hospitals, and nonteaching hospitals) is needed to further establish the validity of the MFTI for clinical use. For example, future researchers who link the initial triage priority level determined by using the MFTI with process outcomes such as disposition status (admission or discharge), time to provider evaluation, total length of stay prior to disposition, levels of nurse staffing, and patient, nurse, and provider satisfaction with the triage and evaluation process may demonstrate the value of the MFTI in improving care processes on perinatal units in the United States. In addition, further testing of the MFTI in the clinical setting is needed to determine whether use of the MFTI standardized prioritization of care during triage improves patient outcomes. Such testing will complement the interrater reliability testing that has already been completed (Ruhh et al., 2015).

Table 2: Results of Content Validity Testing of the Maternal Fetal Triage Index

	Validation Round	
	All Round 1 Content Validators	All Round 2 Content Validators
I-CVI Range	*n* (%)	*n* (%)
> 0.78	49 (80.3)	66 (95.7)
≤ 0.78	12 (19.7)	3 (4.3)
Total number of items evaluated	61 (100)	69 (100)

Note. I-CVI = Item Content Validity Index.

Conclusion

Based on our review of the literature, the MFTI is the first triage tool developed for the triage of the pregnant woman and her fetus(es) that has undergone content validity testing of each item by RNs, physicians, and CNMs. Our results demonstrate the content validity of the MFTI as a tool that can be introduced for use in clinical settings to improve patient and process outcomes.

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