FALL RISK EVALUATION SCALES: AN INTEGRATIVE LITERATURE REVIEW

ESCALAS DE AVALIAÇÃO DE RISCO PARA QUEDA: REVISÃO INTEGRATIVA DA LITERATURA

ESCALAS DE EVALUACIÓN DE RIESGO DE CAÍDAS: REVISIÓN INTEGRATIVA DE LA LITERATURA

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Objective: to characterize and qualify fall risk evaluation scales validated for application in hospitalized adult patients. Method: an integrative literature review that included investigations developed with hospitalized patients 18 years old or older after consulting the LILACS, PubMed, CINAHL, and Embase databases. Results: 319 papers were found, among which nine were included in the present review. Most scales were developed between 1989 and 1999 and oriented to assess fall risk in adults and elderly people. The domains mobility (88.8%), fall history (88.8%), mental state (66.6%), incontinence (77.7%), use of medications (66.6%), and sensory deficit (55.5%) were used most often. Four scales (44.4%) showed test results for the evaluation of psychometric properties. Conclusion: the scales found in the scientific literature did not present a consensus on the domains for fall prediction and most were not submitted to evaluation of the recommended psychometric properties.


Objetivo: caracterizar e qualificar escalas de avaliação de risco de quedas validadas para emprego entre pacientes adultos hospitalizados. Método: revisão integrativa da literatura que incluiu investigações desenvolvidas entre pacientes hospitalizados com idade igual ou superior a 18 anos, consultadas as bases de dados LILACS, PubMed, CINAHL e Embase. Resultados: localizou-se 319 artigos, dos quais 9 foram incluídos nesta revisão. A maioria das escalas foi criada entre os anos de 1989 e 1999, para avaliação de riscos entre adultos e idosos. Os domínios mobilidade (88,8%), história de queda (88,8%), estado mental (66,6%), incontinência (77,7%), uso de medicamentos (66,6%) e déficit sensorial (55,5%) foram mais frequentemente empregados. Quatro escalas (44,4%) apresentaram resultados de testes para avaliação de propriedades psicométricas. Conclusão: as escalas encontradas na literatura científica não apresentaram consenso entre os domínios para predição de quedas e a maioria não foi submetida à avaliação das propriedades psicométricas recomendadas.


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Fall risk evaluation scales: an integrative literature review

Objetivo: caracterizar y calificar escalas de evaluación de riesgo de caídas validadas para su aplicación en pacientes adultos hospitalizados. Método: Revisión integrativa de la literatura que incluyó estudios desarrollados entre pacientes hospitalizados con edad igual o mayor a 18 años, consultadas en las bases LILACS, PubMed, CINAHL y Embase. Resultados: Se obtuvieron 319 artículos, 9 de los cuales fueron incluidos en la revisión. La mayoría de las escalas fueron creadas entre 1989 y 1999, para evaluación de riesgos entre adultos y ancianos. Los dominios movilidad (88,8%), historial de caídas (88,8%), estado mental (66,6%), incontinencia (77,7%), uso de medicamentos (66,6%) y déficit sensorial (55,5%) fueron los más habitualmente empleados. Cuatro escalas (44,4%) presentaron resultados de tests para evaluación de propiedades psicométricas. Conclusión: Las escalas encontradas en la literatura científica no expresaron consenso entre los dominios para la predicción de caídas. La mayoría no fue sometida a evaluación de propiedades psicométricas recomendadas.


Introduction

Fall can be defined as the unintentional displacement of the body compared to its initial position, resulting in an event that cannot be corrected when it occurs, because of multiple factors\(^1\).

Fall prevention is pointed out by health organizations as a priority activity, given that it is a potential problem in most hospitalized patients, regardless of the type of institution\(^2-5\). Falls can cause consequences ranging from an increase in morbidity to death, in addition to leading to physical and psychological damage for patients and their families and having economic implications for health institutions\(^4,5\).

Fall risk in hospitalized patients results from a combination of intrinsic and extrinsic factors, among which age, gender, cognition, functional capacity, depression, anemia, cancer diagnosis and treatment, including chemotherapy, hormone therapy, or radiotherapy, surgery, and nutritional state stand out\(^6,7\). Other aspects also play a role, such as impaired mobility and gait, fall history, vesicointestinal incontinence, visual deficit, pain, and the use of several types of medications, for instance opiates, anticonvulsants, antihypertensives, sedatives, laxatives, and diuretics\(^8\).

Measures to prevent falls go through an accurate approach and require several interventions such as evaluation of patients, risk identification, and implementation of interventions and educational actions\(^4\). Therefore, despite the recognition that it is impossible to eliminate the fall risk, it is considered that an assertive evaluation can minimize it significantly\(^1\), in addition to allowing the implementation of interventions suitable to the needs of each patient\(^5-10\).

