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SYNCOPE: A NARRATIVE REVIEW OF THE SCORES AND THEIR APPLICABILITY IN THE EMERGENCY ROOM

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Abstract: **Goal:** To explain the clinical scores related to syncope and their applicability in the management of this syndrome. Methods: Narrative review of the literature based on 32 articles that ranged between 2019 and 2023. Results: Syncope, in most cases, has an underlying benign etiology. However, 20% of patients who consult emergency services present manifestations of concomitant potentially fatal disease, generally of cardiovascular origin. Scales that can be used to assess short-term outcomes include the São Francisco scale, for predicting death and serious events within 7 days; the Boston Scale, ROSE and the Canadian Syncope Risk Score, which seek to predict serious events within a month. The EGSYS and OESIL scales, in turn, are used for long-term assessment, the first to predict serious outcomes within one year and the second within two years. **Conclusion:** It was evident that the Canadian Syncope Risk Score represents the score with the best performance and greatest applicability in the clinical context. However, this score still has significant limitations - low specificity, for example -, making additional studies essential.
Keywords: Syncope; Prognosis; Emergency Identification.

INTRODUCTION

Syncope is classified as the sudden and transient loss of consciousness associated with the loss of postural tone that presents rapid and spontaneous recovery, which does not cause permanent neurological damage (ROCHA EA, et al., 2021). Patients who report loss of consciousness require immediate attention to identify the cause and undergo risk stratification, which is essential to establish appropriate treatment (YASA E, et al., 2019). Furthermore, these individuals may present greater risks of mortality and morbidity, as well as several associated comorbidities (ROCHA EA, et al., 2021).

The São Francisco Syncope Rule, the Canadian Syncope Risk Score (CSRS), the Martin Pittsburg Scale, the Assessment of Guidelines in the Study of Syncope (EGSYS), the Boston Scales, and the OESIL Syncope Score were developed to be used in the initial screening of individuals with syncope in Emergency Departments. In summary, risk stratification has, among other objectives, to estimate the prognosis and influence the hospitalization decision (ROOPINDER K, et al., 2020).

Worldwide, the frequency of hospitalizations resulting from a syncopal event is common and leads to high health costs. An annual expense of US$ 1.7 is estimated

million and approximately US$22 to 26 thousand per hospitalization in the United States (GOLDBERGER Z, et al., 2019). Furthermore, it is clear that 7% to 23% of patients who experience an unexplained syncope event develop an adverse event, such as heart attack, bleeding and even death (SWEANOR ALR, et al., 2020).

With regard to mortality from syncope in the Brazilian context, 92 deaths were registered in the Information Technology Department of the Unified Health System (DATASUS) between 2018 and 2021. Therefore, as it is a constant pathology in health services, which can be caused by life-threatening conditions, such as cardiac arrhythmia, pulmonary embolism, orthostatic hypotension and reflex syncope ("vasovagal"), usually with an unexplained etiology, a deeper analysis of this topic is important (SWEANOR ALR, et al., 2020).

The objective of the study is to expose the clinical scores related to syncope and their applicability in the management of this syndrome.

METHODOLOGY

A narrative review of the literature was carried out based on 27 articles that ranged from 2008 to 2022, in the months of July to September 2023. The articles covered the Portuguese, English and Spanish languages and were taken from the DATASUS, Scielo, ScienceDirect and JAMA network. The descriptors used were "Syncope", "Prognosis", "Identification of the emergency".

RESULTS

Syncope, in most cases, has an underlying benign etiology. However, 20% of patients who consult emergency services present manifestations of concomitant potentially fatal disease, generally of cardiovascular origin. This way, syncope becomes a challenge for the emergency clinician when defining which patients must be properly admitted and observed. In this context, there is a need for tools capable of predicting the risks of mortality or other serious outcomes, both in the short and long term (DÍAZ-TRIBALDOS DC, et al., 2018)

Scales that can be used to assess short-term outcomes include the São Francisco scale, for predicting death and critical events within 1 week; the Boston Scale, ROSE and the Canadian Syncope Risk Score, which seek to predict serious events within 30 days. The EGSYS and OESIL scales, in turn, are used for long-term assessment, the first to predict serious outcomes in one year and the second in two years (DÍAZ-TRIBALDOS DC, et al., 2018).

SÃO FRANCISCO RULE

Syncope is a transient episode of unconsciousness, which prevents many patients from seeking emergency care. Therefore, they are not subjected to hospital investigation. After stating this, a study was carried out in 2004 in a hospital in São

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Francisco with the aim of stratifying patients who had a poor prognosis (LIANG Y, et al., 2022).

