Comparative Analysis of Two Fall Risk Assessment Tools in the Obstetric Population

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ABSTRACT

Objective: To examine the relative accuracy of the Morse Fall Scale (MFS) and the Obstetric Fall Risk Assessment System (OFRAS) in predicting obstetric patients' fall risk.

Design: Retrospective comparative analysis of the MFS and the OFRAS in obstetric inpatients.

Setting: A 575-bed urban teaching hospital in Hawaii.

Participants: Eighty-five records of people hospitalized for childbirth.

Methods: Adequate power modeling and statistical analyses were completed using the programs R packages Version 4.0.1 and SAS Version 9.4. Subsequently, a ratio of 17 fall records to 68 nonfall records (1:4) with similar dates of admission were reviewed. Investigators collected the MFS score/risk level as documented and the required data points to obtain the OFRAS fall risk score/level. Logistic regression models were fit using the MFS and OFRAS as predictors of falls. Results are expressed as odds ratios with 95% confidence intervals and *p* values to test for statistical significance. Receiver operating characteristic (ROC) curves were derived from logistic regression results and graphed to compare the instruments. Areas under ROC curve (AUROCs) were calculated to display the specificity and sensitivity of the risk assessment tools.

Results: Data for 85 pregnant or postpartum people were included in the sample. Analysis of AUROCs demonstrated that the OFRAS is more sensitive and specific for obstetric patients than the MFS. The OFRAS showed significance ($p < .001$) in predicting falls compared to the MFS ($p = .40$). Associations between fall scores and falls were examined in separate conditional logistic regression models.

Conclusion: The OFRAS demonstrated higher sensitivity and specificity in fall risk prediction. The MFS performed similarly to random chance regarding obstetric fall risk prediction. The potential exists to better anticipate patient falls, protect staff from injury related to patient fall, and decrease organizational risk using a population-specific tool.

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Falls in hospitals are one of the most significant patient safety threats. In 2024, the Agency for Healthcare Research and Quality (AHRQ) noted that approximately 700,000 to 1,000,000 people in the United States experience falls in the hospital. Of those who experience falls, more than one third sustain serious injury, including fractures and head trauma (AHRQ, 2024). Even individuals who experience a near-miss or a fall without injury report feelings of anxiety about ambulation (AHRQ, 2024). Falls are also problematic for hospitals. The average total cost of an inpatient fall is estimated to be $64,526 (Dykes et al., 2023). In addition, in 2008, the Centers for Medicare and Medicaid Services (2008) ceased reimbursement for hospital-acquired conditions, including injuries sustained during a fall event.

To mitigate these risks, fall risk assessments have been studied and implemented with inpatient adult and pediatric populations since the 1980s (Franck et al., 2017; Harvey et al., 2010; Hendrich et al., 2003; Hendrich et al., 2020; Klinkenberg & Potter, 2017; McNeely et al., 2018; Morse et al., 1989). Fall risk assessment tools commonly assess and stratify risk by identifying physiologic and/or comorbid conditions that affect an individual's ability to safely ambulate. Fall risk assessment tools designed for the general population may not be sufficiently sensitive to predict accurate fall risk in populations with differing characteristics such as age, disability, and clinical condition (Park, 2018). Therefore, validation of fall risk assessment tools in specialized populations is imperative to ensure appropriate risk evaluation and stratification (Risso et al., 2024).

The falls assessment tool implemented in the study hospital is the Morse Fall Scale (MFS). This tool is designed to assess falls in the general inpatient population (Morse et al., 1989). The MFS has six assessment categories: history of falling, secondary diagnosis, use of an ambulatory aid, intravenous therapy/saline lock, gait, and mental status. Each item is assigned a value, and the total score determines the level of risk: less than 25, low risk of fall; 25 to 45, moderate risk of fall; or greater than 45, high risk of fall (Morse et al., 1989) The lowest possible score is 0, and the highest possible score is 125 (Morse et al., 1989). Interventions to mitigate fall risk are implemented based on total fall score and risk level. At the study hospital, the MFS is completed by nursing staff on patient admission, on initiation of epidural analgesia, at first attempt to ambulate after birth, and on

CLINICAL IMPLICATIONS

- The Obstetric Fall Risk Assessment System (OFRAS) tool had higher sensitivity and specificity in fall risk prediction for both fall and nonfall individuals.
- The Morse Fall Scale, by comparison, performed similarly to random chance with respect to fall risk prediction in this population.
- Nursing clinical judgment is crucial in mitigating fall risk. By using the OFRAS, the approach to fall risk is standardized regardless of the primary nurse's level of clinical experience.

transfer to postpartum level of care. The MFS takes approximately 2 min to complete and has been validated in the hospital acute inpatient, rehabilitation, and nursing home units (Strini et al., 2021). At the time of the study, there is no literature that validates the MFS in the obstetric population.

