

Comparing the Sensitivity and Specificity of Wilson-Sims Fall Risk Assessment Tool, Clinical Judgment and Morse Fall Scale in the Assessment of Fall Risk among Psychiatric Inpatients

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Abstract - Effective fall risk assessment tool is important for preventive measures to be instituted among psychiatric inpatients. Our study aimed to compare the sensitivity and specificity of Wilson-Sims Fall Risk Assessment Tool (WSFRAT), clinical judgment and Morse Fall Scale (MFS) in the assessment of the risk of fall among psychiatric inpatients. All psychiatric inpatients who were admitted to psychiatric ward of Hospital Tuanku Fauziah, Malaysia from April 1st, 2019, till December 31st, 2020 were assessed for their risk of fall using WSFRAT, clinical judgment and MFS. The frequency and characteristics of actual fall event during period of hospitalization was documented. The study included a total of 400 psychiatric inpatients. Clinical judgment stratified 17 patients as high risk of fall (Mean age: 50.9 ± 12.13 years old, male predominance at 76.5 % and otherwise physically healthy), among which, five actually fell. Among these, four were considered as high risk by WSFRAT and two by MFS. The WSFRAT demonstrated higher sensitivity of fall detection as compared to MFS (60 % vs. 40 %), while the sensitivity of clinical judgment alone without specific fall risks tools was 80 % and a specificity of 96.7 %. Clinical judgement is derived from a comprehensive psychiatric assessment. The value of any objective assessment tool proved to be superior when an element of clinical judgement is concurrently added.

Key words: accidental falls; risk assessment; psychiatry; Malaysia; judgment

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Introduction

Falls are the most frequently reported incidence among hospital inpatients with 30 to 51 % resulting in some form of injury, rang-

ing from minor bruises to severe wounds and fractures [1]. Falls among hospital inpatients contribute to prolonged hospitalization, increasing healthcare costs and litigation risk for the healthcare centre [2]. Inpatient falls also indirectly demonstrates the failure of the healthcare system and quality of medical care. Therefore, appropriate fall risk assessment tool is very important for the planning of pre-

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ventive measures to reduce the occurrence of falls and to prevent recurrence of falls.

Morse Fall Scale (MFS) is a conventional fall risk assessment tool for all inpatients, regardless of diagnoses and nature of illness. It is intended for use in acute medical-surgical units with the reported sensitivity of 83% for general fall risk detection, and a specificity of 29 % [3]. Despite so, MFS has not been validated for use in psychiatric inpatient population [4]. Most psychiatric patients have compromised learning ability and cognitive status, therefore may result in under detection of the risk of fall through MFS assessment [5]. Furthermore, MFS components do not measure the direct risk of fall among psychiatric population, such as the use of psychotropic medications, current mental state condition (i.e. agitation, restlessness, aggression), presence of neurological disorders and the use of detoxification protocol. This is further supported by a study that determined psychotropic medications and patient's mental status were found to have the strongest association with fall episodes [6,7].

Unsworth recommends that the assessments of falls should include a review of intrinsic factors such as past medical history, mobility, medications, vision, footwear and lower extremity functioning as well as extrinsic factors such as slipping, tripping and other environmental hazards [8]. A qualitative study in Michigan highlighted that toileting was an important factor contributing to fall, which MFS may fail to capture, but is captured by the Wilson-Sims Fall Risk Assessment Tool (WSFRAT) under the "Elimination" factor [9].

WSFRAT was developed for assessment of the risk of fall in adult psychiatric inpatients with the reported content validity of 90 % [10]. It has a superior sensitivity of 100.0 % and a specificity of 63.1 %. The design was intended to be used by staff nurses, with the additional section for subjective clinical judgement. Factors assessed with the revised WS-

FRAT include age, mental and physical status, elimination, impairments, gait, history of falls, specific medications and use of detoxification protocol.

It is important to note that while fall risk assessment tools are important in early prediction of inpatient fall, they are frequently inaccurate and ineffective in determining who are at risk of falling. Some fall assessment tools may put a large percentage of people at risk, limiting the ability to intervene more effectively for those who are truly at risk.