Parameters assessed on this scale include abnormal electrocardiogram (ECG) results, hematocrit levels below 30%, history of congestive heart failure, complaints of dyspnea and systolic blood pressure below 90 mmHg. One factor that facilitates its use is the existence of the acronym CHESS, which stands for congestive heart failure history, hematocrit, EKG abnormal, shortness of breath symptoms and systolic BP. This way, memorization becomes easier (CANAKCI ME, et al., 2022).

The São Francisco Rule has a sensitivity of 86% and specificity of 46%, whose low specificity value may reflect the subjectivity in the evaluation of exams, such as the ECG. In medical practice, sensitivity is the ability to correctly identify individuals who have the disease, while specificity is the ability to identify those who are not sick. In other words, the low specificity value ends up increasing the chances of a result being false positive (SERRANO LA, et al., 2010).

Despite its limitations, the São Francisco Rule presented superior performance, avoiding unnecessary hospitalizations (SWEANOR RA, et al.,2020). Therefore, in the absence of more precise risk stratification strategies, SFSR can be understood as a viable alternative to contribute to clinical diagnosis.

BOSTON SYNCOPE MANAGEMENT PATHWAY (BSCMP)

Boston Syncope Management Pathway, also known as the Boston Scale or Boston Syncope Criteria, is a tool used to investigate and individualize patients who present to the emergency room complaining of syncope. It was developed by emergency doctors and cardiologists in 2007, with the aim of establishing a consensus on whether or not hospital admission is necessary according to the symptoms and comorbidities presented by patients. The scale also determines the possible major adverse effects and risks that patients may experience within a month, after the initial visit to the emergency room (MECHANIC OJ, et al., 2019).

The Boston Scale is categorized by eight main risk factors, which include signs and symptoms of acute coronary syndrome, history of previous heart disease, family history of sudden death, valvular heart disease, signs of cardiac conduction disease, volume depletion, abnormal vital signs persistent for more than five minutes and involvement of the central nervous system. It is also used to analyze patients with pre-syncope or lipothymia, who present a sensation of loss of senses and muscle strength, but without sudden loss of consciousness and with full conservation of respiratory and cardiac functions (MUHTASEB O, et al., 2021).

The scale has a sensitivity of 97%, specificity of 62%, negative predictive value (NPV) of 99% and positive predictive value of 44%. Therefore, there is a certain security for its use, since the VPN is essential for emergency physicians when determining who must be discharged appropriately and safely (MUHTASEB O, et al., 2021). Furthermore, they reduce hospital admission rates and significantly reduce the number of returns and readmissions, providing a certain advantage given the financial restrictions involved in the current healthcare context. (MECHANIC OJ, et al., 2019). However, at this point it is not clear whether there is a reduction in hospitalization in pre-syncope, even though these patients are as likely as patients with syncope to experience serious adverse effects after discharge (GROSSMAN SA, et al., 2012).

ROSE SCALE (RISK STRATIFICATION OF SYNCOPE IN THE EMERGENCY DEPARTMENT)

The ROSE scale was created with the aim of optimizing the management of patients who arrive at the hospital with syncope, separating them into low risk and high risk more quickly. His idea for creation came from a meeting with medical professionals from the areas of emergency, cardiovascular, geriatrics and statistical medicine in January 2007 (REED MJ, et al., 2010)

The Scale is made up of Brain Natriuretic Peptide (BNP) Level ≥ 300pg/ml; Bradycardia ≤50 in the emergency or pre-hospital department; rectal examination with occult blood in the feces (if gastrointestinal bleeding is suspected); anemia with hemoglobin ≤90 g/l; chest pain related to syncope; ECG with Q wave (except in lead III); and saturation ≤94% in room air. If 1 item is confirmed, the patient is already classified as high risk. The acronym BRACES help with memorization, as the B stands for BNP and bradycardia, R for Rectum, A for anemia, C for Chest Pain, E for ECG, and S for saturation. Of all the items, the most relevant is BNP, as its increase implies a poor prognosis (REED MJ, et al., 2010).

The Rose Scale presents few studies on its reliability and applicability, with data only evaluated in 2010. Therefore, it is still unable to accurately assess high-risk patients. In practice, this means that it can be useful in helping the professional make decisions, but it cannot be the only factor evaluated (SWEANOR RAL, et al., 2021).