The Joint Commission (2015) recommends the use of a standardized tool to identify population-specific risk factors for falls. The absence of typical risk factors in obstetric patients results in an underestimation of fall risk in this population (Risso et al., 2024). There are changes that occur in pregnancy and throughout the hospitalization for childbirth that can increase the risk of falls (Heafner et al., 2013). These include changes in center of gravity and balance, hypotension related to shifts in blood volume, symptoms related to anemia, and mobility issues related to epidural placement (Frank et al., 2009; Heafner et al., 2013). Because these obstetric-specific changes are not captured in general fall risk assessment tools, obstetric fall risk is not adequately estimated (Risso et al., 2024). Thus, a fall risk assessment for obstetric patients should include these physiologic measures. Risso and colleagues (2024) compared the nine available tools designed for obstetric patients and noted that the Obstetric Fall Risk Assessment System (OFRAS) is the only tool designed for use through pregnancy, labor, and the postpartum period.

The OFRAS was developed by Heafner and colleagues (2013) to address differences in physiologic risk for all obstetric individuals. This tool is currently not used by the study hospital. The OFRAS tool comprises six assessment categories: history (history of fall, history of bedrest, visual impairment); cardiovascular (history of anemia or preeclampsia, orthostatic hypotension, and dizziness); hemorrhage (amount of blood loss, diagnosis of abruption, or placenta previa); neurologic function/anesthesia (level of anesthesia, hours since epidural discontinuation); motor activity (ability to bridge and straight-leg raise, ability to straight-leg raise but not bridge); and medications (antihypertensive administration within 1 hr, intravenous or intramuscular opioid administration within 30 min). Each category is assigned a total score based on the applicable risk components; the lowest possible score is 0, and the highest possible score is 18 (Heafner et al., 2013). Total scores translate to the following risk levels: *low risk* (score 0–2), *moderate risk* (score 3–4), and *high risk* (score >5) (Heafner et al., 2013). Interventions are implemented based on risk level. The OFRAS is designed to be completed by nursing staff. Study investigators noted that the time required to complete the OFRAS was approximately 3 min. Psychometric properties for the OFRAS are not available in the literature (Risso et al., 2024).

> Falls in hospitals are one of the most significant patient safety threats

Our objective for this retrospective comparative analysis study was to examine the relative accuracy of the MFS and the OFRAS in predicting obstetric patients' fall risk. We aimed to fill a gap in the literature related to the extent to which fall tools developed for the general inpatient population accurately predict fall risk in specialized populations.

Methods

Research Design

We used a retrospective, comparative analysis design to evaluate the relative accuracy of MFS and OFRAS for individuals receiving obstetric inpatient care from admission to the labor/delivery unit through discharge from the postpartum unit. This study was approved by The Queen's Medical Center Research and Institutional Review Committee and deemed a minimal-risk study.

Study Setting and Sampling

The study hospital is a 575-bed Level 1 trauma center in urban Honolulu, Hawaii, with fewer than 2,000 births per year. The sample included obstetric inpatients admitted from January 1, 2014, through December 31, 2020. The study timeframe was selected based on when the study hospital's fall data became accessible in the incident reporting system.

Inclusion and exclusion criteria are listed in Box 1. Individual health records ($N = 13{,}972$) that met the inclusion criteria for nonfall were identified by the health records department, grouped by year, and randomized using the RAND function in Microsoft Excel (Microsoft Corp). Adequate power modeling was completed using the programs R packages Version 4.0.1 (June 2020) and SAS Version 9.4 (July 2013). A ratio of 17 fall records to 68 nonfall records (1:4) with similar

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dates of admission provided adequate statistical power for the study.

We identified health records of individuals experiencing a fall event through the study hospital's incident reporting system; 17 individuals met the inclusion criteria. To control for variances in nursing clinical practice and hospital policy that happen over time, we matched fall and nonfall individuals by year. No additional factors were used to match fall and nonfall cases.