To achieve this goal, there are tools of varied configurations, such as the Morse Fall Scale\(^11\), the St. Thomas Risk Assessment Tool\(^12\), the Conley Scale\(^13\), Hendrich II\(^14\), and the Hester Davis Scale\(^15\). Despite these alternatives, it is important to stress that some of them were designed in the 1990s, thus in healthcare delivery settings different from those currently available\(^15\).

Another problem is the low specificity of the existing fall risk evaluation scales, resulting from their low or moderate predictive power\(^16\). It is suggested that the variation in specificity and sensitivity may impact the accuracy of the tools when applied in the care practice, which makes it difficult for nurses to choose the instrument most suitable to their reality\(^2-3\).

To prevent severe damages and even death caused by falls, it is necessary to resort to an efficient and reliable risk evaluation tool, which can identify risks early and help plan and implement interventions to prevent falls\(^16,17\).

Given this context, fall risk evaluation tools must be easy to apply and have proper reliability and validity. However, regardless of the instrument used for this objective, the clinical evaluation of nurses can never be ignored. These professionals play an important role during the evaluation of patients and implementation of interventions that
can reduce or eliminate the risk\(^{18-19}\). Additionally, an efficient fall risk evaluation instrument may be applied by multidisciplinary teams to identify risk factors and help develop intervention plans\(^{20}\). The objective of the present integrative literature review was to characterize and qualify fall risk evaluation scales validated for use in hospitalized adult patients.

**Method**

During the development of the present integrative literature review, the following steps were performed: identification of the subject and drafting of the guiding question, sampling or literature search, data extraction from the included papers, study evaluation and interpretation of results, and synthesis of knowledge or presentation of the review\(^{21}\).

The PICO strategy\(^{22}\) was used to draft the guiding question, in which P (patient/population): hospitalized adult patients, I (intervention): scales/instruments for fall prevention, C (control): does not apply, and O (outcome): fall prevention. Consequently, the resulting guiding question was: What fall risk evaluation scales/instruments validated for use in hospitalized adult patients exist in the scientific literature?

The inclusion criterion was primary studies for validation of fall risk evaluation scales/instruments carried out with hospitalized patients 18 years old or older, published in Portuguese, English, or Spanish. Exclusion criteria were: case studies, experts’ opinions, studies with qualitative design, and scales/instruments that did not describe the validation procedures.

Once the guiding question and inclusion and exclusion criteria were defined, the following controlled descriptors were selected: Accidental Falls, Risk Assessment, and Nursing Assessment. They were combined as controlled and noncontrolled descriptors simultaneously using the keyword search mechanism in titles and abstracts.

The databases used to search for the studies included in the present integrative review were: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medical Literature Analysis and Retrieval System Online (Medline/PubMed), Latin America and Caribbean Center on Health Sciences Information (LILACS), and Embase. The choice of descriptors was based on terms found on the Medical Subject Headings (MeSH), CINAHL Information Systems’ List of Headings, and the Virtual Health Library’s Health Sciences Descriptors (DeCS, as per its acronym in Portuguese).


The search on the gray literature was performed by consulting experts in the nursing and fall prevention area and analyzing references in the publications included in the review, in addition to theses and dissertations about the subject. This part of the search resulted in the localization and inclusion of three investigations (Diagram 1).
Fall risk evaluation scales: an integrative literature review

Diagram 1 – Inclusion and exclusion of papers available in the consulted databases. São Paulo, SP, Brazil – 2017

Extraction of data from the studies included in the review was carried out independently by two researchers, using an instrument that included the following data: paper identification (authors, local, publication type) and methodological characteristics (objective, sample, inclusion and exclusion criteria, data treatment, results, conclusions)\(^{23}\). The investigations were analyzed according to the COnsensus-based Standards for the Selection of Health Measurement INstruments (COSMIN)\(^{24}\). This checklist, recommended for systematic reviews on measurement properties, is made up of three steps, namely: verifying which measurement properties were evaluated, determining what the statistical method used is based on, and checking whether the study meets good methodological quality requisites\(^{24}\).

Results

Nine studies met the proposed inclusion and exclusion criteria. Five (55.5%) were published in the United States of America\(^{13,15,25-27}\), one (11.1%) in Canada\(^{14}\), one (11.1%) in China\(^{20}\), one (11.1%) in England\(^{12}\), and one (11.1%) in Sweden\(^{28}\). Most (five or 55.5%) were published in the 1990s\(^{12,13,25,27-28}\).