SCORE OESIL

OESIL was created and tested in 2002 by doctors from the Department of Cardiology at Hospital San Filippo Neri due to the need for a tool that would help with clinical judgment and making appropriate decisions regarding the treatment of patients with syncope (PABÓN GM, et al, 2016). This score estimates the risk of mortality in 12 months from all causes in patients admitted to the emergency room due to syncope and is a rapid clinical test, which is used to stratify the patient's risk (DIAZGRANADOS L, et al., 2017).

With this in mind, OESIL is a simple prognostic tool that encompasses demographic, historical and laboratory characteristics that can be used to benefit and simplify patient care during screening and, thus, provide better treatment. Its evaluation criteria include four clinical characteristics that determine the risk of mortality and serious complications in individuals with syncope: 1) Abnormal electrocardiogram (1 point); 2) Absence of prodromal symptoms (1 point); 3) History of cardiovascular disease (1 point); 4) Age over 65 years old (1 point) (LIANG Y, et al., 2022).

Therefore, if the patient's score is between zero and one point, it is a low-risk classification with mortality between 0 and 0.8%. If the patient presents between two and four points, which is the maximum score, there is a high-risk classification, with mortality ranging from 19.6 to 57.1%. In low-risk patients, only a clinical assessment and outpatient follow-up may be considered. On the other hand, in those with a high-risk classification, it is necessary to continue with hospitalization for a more intense diagnostic and therapeutic approach in search of reducing mortality (COLIVICCHI, 2002; DIAZGRANADOS L, et al., 2017).

The OESIL score has high values of sensitivity (97%), specificity (73%) and negative predictive value (99%) and a low positive predictive value (32%). This way, it has a good performance for predicting the patient's death within 12 months from all causes, in addition to carrying out risk classification, in order to indicate the best

treatment that suits the patient's conditions (DE LAVALLAZ JF, et al., 2018).

SCORE EGSYS (EVALUATION OF GUIDELINES IN SYNCOPE STUDY)

The Evaluation of Guidelines in Syncope Study (EGSYS) is a score that was created and validated with the aim of classifying syncope episodes as a cardiac cause or not and evaluating the patient's long-term prognosis in the Emergency Department.

The score evaluates six clinical characteristics obtained during the initial evaluation, namely the existence of heart disease or abnormal 12-lead ECG (+3 points); palpitations before syncope (+ 4 points); syncope precipitated by exertion (+3 points); syncope in lying position (+2 points); vegetative prodromes (-1 point) and existence of precipitating factors (- 1 point) (DE SOUSA BISPO, et al., 2020).

In cases of scores < 3, the cardiac cause can be ruled out and the patient has a low risk of mortality. Scores ≥ 3 indicate a greater probability of cardiac syncope and a worse prognosis, requiring hospitalization. Furthermore, the presence of a score > 4 suggests the diagnosis of cardiac syncope and hospitalization is indicated (LIANG Y, et al., 2022). The EGSYS has good sensitivity (92%) and specificity (69%) for selecting patients with cardiac syncope in the emergency room, being considered useful for assisting doctors in the emergency room and reducing hospitalizations (KARIMAN H, et al; 2015). However, the score did not show satisfactory accuracy to replace the clinical judgment of specialists in cardiac syncope in patient management (LIANG Y, et al., 2022).

Compared to the São Francisco Rule and the OESIL Score, the EGSYS presented an advantage in the evaluation of individuals with cardiac syncope in the emergency environment, as it was shown to be able to identify high-risk patients even in the absence of an abnormal electrocardiogram or heart disease. Thus, it manages to prevent a worse prognosis for the patient more effectively and quickly than the other scores compared (DEL ROSSO A, et al; 2008).

CANADIAN SYNCOPE RISK SCORE - CSRS:

The Canadian Syncope Risk Score (CSRS) corresponds to the most recent risk stratification and is an instrument designed with the purpose of predicting serious outcomes within 30 days after care in the Emergency Health Service. This score was developed based on in a prospective cohort study carried out using data obtained from university hospitals in four cities in Canada between 2010 and 2014, which had a sample of 4,030 patients aged 16 years or over who sought the emergency department within 24 hours after a syncope episode (VENKATESH T, et al., 2020).

Analysis of the data obtained allowed the creation of a model composed of nine risk criteria: three are results of clinical assessment, four are results of additional tests and two consider the etiology of syncope. The points assigned to each predictor vary between -2 and 2 and their sum varies between -3 and 11. Furthermore, the result of each sum corresponds to one of the following five risk categories: very low risk (-3 and -2), low risk (-1 and 0), medium risk (1 and 3), high risk (4 and 5) or very high risk (6 to 11). (VENKATESH T, et al., 2020).