The study hospital uses MFS as its inpatient fall assessment tool for all adults. The fall assessment is incorporated into the electronic health record. Of note, there were no reported obstetric falls in 2019. Data collected from health records included demographics, dates of service, medical history related to fall risks, the MFS risk level and total score, and clinical charting of the categories composing the OFRAS (see Box 2).

Data Collection

The study site did not use the OFRAS; therefore, investigators individually calculated the OFRAS risk level and total score from the nursing clinical documentation. To ensure intercoder reliability during data abstraction from health records, all three investigators first reviewed and abstracted data from the 17 fall charts and 10 nonfall charts as a group. There was 100% agreement among the investigators with the pilot data set ($N = 27$). Then, each investigator was assigned a set of health records to review and abstract data independently. All data were compiled into a SurveyMonkey (Version 2.0.2) database for management.

Analysis

Descriptive statistics were used to describe the sample characteristics. Because the scales of the two fall questionnaires are quite different, the scores were converted to *z* scores for comparison using standard methods. Descriptive results for scores were calculated on both the original scales and the *z* scores to help with interpretation.

Separate logistic regression models were fitted using the MFS and the OFRAS as predictors of falls. Results from the regression models are expressed as odds ratios with 95% confidence intervals (CIs) and with $p < .05$ to test for statistical significance. Receiver operating characteristic (ROC) curves were derived from the logistic regression results and graphed to compare the instruments. Areas under the ROC curves (AUROCs) were calculated as an additional metric for comparison using nonparametric methods. Nonparametric methods are more accurate with small samples and provide unbiased estimates of sensitivity and specificity by using all discrete data points (Nahm, 2022). Differences between fall and nonfall cases were assessed with *t* tests for continuous variables and with chi-square tests for categorical variables. As a descriptive graphic, ROC curves were overlaid to compare the two tools with respect to fall prediction. Initial models were unadjusted, including only the fall tool scores. Second models were age-adjusted, and subsequent models included additional variables. C-statistics, indicating the fit of the various models, are reported and correspond to the AUROCs from the regression models. For interpretation purposes, higher C-statistics indicate better fit. Analyses were completed using the programs R packages Version 4.0.1 (June 2020) and SAS Version 9.4 (July 2013).

> Nurses' clinical judgment is crucial in mitigating fall risk

Results

Descriptive Analyses

The total sample included 85 health records, of which 17 noted a fall and 68 noted no fall event (see Table 1).

Nearly three fourths of the total sample were 18 to 34 years old. The largest racial/ethnic group was Asian ($n = 45$; 53%), followed by Native Hawaiian/Pacific Islander ($n = 17$; 20%) and White ($n = 19$; 22%) (see Table 2).

Multivariate Analyses

Results of the logistic regression models differed between the two fall instruments (see Table 3). The average MFS total score was 26.4 with a median of 11.1, and the average OFRAS total score was 2.4 with a median of 2.1. The odds ratio per standard deviation for the MFS was 1.27 [95% CI = 0.74, 2.24] and for the OFRAS was 2.93 [95% CI = 1.69, 5.72].

The ROC curves provide a visual representation of the specificity and sensitivity of each tool in predicting falls (see Figure 1). The ROC curves demonstrate the relationship between prediction that a fall will occur and an actual fall. The solid red line represents the performance of the OFRAS tool. The dotted blue line represents the performance of the MFS. The diagonal black reference line in the center of the image represents tool performance expected by random chance. The AUROC is greater for a tool with higher sensitivity and specificity across all fall risk levels. For a clinical tool to be acceptable, the AUROC must be greater than 0.8 (Nahm, 2022).

For individuals who did not fall, the MFS identified 67 as low risk and 1 as high risk. In this same group, the OFRAS tool identified 46 as low risk, 17 as moderate risk, and 5 as high risk (see Figure 2). For individuals who did fall, the MFS identified 15 as low risk and 2 as high risk. In the fall group, the OFRAS tool identified 3 as low risk, 10 as moderate risk, and 4 as high risk (see Figure 3).

