Usefulness of Syncope Guidelines in Risk Stratification of Syncope in Emergency Department

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Background: *Management of patients with syncope in the Emergency Department now focuses on identifying patients who will be at future risk of serious morbidity. Among the risk stratification scoring systems being used were the San Francisco Syncope Rule (SFSR) and Osservatorio Epidemiologico sulla Sincope nel Lazio (OESIL) score.*
Objective: *To assess the accuracy of SFSR and OESIL score at predicting short-term serious outcome in Maharaj Nakorn Chiang Mai Hospital.*
Material and Method: *In a prospective descriptive analysis study, adult patients presenting with syncope or near syncope between October 1, 2009 and April 24, 2010 were enrolled. All patients were followed-up at 7-day and 1-month. Statistical analysis included accuracy, sensitivity, specificity, predictive values, and likelihood ratios.*
Results: *One hundred seventy eight patients were enrolled in the present study. Fifty-three patients had a short-term serious outcome on follow-up. SFSR had 74.7% accuracy, 90.6% sensitivity, 68% specificity, 54.5% PPV, 94.4% NPV, likelihood ratio positive (LR+) of 2.8, and likelihood ratio negative (LR-) of 0.1, whereas OESIL score had 80.9% accuracy, 79.4% sensitivity, 81.6% specificity, 64.6% PPV, 90.3% NPV, LR+ of 4.3, and LR- of 0.2.*
Conclusion: *Both scores have good accuracy and sensitivity, but they should not be used as the only device in patient disposition. However, both scores showed a low false negative rate. Therefore, they may help in helping physician discharge low-risk patients.*

Keywords: *Syncope, San Francisco Syncope Rule, OESIL risk score*

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Syncope is a symptom complex that is composed of a brief loss of consciousness associated with an ability to maintain postural tone that spontaneously and completely resolves without medical intervention[1]. It accounts for approximately 1 to 3% of Emergency Department (ED) visits[1], affecting six per 1,000 people per year in USA[2]. In Maharaj Nakorn Chiang Mai Hospital, data from medical record in 2008 showed 401 cases of syncope, with 50 patients needing hospitalization.

The cause of syncope varies. Most causes are benign, but some are associated with morbidity and mortality, which in turn increases unnecessary hospital admission due to its unclear etiology. There is currently no practical guideline in disposition of patients with syncope available, but several attempts were made to identify patients with high-risk of developing serious outcome using risk stratification scores. Unfortunately, the scoring systems were not accurate enough and thus, not widely accepted worldwide[3-6].

The San Francisco Syncope Rule (SFSR) is one of the risk stratification scoring system for patients with syncope developed by Quinn JV et al[3]. It consists of five predictors; a complaint of shortness of breath, a history of congestive heart failure, systolic blood pressure less than 90 mm Hg, hematocrit level less than 30%, and an abnormal ECG result. Patient with any of the predictors is considered to have a high-risk of developing short-term serious clinical event. This risk scoring system demonstrated 96% sensitivity and 62% specificity[3]. In a prospective study to validate the scoring system, it demonstrated 98% sensitivity and 56% specificity[4].

The Osservatorio Epidemiologico sulla Sincope nel Lazio (OESIL) score is another risk stratification scoring system for patients with syncope developed by Colivicchi F et al[5]. The OESIL score includes four predictors, age >65 years, a history of cardiovascular disease, syncope without

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prodromal symptoms, and an abnormal ECG result. It is calculated with a simple arithmetic sum of the number of predictors presented. This risk scoring system demonstrated an increased mortality of 0, 0.8, 19.6, 34.7, and 57.1% for a score of 0, 1, 2, 3, and 4, respectively[5].

The SFSR and OESIL score were externally validated in many studies following their publications. Some studies yield the same result[6-8], whereas some demonstrated lower sensitivity and likelihood ratios, and suggested that these scoring systems are not appropriate for ED use[9].

Objective

To assess accuracy of San Francisco Syncope Rule (SFSR) and Osservatorio Epidemiologico sulla Sincope nel Lazio (OESIL) score at predicting short-term serious outcome in Maharaj Nakorn Chiang Mai Hospital.

Study design

Prospective descriptive analysis study.

Material and Method

Participants

Adult patients presenting with syncope or near syncope in Maharaj Nakorn Chiang Mai Hospital between October 1, 2009 and April 24, 2010.

Enrolment into study

Inclusion criteria

Adult patients, age ≥18 years old, presenting with syncope or near syncope according to the following definition. Syncope is defined as a brief loss of consciousness associated with an ability to maintain postural tone that spontaneously and completely resolves without medical intervention[1].

Near syncope is defined as a feeling of going into syncope, without syncope actually happened.

Exclusion criteria

1. Patients with altered mental status, alcohol or illicit drug-related loss of consciousness, and definite seizure.
2. Patients with head trauma.
3. Patients who did not want to participate in this study.

Method

Data from patients presented with syncope or near syncope in Maharaj Nakorn Chiang Mai Hospital between October 1, 2009 and April 24, 2010 according to the inclusion and exclusion criteria were collected based on SFSR and OESIL scoring system.

Calculate the patient's data according to SFSR and OESIL score in order to assess the risk of developing short-term serious outcome. The physician's decision whether to admit or discharge was also documented. The present study had no effect on physician's judgment on patient disposition.

The patient was then asked to participate in the study, with written documents and explanation of the study purpose given. Informed consent and the patient's contact information were then obtained for further follow-up purpose.