By establishing the risk classification, the medical professional is able to decide between admission to an inpatient unit or outpatient observation of the patient. To guide this decision, there are two guidelines available: the first was developed jointly between the American Cardiovascular College, the

American Heart Association and the Heart Rhythm Society (ACC/AHA/HRS); and the second prepared by the European Society of Cardiology (ESC). Both agree that very low-risk or low-risk patients must be monitored on an outpatient basis, while high- or very high-risk patients must be admitted to the hospital.

However, there are differences regarding the management of intermediate categories: the ACC/AHA/HRS suggests that this category of patients be kept under observation for a limited time (average of 6 to 48 hours) and receive free access to exams and consultations with cardiologist; on the other hand, the ESC recommends the admission of patients to specialized syncope units (GOLDBERG Z, et al., 2019). However, despite presenting favorable evidence, the admission of medium-risk individuals to syncope units does not correspond to a viable strategy in all contexts, as these units are only common in European countries and the United Kingdom. As an alternative, the ECS suggests outpatient follow-up if syncope units are not available (BRIGNOLI M, et al., 2018).

The Canadian Syncope Risk Score stands out when compared to other scores in several aspects. Firstly, this score was created based on the largest prospective syncope study to date - the larger the sample size, the more precise the estimates obtained. Furthermore, the score presents well-established predictors regarding electrocardiogram changes (abnormal QRS axis, prolongation of the QRS interval and prolonged corrected QT interval), unlike other scores, which adopt unclear definitions regarding ECG normality (VENKATESH T, et al., 2020).

Regarding clinical applicability, the Canadian score appears to be quite efficient, as it uses simple criteria and additional, easily accessible exams as predictors. On the other hand, some scores have a very extensive list of criteria, such as, for example, the Boston Scale composed of 25 predictors; or choose as parameters tests that are not easily found in health services, such as the dosage of natriuretic peptide taken into consideration, by the Syncope Risk Stratification in the Emergency Department (ROSE) (VENKATESH T, et al., 2020).

The CSRS has great credibility as it has external validation. In 2020, a study carried out in 8 different countries reaffirmed the safety and applicability of the score. Furthermore, it revealed that when compared to the OESIL score, the Canadian Syncope Risk Score presents better performance in predicting a good prognosis in patients classified as low risk. In summary, only 0.6% of patients classified as low risk by the CSRS developed a serious event within 30 days, on the other hand, 1.5% of patients stratified by the OESIL developed unfavorable outcomes (ZIMMERMANN T, et al., 2020).

Although it presents significant advantages, the Canadian Syncope Score has some limitations. In short, the cohort used to prepare it only considered patients who were admitted to emergency services within 24 hours after a syncopal episode. Therefore, patients who took longer to seek the emergency department after experiencing syncope could not be evaluated. Finally, despite having a significantly high sensitivity (97.8%), the Canadian score presented low specificity (44.3%), which translates into a limited ability to predict true negatives (VENKATESH T, et al., 2020).

CHOOSING THE MOST APPROPRIATE SCORE

Currently, no guidelines recommend a specific stratification method, likely due to the availability of many risk assessment strategies as well as the lack of systematic reviews that are conclusive in comparing them. Using

quantitative data such as sensitivity and specificity must be a strategy for choosing the most appropriate score, however, the heterogeneity between validation studies for each score and the divergence between some values obtained make a choice based exclusively on quantitative analysis unfeasible. Therefore, qualitative criteria need to be taken into consideration when comparing scores (SWEANOR R, et al., 2020).

A recent systematic review found, based on a qualitative analysis and predictive accuracy, that among the available scores, the CSRS represents the most accurate. The study also revealed that some rules, such as OESIL, for example, lack precision, while others are limited in identifying high-risk patients, such as SFSR, the Boston Criteria and ROSE (SWEANOR R, et al., 2020). In addition to this, another analysis compared the scores with the use of biomarkers in isolation, which concluded that their prognostic accuracy is superior to that of the ROSE Scale, OESIL and SFSR, being surpassed only by the prognostic accuracy of the CSRS (DE LAVALLAZ J, et al., 2019). In view of this, it is clear that despite there being no direct recommendation from the guidelines, the use of the CSRS in clinical practice appears to be the appropriate choice.