BOX 1 INCLUSION AND EXCLUSION CRITERIA

Inclusion criteria for fall
- Individuals at the study hospital with a primary diagnostic code as an obstetric inpatient (*International Classification of Diseases, Tenth Revision,* code Z34.90)
- Obstetric inpatient stay between January 1, 2014, and December 31, 2020
- Documented MFS
- Documented fall or near-miss in the incident reporting system

Inclusion criteria for nonfall
- Individuals at the study hospital with a primary diagnostic code as an obstetric inpatient (*International Classification of Diseases, Tenth Revision,* code Z34.90)
- Obstetric inpatient stay between January 1, 2014, and December 31, 2020
- Documented MFS

Exclusion criteria for nonfall charts
- Documented fall event (actual fall or near-miss) in the incident reporting system

BOX 2 HEALTH RECORD VARIABLES

Demographics
Name
Age
Ethnicity
Health record number
Dates of service, to facilitate selection of nonfall cases
Applicable Individual History
Previous fall
Preeclampsia
Bedrest
Anemia
MFS Components
MFS risk level
MFS total score
Clinical Charting of OFRAS Score Components
Current visual impairment
Dizziness
Orthostatic hypotension
Diagnosis of placental abruption
Diagnosis of placenta previa
Numbness in thigh
Epidural off <3 hr
Able to straight-leg raise but not bridge
Aldrete score
Postpartum hemorrhage (total blood loss)
Medication administration record components:
Opioid administration within 30 min of fall risk scoring
  Intravenous
  Intramuscular
Antihypertensive medications
Note. MFS = Morse Fall Scale; OFRAS = Obstetric Fall Risk Assessment System.

Discussion

In this study, the OFRAS tool had higher sensitivity and specificity in fall risk prediction for both fall and nonfall individuals. The MFS, by comparison, performed similarly to random chance with respect to fall risk prediction in this population. The potential exists to better predict fall risk in obstetric patients, reduce the risk of staff injuries related to patient falls, and decrease organizational risk using a population-specific tool.

Nurses' clinical judgment is crucial in mitigating fall risk. For the obstetric population, in the absence of a population-specific fall risk assessment tool, clinical judgment is the main protection for individuals (Lockwood & Anderson, 2013; Risso et al., 2024). By including components such as lower extremity weakness, blood loss, and time from discontinuation of epidural, the OFRAS structures the nursing assessment to capture population-specific risk.

Nursing interventions used by experienced obstetric RNs contribute to minimizing the risk of falls in this population, which provides an explanation for why an individual may have a moderate or high fall risk score and yet not experience a fall. Although not the focus of this study, the OFRAS includes risk-specific interventions that can be used by nursing units.

This study had several limitations. First, obstetric fall rates are low; therefore, the study is limited by sample size from a single study hospital. Although the results have adequate statistical power, the use of a singular hospital and the smaller size precludes application of the results beyond this population. Heafner et al. (2013) note that OFRAS is designed for use throughout pregnancy, labor, and the postpartum period. In this study, only labor and postpartum data points were collected. The fall cases used for this study were reported in the study hospital's incident reporting system. It is possible that some falls were not reported. In addition, fall and nonfall cases were matched by year to control for variations in nursing practice and hospital policy changes. No other variables were controlled for in case matching, and, therefore, there could have been specific differences in the populations that were not accounted for. Finally, the investigators note that there was documentation of fall risk components in various areas of the health

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TABLE 1 DISTRIBUTION OF THE STUDY SAMPLE

Calendar Year	Reported Fall Events, *n*	Selected Nonfall Events, *n*	Total, *n* (% of Sample)
2014	2	8	10 (11.8)
2015	2	8	10 (11.8)
2016	3	12	15 (17.6)
2017	7	28	35 (41.2)
2018	2	8	10 (11.8)
2019	0	0	0
2020	1	4	5 (5.8)

Note. $N = 85$.

record. This has the potential to result in incomplete data sets and should be a consideration for researchers wishing to replicate this study.

Implications for Practice

The results of this study have several implications for clinical practice. First, utilization of a population-specific tool such as the OFRAS could be more accurate in identifying obstetric patients at higher risk for falls (Risso et al., 2024). Health care organizations must recognize that generalized risk assessment tools may not be appropriate for all population groups. Fall risk assessment and assignment of risk level must be paired with appropriate interventions to prevent falls (AHRQ, 2024). Although both the MFS and the OFRAS suggest interventions based on fall risk score, the OFRAS risk assessment is tailored to the clinical presentation of the obstetric population. Obstetric nurses must continue to advocate for population-specific fall risk assessment tools and interventions.

