Evaluation of Fall Risk Assessment Tools for Psychiatric Patient Fall Prevention
A Comparative Study

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ABSTRACT
The Hendrich II Fall Risk Model™ (Hendrich II) is used to determine patient fall risks. However, the WilsonSims Fall Risk Assessment Tool (WSFRAT) is more specific to psychiatric patients. The current study tested the Hendrich II and WSFRAT simultaneously to determine which tool was the most predictive for patient falls in a psychiatric population. Fall risk assessments using the Hendrich II and WSFRAT tools were completed through discharge. Fall risk assessment scores, medications, and falls data were documented. Fifty patients who met eligibility criteria generated 319 observations; of the 50 patients, two (4%) experienced falls. Sensitivity was 100% for the Hendrich II and WSFRAT, with all patients properly categorized as high risk for falling. Both assessments had similar specificity (Hendrich II = 67.8%; WSFRAT = 63.1%). Both tools have similar specificity; thus, additional research is warranted.

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In 2008, The Joint Commission on Accreditation of Healthcare Organizations specified the goal of reducing the risk of patient harm resulting from falls. However, patient falls continue to be a major concern for patient safety during hospitalization. Fall risk assessment tools are needed to facilitate nurse prediction of patient fall risk and subsequent patient management. The current study compared two fall risk assessment tools in a psychiatric patient population.

The annual cost of fall injuries for older adults is estimated to exceed $30 billion by 2020 (Agency for Healthcare Research and Quality, 2007; Chang et al., 2004; Ulrich & Zimring, 2004). Approximately 2 decades ago, the annual indirect and direct costs of falls for all individuals (versus older adults only) was projected to be $54.9 billion by 2020 (Centers for Disease Control and Prevention, 2014). Diagnoses, treatments, and increased lengths of stay for inpatients who fall are costly for a hospital. Hospitals must implement evidence-based fall prevention intervention programs not only for patient safety but also to manage hospital costs. Hospitals are at risk of losing Medicare reimbursement for falls with injury if the fall was preventable, and other third-party payers are following Medicare’s initiative (ECRI Institute, 2009). Nursing clinical practice must focus on both quality care and patient safety through evidence-based fall prevention strategies, as well as interventions to decrease the potential for patient falls and the subsequent injury and related costs for those patients who fall.

Hospital fall prevention strategies and interventions typically use fall risk assessment tools designed to measure patient risk for falling. Although research exists on fall risk assessment tools, evidence to support the best tool for specific inpatient population types, such as psychiatric inpatients, is lacking. The incidence of falls per 1,000 days has been found to be higher on psychiatric units (13.1 to 25 per 1,000 inpatient days) than on acute care units (3 to 5 per 1,000 inpatient days) (Blair & Gruman, 2005).

LITERATURE REVIEW

A literature search was conducted using search terms WilsonSims Fall Risk Assessment Tool (WSFRAT), Hendrich II Fall Risk Model™ (Hendrich II), comparative studies, and falls/psychiatric unit for years 2003 to 2014 in CINAHL, MEDLINE, and Cochrane Library databases. Findings from the search were reviewed to determine best practice fall assessment tools.

In a study of 144 adult patients in an acute care setting, the Morse Fall Scale (MFS), St. Thomas’ Risk Assessment Tool in Falling Elderly Inpatients (STRATIFY), and Hendrich II were evaluated for interrater reliability. The Hendrich II was the most useful in identifying patients at high risk for falls (Kim, Mordiffi, Bee, Devi, & Evans, 2007). In the Hendrich II original research, the authors reported that the tool was easy to use and was useful because it was both sensitive (i.e., 74.9% of high-risk patients were correctly identified) and specific (i.e., 73.9% of patients not at risk of falling were correctly identified) (Hendrich, Bender, & Nyhuis, 2003). The Hendrich II focuses on eight independent risk factors: (a) confusion; (b) disorientation and impulsivity; (c) systematic depression; (d) altered elimination; (e) dizziness/vertigo; (f) gender (men); (g) prescribed/administered anti-epileptic (anticonvulsant) agents; and (h) prescribed/administered benzodiazepine agents. It also uses the Get Up and Go test, which assesses mobility (Caldevilla, Costa, Teles, & Ferreira, 2012; Hendrich et al., 2003). By having one or more of these risk factors, patients’ risk for falling is increased. Patients are categorized as either a low (0 to 4) or high (≥5) fall risk (Chapman, Bachand, & Hyrkäis, 2011).