Components assessed in MFS are not specific and may not capture some important contributing factors to falls that are present among psychiatric inpatients. In comparison, WSFRAT appears to be a more specific tool for psychiatric inpatients as the measures include additional assessment of mental status and presence of psychotropic prescriptions. There is a paucity of research comparing the diagnostic efficacy of MFS and WSFRAT. The most recent was a study by Wong and Pang and associates, who discovered that WSFRAT has a higher sensitivity than MFS and is better at predicting the likelihood of falls in psycho-geriatric inpatients [11]. They did not, however, include the clinical judgement component for comparison. Therefore, our study aimed to compare the effectiveness of fall risk detection between MFS and WSFRAT, where the latter was applied together with clinical judgement. The concordance of scoring between WSFRAT and MFS were also compared and contrasted.

Subjects and Methods

This was a prospective observational study conducted from 1st April 2019 till 31st December 2020. All patients admitted to the psychiatric ward of Hospital Tuanku Fauziah, Perlis, Malaysia during the study period were assessed for their risk of fall using both WSFRAT and MFS upon admission. Reassessment of the risk of fall were done if

Table 1. Calculation for sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV)

	Outcome (+)	Outcome (-)
Screening (+)	A	B
Screening (-)	C	D

Sensitivity: $A/(A+C) \times 100$

Specificity: $D/(D+B) \times 100$

PPV: $A/(A+B) \times 100$

NPV: $D/(D+C) \times 100$

there were changes in the patient's mental status, adjustment of the dosage or changes of the psychotropic medications.

Clinical judgment section was added in the WSFRAT assessment form and to be concurrently completed by the attending medical officer. Clinical judgment contains elements of clinical decision-making from comprehensive psychiatric assessment depending on the medical officer knowledge, experience, skill, evidence, critical thinking, and clinical judgment to assess the patient's risk of fall regardless of the score from the measurement tools. On the other hand, MFS chart was provided by the Nursing Division, Ministry of Health Malaysia, and was completed by the nursing staffs. The medical officers and nursing staffs who completed the forms have a minimum of three years experienced working in psychiatric department.

Data collection

Data of interest include the total number of psychiatric admissions, WSFRAT and MFS scoring at admission for individual patients, number of patients identified as high, moderate or low risk of fall, and number of actual fall incidences.

The outcome of fall among psychiatric inpatients was observed throughout hospital admission. All incidence of falls was reported in the Incident Reporting (IR) System and investigation using Root Cause Analysis (RCA) was conducted

to identify the causes and contributing factors of the falls.

The scoring concordance and discordance between WSFRAT and MFS were further compared and contrasted. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of each instrument were calculated using the standard formula as follows (Table 1).

Study instrument

Two scales for fall risk assessment were used in the study: (i) Morse Fall Scale (MFS)¹s a simple and rapid method in the assessment of likelihood of fall among inpatients [3]. Among the criteria included in the assessment include prior history of fall, presence of ambulatory aid, having intravenous access in place and current mental status. MFS was used as the standard fall risk assessment tool among all inpatients in governmental health-care facilities in Malaysia; (ii) Wilson-Sims Fall Risk Assessment Tool (WSFRAT) is specifically designed for use among psychiatric inpatients [12]. Among the factors assessed include patient's age, mental and physical status, impairments, elimination, gait, prior history of falls, presence of specific medications, and detox protocol. On the other hand, clinical judgment was decided based on the patient's physical and mental status, behaviour, medication, and environmental factors.

This study was registered with the National Medical Research Register (NMRR) of the Ministry of Health Malaysia (NMRR-21-162-58503). Permission to use WSFRAT as the study instrument has been obtained.

Results

There was a total of 400 psychiatric inpatients during the study period with five reported incidences of fall. There were 17 patients determined to have high risk of fall by clinical judgment vs. 12 cases with reported moderate-high risk by MFS vs. 13 as high risk by WSFRAT (Table 2). Preventive measures were taken to prevent occurrence of fall for

Table 2. Clinical characteristics of 17 patients with high risk of fall by clinical judgment