TABLE 2 DEMOGRAPHIC CHARACTERISTICS OF THE STUDY PARTICIPANTS

Characteristic	*n* (%)
Fall	
Yes	17 (20)
No	68 (80)
Age in years	
<18	2 (2.4)
18–34	63 (74.1)
≥35	20 (23.5)
Race	
Black	3 (3.5)
White	19 (22)
Asian	45 (53)
Native Hawaiian/Pacific Islander	17 (20)
≥2 races	1 (1.2)

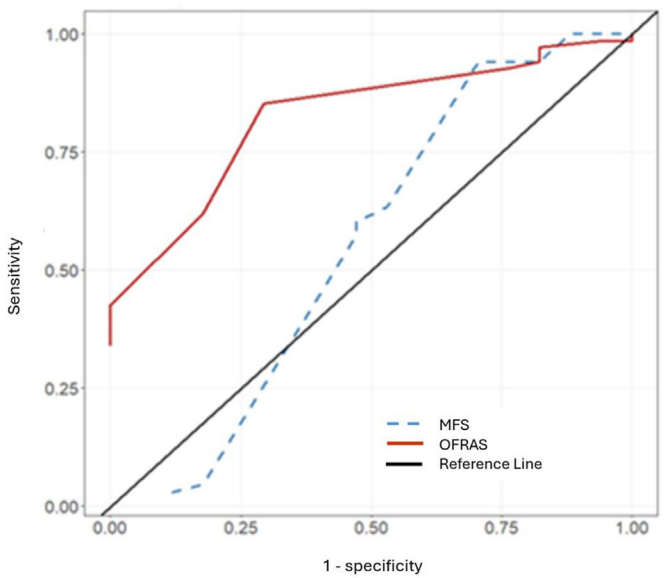
Note. $N = 85$. Percentages for race do not add up to 100% due to rounding.

TABLE 3 ASSOCIATION OF MFS TOTAL SCORE AND OFRAS WITH RISK OF HAVING A FALL AMONG INDIVIDUALS HOSPITALIZED IN OBSTETRIC UNITS IN THE STUDY HOSPITAL

Risk Score	Odds Ratio (95% CI) per *SD*	*p* Value	AUROC (95% CI)
MFS	1.27 [0.74, 2.24]	.40	0.55 [0.37, 0.74]
OFRAS	2.93 [1.69, 5.72]	<.001	0.83 [0.73, 0.92]

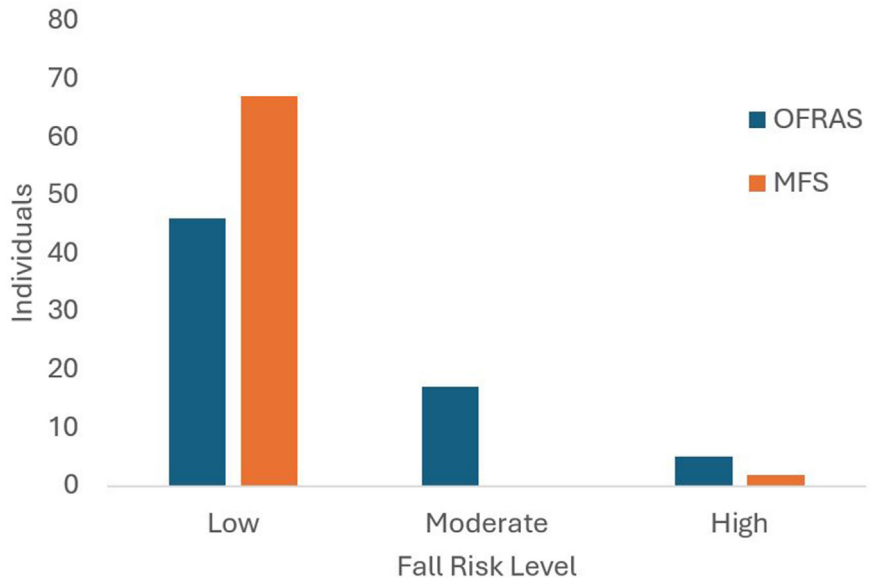
Note. MFS = Morse Fall Scale; OFRAS = Obstetric Fall Risk Assessment System; CI = confidence interval; AUROC = area under the receiver operating characteristic curve.