The proposed scales were developed based on adult patients who stayed at the ward of the following specialties: geriatrics (4; 44.4%)\(^{11-12,20}\), medical-surgical ward (2; 22.2%)\(^{13,25}\), clinical ward (1; 11.1%)\(^{20}\), neurology (1; 11.1%)\(^{15}\), and one study did not mention the specialty (11.1%)\(^{14}\).

Three scales (33.3%)\(^{11-12,14}\) were submitted to transcultural adaptation, and the Morse Fall Scale\(^{11}\) was the most translated and adapted.
(Australia, Belgium, Brazil, Canada, China, Denmark, France, Germany, Italy, Japan, Korea, Netherlands, Philippines, Portugal, Singapore, Spain, Switzerland, and United States of America). The second and third most translated and adapted scales were the Hendrick scale (Brazil, Italy, Singapore, and United States of America) and the St. Thomas Risk Assessment Tool in the Falling Elderly (Australia, Belgium, Canada, France, Italy, and Netherlands).

To facilitate the understanding of the results, the studies included in the present review were grouped according to publication year, application specialty, origin country, and evaluators in Chart 1.

**Chart 1** – Characterization of the manuscripts included in the review according to publication year, study, scale name, origin country, application specialty, and evaluators. São Paulo, SP, Brazil – 2017

<table>
<thead>
<tr>
<th>Publication year</th>
<th>Study/Scale name/Origin country</th>
<th>Specialty</th>
<th>Number of evaluators and their specialty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>Morse JM, Morse RM, Tylko S</td>
<td>General</td>
<td>21 evaluators. Does not describe the professional category.</td>
</tr>
<tr>
<td></td>
<td>Morse Fall Scale Canada</td>
<td>hospital</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>Hendrich AL, Bender PS, Nyhuis A</td>
<td>Clinical</td>
<td>Does not describe either the number of evaluators or the professional category.</td>
</tr>
<tr>
<td></td>
<td>Hendrich Fall Risk Assessment</td>
<td>ward</td>
<td></td>
</tr>
<tr>
<td></td>
<td>United States of America</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>MacAvoy S, Skinner T, Hines M</td>
<td>Medical-</td>
<td>6 managers and 1 nursing director.</td>
</tr>
<tr>
<td></td>
<td>Fall Risk Assessment Tool</td>
<td>surgical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>United States of America</td>
<td>ward</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Nyberg L, Gustafson Y</td>
<td>Geriatric</td>
<td>Does not describe either the number of evaluators or the professional category.</td>
</tr>
<tr>
<td></td>
<td>Downtown Index</td>
<td>ward</td>
<td></td>
</tr>
<tr>
<td></td>
<td>United States of America</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>Oliver D, Britton M, Seed P,</td>
<td>Geriatric</td>
<td>Does not describe either the number of evaluators or the professional category.</td>
</tr>
<tr>
<td></td>
<td>Martin FC, Hopper AH</td>
<td>ward</td>
<td></td>
</tr>
<tr>
<td></td>
<td>St Thomas Risk Assessment Tool</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>in the Falling Elderly (STRATIFY)</td>
<td>England</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>Conley D, Schultz AA, Selvin R</td>
<td>Medical-</td>
<td>Care nurses.</td>
</tr>
<tr>
<td></td>
<td>Conley Scale</td>
<td>surgical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>United States of America</td>
<td>ward</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>Poe SS, Cvach M, Dawson PB,</td>
<td>Clinical</td>
<td>9 specialized nurses, 2 directors, 1 coordinator, and 1 nursing manager.</td>
</tr>
<tr>
<td></td>
<td>Straus H, Hill P</td>
<td>ward</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Johns Hopkins Fall Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>United States of America</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>Hester AL, Davis DM</td>
<td>Neurological</td>
<td>30 nurses. 5 experts in nursing subjects, occupational therapy, and physical therapy.</td>
</tr>
<tr>
<td></td>
<td>Hester Davis Scale</td>
<td>ward</td>
<td></td>
</tr>
<tr>
<td></td>
<td>United States of America</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>Chang YW, Chang YH, Pan YL,</td>
<td>Geriatric</td>
<td>5 clinical nurses, 5 nursing specialists, physicians, occupational therapists, and physical therapists.</td>
</tr>
<tr>
<td></td>
<td>Kao TW, Kao S</td>
<td>ward</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tw-FRHOP</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>China</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Created by the authors.

The domains most frequently covered by the examined scales were: mobility (8; 88.8%), fall history (8; 88.8%), mental state (6; 66.6%), incontinence (7; 77.7%), use of medications (6; 66.6%), age (3; 33.3%), intravenous devices (2; 22.2%), secondary diagnosis (3; 33.3%), sensory deficit (5; 55.5%), cognitive deficit (3; 33.3%), nutritional condition (1; 11.1%), and gender (1; 11.1%). Chart 2 shows the synthesis of the domains covered in the scales included in the present integrative review.
It was not possible to thoroughly identify the steps developed during the design and validation processes of all the scales included in the present study. The duration of the validation processes was 4, 6, 10, 12, and 24 months. Four studies (44.4%) did not define either the professional category or the number of evaluators involved in the validation of the scale or instrument. In the publications that mentioned this type of information, nurses stood out as the main professional category.