In a study of 1,546 adult patients in an acute care setting, four tools (i.e., MFS, Hendrich II, New York-Presbyterian Fall and Injury Risk Assessment Tool [New York-Presbyterian], and the Maine Medical Center Falls Risk Assessment/Interventions) were evaluated simultaneously on 17 units to evaluate their sensitivity, specificity, and feasibility (Chapman et al., 2011). Although the sensitivity and specificity varied, the New York-Presbyterian had the best sensitivity and specificity.

In a third study of 200 geriatric patients on a rehabilitation unit, the Downton and STRATIFY fall risk tools were compared to clinical judgment for sensitivity, specificity, and total predictive accuracy of these tools (Vassallo, Poynter, Sharma, Kwan, & Allen, 2008). Clinical judgment had a greater accuracy than the two fall risk assessment tools.

PSYCHIATRIC FALL RISK ASSESSMENT TOOLS

Two fall risk assessment tools were identified from the literature specific to psychiatric populations; however, limited research is available to definitively determine the best tool for psychiatric inpatients (Edmonson, Robinson, & Hughes, 2011; Wilson, Fettes, & Sims, 2014).
The WSFRAT comprises nurse ratings for nine risk factor fields: (a) age; (b) mental status; (c) physical status; (d) elimination; (e) sensory impairments; (f) gait or balance; (g) history of falls in the past 6 months; (h) medications (e.g., mood stabilizers, benzodiazepine agents, narcotic agents, sedative/hypnotic drugs, antipsychotic agents); and (i) a detoxification protocol. A total score of 0 to 6 is low risk; a score of ≥7 is high risk. The WSFRAT also has a field for nurses to use clinical judgment to specify whether the patient is a fall risk (yes/no). This clinical judgment assessment is not part of the WSFRAT fall risk score. An open-ended field is included for nurses to comment about the fall risk factors or clinical judgment, which is also not part of the WSFRAT fall risk score.

The WSFRAT is a validated tool for item (0.7 to 1.0) and scale (0.91) content validity (Kruszewski, Killeen, Fettes, Wilson, & Sims, 2011). The Edmonson Psychiatric Fall Risk Assessment Tool (EPFRAT) also includes nine risk factors: (a) age; (b) mental status; (c) elimination; (d) medications; (e) diagnosis; (f) ambulation/balance; (g) nutrition; (h) sleep disturbance; and (i) history of falls. Researchers retrospectively compared these factors to the MFS, as the MFS was the tool being used at the time of the research. In comparing 138 patient records, the authors reported that the EPFRAT was more sensitive (0.63) than the MFS (0.49) in assessing fall risk (Edmonson et al., 2011). Additional psychometric testing to determine EPFRAT reliability and validity was recommended. The EPFRAT did not include a field for nurses to use clinical judgment (Edmonson et al., 2011).

**PURPOSE**
The Hendrich II is the fall risk assessment tool used for all inpatient units at the hospital where the current study was conducted. The current research is a result of nurse researchers from the psychiatric unit wanting to use a best-practice fall risk assessment tool for a psychiatric patient population. Specifically, a fall risk tool that more comprehensively assessed (a) prescribed psychotropic medications, (b) patients under the influence of alcohol/drugs and placed under a detoxification protocol, and (c) RN clinical judgment for fall risk factors was targeted. The WSFRAT included these three factors. Based on the literature review, no study was identified that compared the Hendrich II to the WSFRAT. Therefore, nurse researchers tested these two fall risk assessment tools simultaneously to determine which tool was the most predictive for patient falls in a psychiatric population.