FIGURE 1 RECEIVER OPERATING CHARACTERISTIC (ROC) CURVE



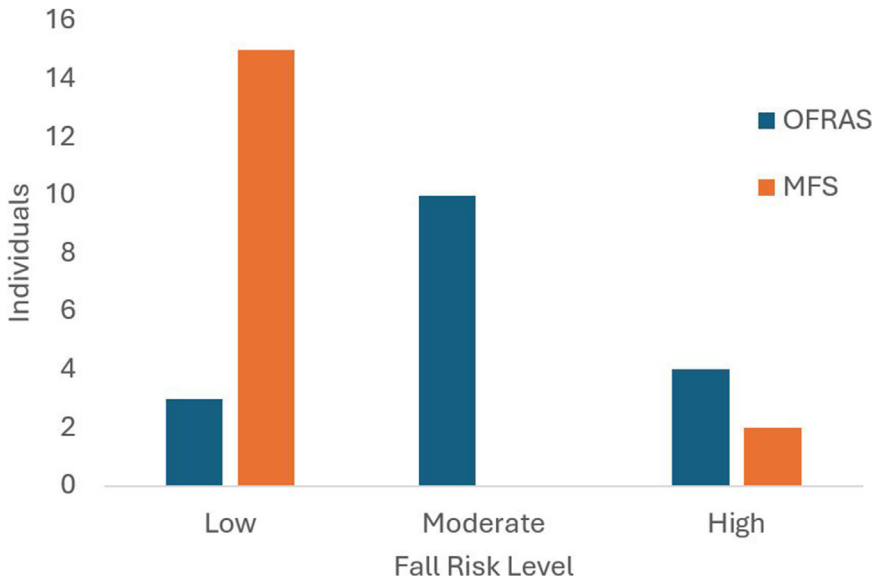
Note. Area under the ROC curve was 0.55 for the MFS and 0.83 for the OFRAS. MFS = Morse Fall Scale; OFRAS = Obstetric Fall Risk Assessment System

FIGURE 2 RISK LEVEL FOR ALL NONFALL CASES



Note. MFS = Morse Fall Scale; OFRAS = Obstetric Fall Risk Assessment System.

FIGURE 3 RISK LEVEL FOR ALL FALL CASES



Note. MFS = Morse Fall Scale; OFRAS = Obstetric Fall Risk Assessment System.

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Ease of implementation is a critical consideration when evaluating risk assessment tools in the clinical setting. The OFRAS tool requires similar assessment and documentation time as the MFS; however, the OFRAS provides more sensitive and specific results. Therefore, this population-specific tool does not create an additional burden for bedside staff while promoting an improved level of quality.

> Ease of implementation is a critical consideration when evaluating risk assessment tools in the clinical setting

Finally, organizations seeking to implement new processes must consider the financial burden. The OFRAS is trademarked and requires facility-level licensing. With facility-level licensing, the OFRAS can be built into an organization's electronic health record for documentation. Licensing costs are based on the annual birth volume of the facility and for-profit or not-for-profit status (J. Kehle, personal communication, September 13, 2024). These costs, and the time required to complete the electronic record build, could present a burden to some organizations. Commercially available obstetric platforms within electronic records should include obstetric-specific risk assessment tools.

Conclusion

Our aim with this study was to compare the relative accuracy of the MFS and the OFRAS in assessing fall risk for individuals receiving inpatient maternity care. In the study population, OFRAS demonstrated higher sensitivity and specificity for fall risk prediction in both fall and nonfall individuals. The MFS performed similarly to random chance with respect to obstetric fall risk prediction. Risk assessment tools help to guide nursing care and interventions that protect individuals from experiencing harm. The use of fall risk assessment tools for the general population may not adequately identify risk in the obstetric population. Future studies should assess psychometric characteristics of OFRAS across the maternal care continuum.