Regarding the psychometric properties of the instruments included in the present review, most scales did not report the results of the statistical tests used to evaluate internal consistency, stability, construct validity, and criterion validity, as recommended by COSMIN. However, results about stability evaluated using the intraclass correlation coefficient, with values equal to 0.90 and 0.96, and the kappa index, with values from 0.716 to 1.0, were identified in two studies. Internal consistency was expressed using the Cronbach’s alpha in two studies, with values of 0.16 and 0.772.

Because of the absence of data related to the scales, it was not possible to apply the second and third steps of the evaluation proposed by COSMIN.

Discussion

The present integrative literature review identified nine validated scales, most of which were proposed in the 1990s. It is noteworthy that, among the publications of transcultural adaptations of three scales, the Morse Fall Scale stood out with the highest number of translations and adaptations, including into Brazilian Portuguese.

It is suggested that many health services perform the evaluation of fall risk in patients by applying a scale designed in 1989, which may have shortcomings in measuring risks to which patients are currently exposed as a consequence of the scientific and technological progress and the advances in treatments and devices used in healthcare that came up in this period.

Additionally, the scales, mostly produced in North America and Europe, include from four to nine domains in their evaluation,
and the most common were those related to mobility, mental state, incontinence, use of analgesic and psychoactive medications, and fall history.

The lack of scales designed by Brazilian researchers raises concerns, because the organization of the Brazilian national health system and the variety of professional categories that make up nursing teams, to name a few factors, diverge from those of the countries where the scales were developed. This may impact on the application of the assessment and nurse care aimed at preventing falls.

Reaching a consensus on the domains covered in the scales is urgent, because the use of a tool that can comprehensively assess fall risk factors is an essential element to minimize the occurrence of these events, contributing to improving nursing care itself. Reaching a consensus on the domains covered in the scales is urgent, because the use of a tool that can comprehensively assess fall risk factors is an essential element to minimize the occurrence of these events, contributing to improving nursing care itself.

Regarding the measure properties examined in the scales, a variation among the studies was observed. Most investigations did not show or carry out any statistical test to evaluate the indicated psychometric properties. The psychometric property mentioned most often was stability, identified in four studies, two of which reporting intraclass correlation coefficients with values approaching 1 and two of which mentioning the kappa test, with values higher than 0.716. The application of a scale by different users indicates instrument reliability. Applying properly validated tools may help nurses in their clinical practice, resulting in greater safety in the indication of nursing care oriented to preventing falls and the associated morbidity.

In addition to listing the fall risk evaluation scales that may be used in the delivery of nursing care in several categories of patients as soon as the instruments' specificities are taken into account, the present integrative review emphasizes that healthcare professionals, especially nurses, can play a central role in detecting and minimizing fall risks. It is also noteworthy the absence of Brazilian publications on the subject among the selected studies. It is suggested that Brazilian researchers develop scales adapted to the Brazilian healthcare delivery reality and the multiple categories of patients.

The methodological diversity adopted in the study design and validation processes was considered an important limitation in the present literature review, because it compromised the application of the COSMIN checklist. To circumvent this limitation, the authors tried to extract the most information that suited the methodology chosen to evaluate the studies.

**Conclusion**

It was verified that most fall risk evaluation scales were proposed in the 1990s and submitted to different validation processes, developed with a focus on the evaluation of clinical or surgical patients, although there were instruments aimed at the geriatric population. The number of domains assessed by these scales was diverse, ranging from four to 11. Among them, mobility and fall history stood out, being included in most examined scales. Additionally, the low methodological quality of the selected investigations became clear, given that they did not show or were not submitted to an evaluation of all the internationally recommended psychometric properties.

Therefore, the subject is little explored at present, although its importance as an indicator of quality and safety in the care to patients continues to grow in health services.

**Collaborations:**

1. conception, design, analysis and interpretation of data: Daniela Andrade, Ramon Antonio Oliveira, Ruth Natalia Teresa Turrini, and Vanessa de Brito Poveda;

2. writing of the article and relevant critical review of the intellectual content: Daniela Andrade, Ramon Antonio Oliveira, and Vanessa de Brito Poveda;

3. final approval of the version to be published: Daniela Andrade, Ramon Antonio Oliveira, Ruth Natalia Teresa Turrini, and Vanessa de Brito Poveda.
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