**METHOD**
The current pilot research study received institutional review board ap-

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**TABLE 1**
CHARACTERISTICS OF THE STUDY POPULATION (N = 50)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean (SD)</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>40.5 (13.8)</td>
<td></td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>27.7 (6.3)</td>
<td></td>
</tr>
<tr>
<td>Average length of stay (days)</td>
<td>6.7 (4)</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>29 (58)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>21 (42)</td>
<td></td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>40 (80)</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>10 (20)</td>
<td></td>
</tr>
<tr>
<td>Educational level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;12th grade</td>
<td>10 (20)</td>
<td></td>
</tr>
<tr>
<td>High school degree/GED</td>
<td>24 (48)</td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>10 (20)</td>
<td></td>
</tr>
<tr>
<td>College degree</td>
<td>6 (12)</td>
<td></td>
</tr>
<tr>
<td>Primary admitting diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bipolar disorders</td>
<td>19 (38)</td>
<td></td>
</tr>
<tr>
<td>Major depressive disorder</td>
<td>16 (32)</td>
<td></td>
</tr>
<tr>
<td>Depression disorder NOS</td>
<td>5 (10)</td>
<td></td>
</tr>
<tr>
<td>Anxiety disorder NOS</td>
<td>3 (6)</td>
<td></td>
</tr>
<tr>
<td>Schizoaffective disorder</td>
<td>3 (6)</td>
<td></td>
</tr>
<tr>
<td>Schizophrenia paranoid type by HX</td>
<td>2 (4)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2 (4)</td>
<td></td>
</tr>
<tr>
<td>Assistive devices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>46 (92)</td>
<td></td>
</tr>
<tr>
<td>Walker</td>
<td>3 (6)</td>
<td></td>
</tr>
<tr>
<td>Cane</td>
<td>1 (2)</td>
<td></td>
</tr>
<tr>
<td>History of falls within past year</td>
<td>9 (18)</td>
<td></td>
</tr>
</tbody>
</table>

*Note. GED = general education diploma; NOS = non-specific; HX = history.*
proval, and all participants provided signed informed consent. The setting was a 12-bed psychiatric unit, which is part of a two-hospital system located in a rural area of the mid-Atlantic region of the United States. Data were collected over a 4-month period between May and September 2013.

Hospitalized adult patients on the psychiatric unit who met the eligibility criteria of activity orders up ad lib and who were able to communicate in the English language were included in the study. Patients with psychiatric comorbidities/diagnosis and/or physical comorbidities precluding their ability to provide consent or participate in study procedures were excluded.

The hospital’s standard fall risk assessment, Hendrich II, was completed for all study patients per the hospital’s Adult Fall Prevention Program Policy (Shore Health System, 2013). Assessments were completed on admission, once per day thereafter through discharge, and if the patient’s condition changed at any time. If a fall occurred, the fall risk assessment was completed immediately after the fall event. For this research, patients were categorized as either a low (0 to 4) or high (≥5) fall risk. The WSFRAT was also completed for all study patients, with fall scores of 0 to 6 considered low risk and scores of ≥7 considered high risk.

Additional data collected were demographics; admitting diagnosis; comorbidities; height and weight for body mass index; use of assistive devices; history of falls; risk assessment tool data and score; fall risk plan of care; medications; information on falls, including health care resources used during hospitalization as a result of the fall; and length of stay. For study purposes, a fall was defined as an unplanned descent to the floor or extension of the floor (e.g., trash can, other equipment) with or without injury (American Nurses Association, 2009).

The current pilot study used a convenience sample of 50 patients, for which a minimum of three fall risk assessments were completed using both the Hendrich II and WSFRAT. Analysis was set at a 0.95 level of confidence. All statistical analysis, which was descriptive in nature, was completed using SAS version 9.3. Sensitivity was defined as the total number of patients correctly identified as high risk for falls (Hendrich II scores of ≥5, WSFRAT scores of ≥7); specificity was total number of patients correctly defined as low risk for falls (Hendrich II scores of ≤4; WSFRAT scores of ≤6); total predictive accuracy was total number of patients correctly identified and expressed as a percentage; positive predictive value was number of high-risk patients who fell; negative predictive value was number of low-risk patients who did not fall.

### RESULTS

A total of 50 patients generated a total of 319 observations. Most patients were women (58%) and Caucasian (80%), with a mean age of 40.5. Primary admitting diagnoses were bipolar disorders (38%) and major depressive disorder (32%). Table 1 provides information describing the study patient population.

Two patients fell during the study period, representing a 4% fall rate. The fall risk ranking scores prior to the fall for the first patient were Hendrich II = 5 (i.e., high fall risk) and WSFRAT = 7 (i.e., high fall risk), and the RN clinical judgment was high fall risk. The fall risk score for the second patient prior to the fall was Hendrich II = 9 (i.e., high fall risk) and WSFRAT = 15 (i.e., high fall risk), and the RN clinical judgment was high fall risk. The fall did not result in a longer length of stay for either patient. Ibuprofen (Motrin®) was provided to one patient for minor muscle pain re-
KEYPOINTS

1. Of the fall risk assessment tools evaluated, the WilsonSims Fall Risk Assessment Tool (WSFRAT) was more specific to psychiatric patients.

2. In the current pilot study of 50 patients, the WSFRAT and Hendrich II Fall Risk Model™ tools had similar specificity.

3. Additional research is warranted to determine the tool that is the most predictive for patient falls in the psychiatric population.