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References

Agency for Healthcare Research and Quality. (2024, February). *Preventing falls in hospitals*. https://www.ahrq.gov/patient-safety/settings/hospital/fall-prevention/toolkit/index.html

Centers for Medicare & Medicaid Services. (2008, July 31). *Medicare and Medicaid move aggressively to encourage greater patient safety in hospitals and reduce never events*. https://www.cms.gov/newsroom/press-releases/medicare-and-medicaid-move-aggressively-encourage-greater-patient-safety-hospitals-and-reduce-never

Dykes, P. C., Curtin-Bowen, M., Lipsitz, S., Franz, C., Adelman, J., Adkison, L., … Bates, D. W. (2023). Cost of inpatient falls and cost-benefit analysis of implementation of an evidence-based fall prevention program. *JAMA Health Forum, 4*(1), Article e225125. https://doi.org/10.1001/jamahealthforum.2022.5125

Franck, L. S., Gay, C. L., Cooper, B., Ezrre, S., Murphy, B., Chan, J. S. L., … Meer, C. R. (2017). The Little Schmidy Pediatric Hospital fall risk assessment index: A diagnostic accuracy study. *International Journal of Nursing Studies, 68*, 51–59. https://doi.org/10.1016/j.ijnurstu.2016.12.011

Frank, B. J., Lane, C., & Hokanson, H. (2009). Designing a postepidural fall risk assessment score for the obstetric patient. *Journal of Nursing Care Quality, 24*(1), 50–54. https://doi.org/10.1097/01.NCQ.0000342937.99036.7b

Harvey, K., Kramlich, D., Chapman, J., Parker, J., & Blades, E. (2010). Exploring and evaluating five paediatric falls assessment instruments and injury risk indicators: An ambispective study in a tertiary care setting. *Journal of Nursing Management, 18*(5), 531–541. https://doi.org/10.1111/j.1365-2834.2010.01095.x

Heafner, L., Suda, D., Casalenuovo, N., Leach, L. S., Erickson, V., & Gawlinski, A. (2013). Development of a tool to assess risk for falls in women in hospital obstetric units. *Nursing for Women's Health, 17*(2), 98–107. https://doi.org/10.1111/1751-486X.12018

Hendrich, A. L., Bender, P. S., & Nyhuis, A. (2003). Validation of the Hendrich II Fall Risk Model: A large concurrent case/control study of hospitalized patients. *Applied Nursing Research, 16*(1), 9–21. https://doi.org/10.1053/apnr.2003.016009

Hendrich, A. L., Bufalino, A., & Groves, C. (2020). Validation of the Hendrich II Fall Risk Model: The imperative to reduce modifiable risk factors. *Applied Nursing Research, 53*, Article 151243. https://doi.org/10.1016/j.apnr.2020.151243

Klinkenberg, W. D., & Potter, P. (2017). Validity of the Johns Hopkins Fall Risk Assessment Tool for predicting falls on inpatient medicine services. *Journal of Nursing Care Quality, 32*(2), 108–113. https://doi.org/10.1097/NCQ0000000000000210

Lockwood, S., & Anderson, K. (2013). Postpartum safety: A patient-centered approach to fall prevention. *MCN: The American Journal of Maternal Child Nursing, 38*(1), 15–20. https://doi.org/10.1097/NMC.0b013e31826bae4b

McNeely, H. L., Thomason, K. K., & Tong, S. (2018). Pediatric fall risk assessment tool comparison and validation study. *Journal of Pediatric Nursing, 41*, 96–103. https://doi.org/10.1016/j.pedn.2018.02.010

Morse, J. M., Morse, R. M., & Tylko, S. J. (1989). Development of a scale to identify the fall-prone patient. *Canadian Journal on Aging, 8*(4), 366–377. https://doi.org/10.1017/S0714980800008576

Nahm, F. S. (2022). Receiver operating characteristic curve: overview and practical use for clinicians. *Korean Journal of Anesthesiology, 75*(1), 25–36. https://doi.org/10.4097/kja.21209

Park, S. H. (2018). Tools for assessing fall risk in the elderly: A systematic review and meta-analysis. *Aging Clinical and*

Experimental Research, 30(1), 1–16. https://doi.org/10.1007/s40520-017-0749-0

Risso, S., Soares, T., & Marques-Vieira, C. (2024). Scoping review of fall risk assessment tools for women who receive maternity care. *Journal of Obstetric, Gynecologic, and Neonatal Nursing, 53*(3), 234–244. https://doi.org/10.1016/j.jogn.2023.11.012

Strini, V., Schiavolin, R., & Prendin, A. (2021). Fall risk assessment scales: A systematic literature review. *Nursing Reports, 11*(2), 430–443. https://doi.org/10.3390/nursrep11020041

The Joint Commission. (2015). Preventing falls and fall-related injuries in health care facilities. *Sentinel Event Alert, 55*, 1. https://www.jointcommission.org/-/media/tjc/newsletters/sea-55-falls-4-26-16-final-2-combined.pdf

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