CONCLUSION

Syncope represents a common reason for seeking emergency services. Furthermore, its evolution varies considerably from benign prognoses to deaths. Therefore, we understand the need for tools that standardize the risk stratification of syncopal patients and guide appropriate conduct for each risk category. In summary, the present work analyzes four scores used to predict serious short-term outcomes in patients with syncope, namely the São Francisco Rule, Rose Scale, Boston Scale and Canadian Syncope Risk Rule; and two scores that seek to predict serious adverse events in the long term: OESIL and EGSYS, the latter being used to distinguish between syncope of cardiogenic and non-cardiogenic origin.

The results obtained revealed that the SFSR has low specificity, while the Rose Scale contains few studies that validate it. The Boston Scale, in turn, has reduced clinical applicability due to its long list of predictors. Regarding long-term scores, the OESIL lacks precision and the EGSYS presents lower accuracy than clinical judgment. Finally, it is clear that the Canadian Syncope Risk Score represents the score with the best performance and greatest applicability in the clinical context. However, this score still has specific limitations - low specificity, for example -, making additional studies essential.

Table 1: Risk scores for patients with syncope						
Study	**Risk factors**	**Score**	**End**	**Results**	**Conduct**	**Validation**
São Francisco Rule	Abnormal ECG Dyspnea Ht < 30% Systolic pressure < 90 mmHg	0-5 (1 point per item)	Severe events in 7 days – short term	0: no risk ≥ 1: present risk	Presence of risk = hospitalization	Sensitivity: 98% Specificity: 56%
Boston Scale	Signs and symptoms of acute coronary syndrome Cardiac history worrisome Family history of sudden death Valvular heart disease Signs of conduction disease Volume decrease Persistent abnormal vital signs (> 15 min) Central nervous system impairment	0-25 (1 point per item)	Serious events in 30 days – short term	0: no risk ≥ 1: present risk	Presence of risk = hospitalization	Sensitivity: 97% Specificity: 62%
ROSE scale	BPN level ≥ 300pg/ml Bradycardia (≤ 50 bpm) Anemia (Hb ≤ 90 g/l) ECG abnormality (presence of pathological Q waves, except lead III) Oxygen saturation ≤ 94% Positive fecal occult blood	0-6 (1 point per item)	Serious events and death from all causes within 30 days – short term	0: no risk ≥ 1: present risk	Presence of risk = hospitalization	Sensitivity: 87.2% Specificity: 65.5% VPN: 98%
EGSYS score	Palpitation before syncope (+4) Presence of heart disease or abnormal 12-lead ECG (+3) Syncope in lying position (+2) Vegetative prodromes (-1) Existence of precipitating factors (-1)	Sum of all points	Cardiac syncope and death from all causes within 2 years – long term	< 3: low probability of cardiac cause/low risk of death ≥ 3: possible cardiac cause/high risk of death	Hospitalization	Sensitivity: 92% Specificity: 69%

OESIL score	Abnormal ECG Absence of prodromal symptoms History of cardiovascular disease Age > 65 years	0-4 (1 point per item)	Mortality in 12 months – long term	≤ 1: low risk >1: high risk	Outpatient follow-up Hospitalization	Sensitivity: 97% Specificity:73% VPN: 99% PPV: 32%
Canadian Syncope Risk Score	Predisposition to vasovagal symptoms (-1) History of heart disease (1) Systolic pressure < 90 or 180 mmHg (2) Elevated troponin level (> 99th percentile of the normal population) (2) Abnormal QRS axis (< -30° or >100°) (1) QRS duration > 130ms (1) Corrected QT interval > 480ms (2) Vasovagal syncope (-2) Cardiac Syncope (2)	Sum of all points	Serious events in 30 days – short term	-2 and –3: very low risk -1 and 0: low risk 1 to 3: medium risk 4 and 5: high risk 6 and 11: very high risk	Outpatient follow-up ACC/AHA/ HRS - Observation (from 6 to 48h) /ESC - admission to syncope unit Hospitalization	Sensitivity: 97.8% Specificity: 44.3%

Table 1: Risk scores for patients with syncope

Subtitle: ECG= Electrocardiogram, Ht = Hematocrit, Hb = Hemoglobin, ACC/AHA/HRS = American College of Cardiology/American Heart Association/Heart Rhythm Society, ESC = European Society of Cardiology. PPV = Positive predictive value, NPV = negative predictive value.

Source: Prepared by the authors based on Sandhu RK, et al., 2019; Venkatesh T, et al., 2020; Sutton R, et al.,2022; From Lavallaz JF, et al.,2018.

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