Variable(s)	Mean (SD)	Frequency (%)
Age	50.9 (12.13)	
Age group		
18 – 59 years old		12 (70.6)
60 – 70 years old		5 (29.4)
Gender		
Male		13 (76.5)
Female		4 (23.5)
Mental status		
Oriented and cooperative		7 (41.2)
Oriented and uncooperative		7 (41.2)
Confused, memory loss, forgets limitation, intoxicated		3 (17.6)
Physical status		
Healthy		12 (70.6)
Generalised muscle weakness		2 (11.8)
Dizzy, vertigo, syncope, orthostatic hypotension		3 (17.6)
Elimination		
Independent and continent		14 (82.4)
Elimination with assistance, diarrhoea, or incontinence		2 (11.8)
Independent and incontinent, urgency or frequency		1 (5.9)
Impairment		
None		12 (70.6)
Uncorrected visual, hearing, language, speech		2 (11.8)
Limb amputation		3 (17.6)
Gait		
Able to walk/stand unassisted or fully ambulatory		7 (41.2)
Physically unable to walk/stand (but may attempt)		2 (11.8)
Walks with cane		1 (5.9)
Unsteady walking, standing, walker, crutches, furniture		7 (41.2)
MFS risk		
Low risk		5 (29.4)
Moderate risk		6 (35.3)
High risk		6 (35.3)
WSFRAT risk		
Low risk		4 (23.5)
High risk		13 (76.5)
MFS score	34.1 (21.23)	
WSFRAT score	7.4 (2.67)	

MFS = Morse Fall scale; WSFRAT = Wilson-Sims Fall Risk Assessment Tool

Table 3. Characteristics of actual fall events as stratified by different risk assessment scales during the study period

Patient	MFS	WSFRAT	CJ	Mechanism(s)
1	↑	↑	↑	Fell during fitting episode (known epilepsy)
2	↑	↑	↑	Fell when jumping off bed during full-blown psychosis
3	↓	↑	↑	Fell due to slippery floor
4	↔	↓	↑	Fell in bathroom due to dizziness (concomitant acute pharyngitis). Not on any medications potentially contributing to instability, dizziness or over sedation.
5	↓	↓	↓	Fell off bed when rolling during sleep. Not on any medications potentially contributing to instability, dizziness or over sedation.

↑ denotes high risk; ↓ denotes low risk; ↔ denotes moderate risk; MFS = Morse Fall scale; WSFRAT = Wilson-Sims Fall Risk Assessment Tool; CJ = Clinical judgment

patients deemed at risk by any of the assessment tool used.

The characteristics of fall events according to the risk stratified by different assessment scales were tabulated in Table 3. Among the five reported incidences of fall, all five were already stratified as high risk from clinical judgment, four from WSFRAT, and two were high

risk and one as moderate risk by MFS. Despite early preventive measures taken, fall episode was inevitable for these patients. The first patient was an epileptic who fell from bed during a brief fitting episode in the ward, the second case fell during to his acute psychotic condition, the third case fell due to environmental factor, whereas the fourth and fifth cases fell

Table 4. Sensitivity, specificity, and predictive values of different fall risk assessment scales

MFS	Fall (+)	Fall (-)	Sensitivity: 40.0 %
Risk fall (+)	2	4	Specificity: 99.0 %
Risk fall (-)	3	391	PPV: 33.3 %
Total	5	395	NPV: 99.2 %
WSFRAT	Fall (+)	Fall (-)	Sensitivity: 60.0 %
Risk fall (+)	3	10	Specificity: 97.5 %
Risk fall (-)	2	385	PPV: 23.1 %
Total	5	395	NPV: 99.5 %
CJ	Fall (+)	Fall (-)	Sensitivity: 80.0 %
Risk fall (+)	4	13	Specificity: 96.7 %
Risk fall (-)	1	382	PPV: 23.5 %
Total	5	395	NPV: 99.7 %

CJ = Clinical judgment; MFS = Morse Fall scale; WSFRAT = Wilson-Sims Fall Risk Assessment Tool; PPV = positive predictive value; NPV = negative predictive value

due to unexpected condition, in which these factors were not covered in any of the assessment tools.

The sensitivity, specificity and the predictive values of the different scales used in the assessment of risk of fall during the study period were tabulated and calculated in Table 4. WSFRAT demonstrated higher sensitivity of fall detection as compared to MFS, while the sensitivity of clinical judgment alone is higher than the fall risks measured by any of the two objective tools.