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sulting from the fall. In the risk factor analysis based on data collected, one possible risk was due to medications administered. One patient took a mood stabilizer 5 hours before the fall and an antipsychotic agent 6 hours before the fall; the second patient took an antihistamine agent both 5 hours and 1 hour before the fall, as well as antidepressant and antipsychotic agents 1 hour before the fall.

Using a two-category rating system of high risk and low risk, both the Hendrich II and WSFRAT correctly classified both patients as high risk prior to their falls (sensitivity = 100%) (Table 2). The Hendrich II had a slightly higher specificity (67.8%) than the WSFRAT (63.1%). The PPV values for both tools were low (i.e., 1.9% and 1.7% for the Hendrich II and WSFRAT, respectively). Conversely, the NPV values were high (i.e., 100% for both tools).

The total number of low-risk category scores was 200 (62.7%) of 319 observations for the WSFRAT and 209 (65.5%) of 319 observations for the Hendrich II. When these numbers were compared to the WSFRAT RN fall risk clinical judgment question (i.e., yes/no), RNs identified 38 (11.9%) additional patients as high risk. When the WSFRAT question regarding RN clinical judgment was applied to total Hendrich II low risk categories, 71 (34%) patients who were considered low risk by the Hendrich II assessment were considered high risk by the WSFRAT RN clinical judgment.

DISCUSSION
In fall prevention strategies for hospitalized patients, it is important to use assessment tools that are specific to inpatient type. It is also important to use clinical judgment when interpreting fall risk assessment scores (Corley et al., 2014). Although the Hendrich II is not specific to a psychiatric population, the sensitivity of the Hendrich II and WSFRAT tools was equal (i.e., 100%) when used to determine patient high-risk and low-risk fall assessment. Both the Hendrich II and WSFRAT performed with reasonable specificity. The discrepancies between the NPV and PPV observed in the current study were similar to those observed in previous research (Chapman et al., 2011).

The WSFRAT’s additional RN clinical judgment was helpful in identifying patients at high risk for falling who otherwise may have been considered low risk. Because the WSFRAT requires a more comprehensive psychiatric assessment (i.e., psychotropic medications and detoxification protocols), only 11.9% of the low-risk category scores were also considered by RN clinical judgment as high fall risk. The Hendrich II, which does not include the more comprehensive psychiatric scoring, had a higher variance (34%) between the number of low-risk category assessments and the WSFRAT RN clinical judgment of yes when applied. This finding could be interpreted as a 34% missed opportunity for implementing additional fall risk interventions for the Hendrich II versus 11.9% for the WSFRAT.

As a result of the current research and previous research on the WSFRAT (and given the equal sensitivity of both fall risk tools and that the WSFRAT is more oriented to psychiatric inpatients), the researchers of the current article concluded that although either fall risk assessment tool could be used, the WSFRAT allowed a more comprehensive assessment. In addition, the WSFRAT RN clinical judgment field can facilitate implementation of additional fall prevention interventions by nurses regardless of a low fall risk score generated for a particular patient at a particular time point.

LIMITATIONS
Although variance in the time taken to complete both tools was not a focus of the current study, the researchers did not report notable differences between the two tools. Nursing time required to conduct fall risk assessments efficiently should be considered, given inpatient populations and overall requirements of nurses (Corley et al., 2014).

As the psychiatric inpatients who participated in this study had two fall assessments completed per study protocol at each fall screening time point, this frequency of assessment may have resulted in implementation of additional fall prevention strategies and, consequently, fewer falls. However, the study fall rate was similar to the fall rate on the psychiatric unit prior to the initiation of the research.

Additional limitations of the current pilot study were the small sample and the inability to generalize these results to nonpsychiatric and/or non-rural populations. Further research is warranted on best-practice fall risk assessment tools in the psychiatric inpatient setting using a larger sample.
IMPLICATIONS FOR NURSING PRACTICE

In fall prevention strategies for hospitalized patients, it is important to use assessment tools that are specific to the inpatient type. It is also important to use clinical judgment when interpreting fall risk assessment scores. Additional research is warranted on best practice fall risk assessment tools for psychiatric patient populations.

CONCLUSION

Although the Hendrich II is not specific for the psychiatric population, the sensitivity of the Hendrich II and WSFRAT tools was equal (i.e., 100%) when used to determine patient high-risk and low-risk fall assessment. Both the Hendrich II and WSFRAT performed with reasonable specificity. The discrepancies between the NPV and the PPV observed in the current study were similar to those observed in previous research.

REFERENCES


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