Discussion

Our study demonstrated the high sensitivity of WSFRAT in predicting fall among psychiatric inpatients as compared to MFS. This is further accentuated by our preliminary unpublished data collected from 1st April 2017 to 31st December 2018, reporting four incidences of fall among a total of 626 psychiatric inpatients, of which all were reportedly low risk as per MFS. Prior to the year 2018, only inpatient fall resulting in injury were reported in IR system and proceeded with RCA. Therefore, the number of incidences of fall in previous years may have been underreported, thus direct comparison of the occurrence of falls is arbitrary.

Based on our study findings, we recommend practical application of clinical judgment as it was evidently better in analysing the risk of fall when supplemented with the existing assessment tool. Despite the subjective assessment of clinical judgment by the assessor, proper evaluation is deemed superior to objective scale assessment, as the interplay of various factors would have been considered in the subjective evaluation, that may otherwise be failed to be picked up by the screening tool. For example, a patient with a full-blown psychosis may require the clinical judgement of the treating doctor to decide on the risk of fall. The nature of the clinical diagnosis and types

of psychotropic medication used may also contribute to fall event, as different psychotropic medications would have different mode of action that may result in different sedative effects.

Even though MFS is a reliable screening tool for fall in general hospital settings, it proved to be inadequate when assessing fall risk among psychiatric patients in view of its emphasis on components related to medical procedures, which are not routinely performed among psychiatric inpatients.

Our study determined the WSFRAT demonstrated higher sensitivity of fall detection as compared to MFS (60 % vs. 40 %) while the sensitivity of clinical judgment alone without specific fall risks assessment tools stands high at 80.0 %. This is further supported by previous studies denoting improved sensitivity of the fall risks assessment when combined with an element of clinical judgment, citing a perfect sensitivity of 100.0 % [13,14].

Unfortunately, we did encounter two patients who were identified as high risk of fall as per clinical judgment, WSFRAT and MFS, but still fell despite installation of early preventive action. One of these patients was a known epileptic who fell from bed following a brief fitting episode. Therefore, appropriate bedding with railings and specification tailored for psychiatric inpatients should be ensured as part of future risk reduction strategy, particularly among high-risk patients [15]. Additionally, neither the measurement tools nor clinical judgment were able to detect the risk of fall in one of the five patients who fell, which explained that the risk of fall among psychiatric inpatients are unexpected, and the risk is difficult to predict.

Both MFS and WSFRAT are clinically useful screening tool to assess the risk of fall among psychiatric inpatients [3,9,10]. However, our findings suggest that WSFRAT takes precedence in the assessment of fall among psychiatric inpatients, particularly when prop-

er clinical judgment is supplemented to address specific risk factors among psychiatric population.

Environmental factors also played a role in the development of fall event [1]. Despite efforts made to assess the risk of fall among inpatients and early intervention was in place to prevent fall, extrinsic factors such as uneven or slippery floor, inadequate lighting or glare, or insecure handrail may also contribute to fall. Additionally, mobile psychiatric inpatients are also at high risk of falls in view of cognitive impairment, use of psychotropic medications, and behaviour manifestation (such as agitation, wandering) [1,2,4,9]. Therefore, findings from root-cause-analysis related to fall events could be used to improve and reduce the risk of future fall. Furthermore, a good communication between the healthcare providers and patient needs to be established to prevent recurrence of fall. Judicial use of temporary chemical or physical restraint may be necessary during the acute psychotic phase with close monitoring.

In summary, screening tool for inpatient fall will promote early institution of preventive strategies based on the identified risk level. Once risk assessment has identified patients who are at risk for fall, care planning and targeted intervention should be matched and tailored to prevent future fall and fall-related injury.

The small number of fall incidents in our study may limit our capacity to generalise the

findings. Therefore, we would suggest for the inclusion of various inpatient psychiatric settings with a larger sample size for future studies. Furthermore, we did not conduct a Kappa statistics for inter-rater analysis prior to the study, which may influence the results; however, because only senior psychiatric medical officers were involved in data collection, we determined that the quality of assessment for both tools was comparable. However, we would recommend that future research utilise a standard list to objectively justify clinical judgment in order to maintain uniformity, regardless of profession or working experience.

WSFRAT is a reliable and sensitive tool in the detection of risk of fall among psychiatric inpatients as compared to MFS. However, comprehensive psychiatric assessment and clinical judgement of the attending staffs override the objective assessment score and proved to be more accurate in determining the risk of fall among psychiatric inpatients.

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Conflict of interest

None to declare.

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