All patients were followed-up at 7-day and 1-month by medical record and/or telephone to determine whether they had a short-term serious outcome, which was defined as either, death from any cause, acute myocardial infarction, life-threatening arrhythmia, pulmonary embolism, cerebrovascular accident or subarachnoid hemorrhage, or significant hemorrhage requiring a blood transfusion of two or more units.

Approval of the study by the hospital's ethic committee was made before data were collected.

Statistical analysis

Statistical analysis included accuracy, sensitivity, specificity, predictive values with their 95% confidence intervals, and likelihood ratios of SFSR and OESIL score to predict short-term serious outcome. Calculations were done by using SPSS version 10. A p-value of less than 0.05 was considered statistically significant.

Results

Two hundred seventy six patients presented with syncope and near syncope in the emergency department, Maharaj Nakorn Chiang Mai Hospital between October 1, 2009 and April 24, 2010. Only 178 patients met the criteria and participated in the study. Ninety-eight patients were excluded due to age, symptoms not consistent with definition of syncope or near syncope, or insufficient data.

Of 178 patients enrolled into the study, mean age was 52.3 years old (SD 19.4), and 48.9% of the patients were male. Mean systolic blood pressure was 129.3 mmHg and mean hematocrit was 36.4%. In those patients, 49.9% were considered high-risk patients according to SFSR, while 33.7%, 29.8%,

24.7%, 10.7%, and 1.1% had OESIL score of 0, 1, 2, 3, and 4, respectively. Characteristic of patients enrolled are shown in Table 1.

Eighty-six patients (48.3%) were admitted to the hospital. Of this, 62 patients (70.4%) were in the high-risk group according to SFSR, while 10, 24, 32, 18, and two (16.7%, 45.3%, 72.7%, 94.7%, and 100%) had OESIL score of 0, 1, 2, 3, and 4, respectively.

After following-up at 7-day and 1-month, 53 patients (29.8%) had short-term serious outcomes. There were three deaths (1.7%), four acute myocardial infarctions (2.2%), 20 life-threatening arrhythmias (11.2%), 10 cerebrovascular accidents (5.6%), and 16 significant hemorrhages requiring blood transfusion of two or more units (8.9%).

Sixty-two patients (70.4%) in high-risk group according to SFSR were admitted to the hospital. Short-term serious outcomes occurred in 48 patients (54.5%). While 0, 11, 26, 14, and two patients (0%, 20.8%, 59.1%, 73.7%, and 100%) with OESIL score of 0, 1, 2, 3, and 4 had short-term serious outcomes.

When calculated from data according to Table 2, SFSR had accuracy 74.7%, sensitivity 90.6% (95% CI 79.8-95.9), specificity 68% (95% CI 59.4-75.5), positive predictive value 54.5% (95% CI 43.6-65.1), negative predictive value 94.4% (95% CI 86.5-97.9), likelihood ratio positive (LR+) of 2.8, and likelihood ratio negative (LR-) of 0.1.

The study of OESIL score did not categorize patients into low-risk and high-risk group as SFSR. Therefore, we cannot calculate its performance in the same fashion. However, we sought to determine the cut point for which to categorize patients into low-risk and high-risk group by using a Receiver Operating Characteristic curve (Fig. 1). The best cut point to categorize patients into low-risk and high-risk group is 1. As a result, we categorized patients with OESIL score of 0 and 1 as low-risk group and those with OESIL score of 2 or more as high-risk group. The performance of OESIL score was calculated in the same fashion as SFSR as shown in Table 3, and accuracy 80.9%, sensitivity 79.2% (95% CI 66.5-88), specificity 81.6% (95% CI 73.9-87.4), positive predictive value 64.6% (95% CI 51.7-75.8), negative predictive value 90.3% (95% CI 82.9-94.8), likelihood ratio positive (LR+) of 4.3, and likelihood ratio negative (LR-) of 0.3 were found. The results were similar to those calculated with ROC curve, accuracy 80.9%, sensitivity 79.2%, and specificity 81.6%.

Table 1. Characteristic of patient enrolled into the study

Characteristics	n = 178
Age (years), (mean ± SD)	52.3±19.4
Sex	
Male	87 (48.9%)
Female	91 (51.1%)
Systolic blood pressure (mmHg), (mean ± SD)	129.3±30.5
Hematocrit (%), (mean ± SD)	36.4±8.2
San Francisco Syncope Rule (SFSR)	
Low risk group	90 (50.5%)
High risk group	88 (49.5%)
Osservatorio Epidemiologico sulla Sincope nel Lazio (OESIL)	
0	60 (33.7%)
1	53 (29.8%)
2	44 (24.7%)
3	19 (10.7%)
4	2 (1.1%)

Table 2. Performance of SFSR for all short term serious outcomes

SFSR	Short term serious outcomes		Total
	Present	Absent	
High risk group	48	40	88
Low risk group	5	85	90
Total	53	125	178

Table 3. Performance of OESIL for all short term serious outcomes, with a cut point of 1

OESIL score	Short term serious outcomes		Total
	Present	Absent	
High risk group (2-4)	42	23	65
Low risk group (0-1)	11	102	113
Total	53	125	178

Discussion

San Francisco Syncope Rule (SFSR)

SFSR has a high sensitivity of 90.6%. However, a high positive predictive value of 54.5% indicates that it has a high rate of false positive. In addition to a moderate specificity of 68%, this indicates that a patient in high-risk group does not always yield a short-term serious outcome. Nevertheless, a high negative predictive value of 94.44% indicates that it has low false negative rate,

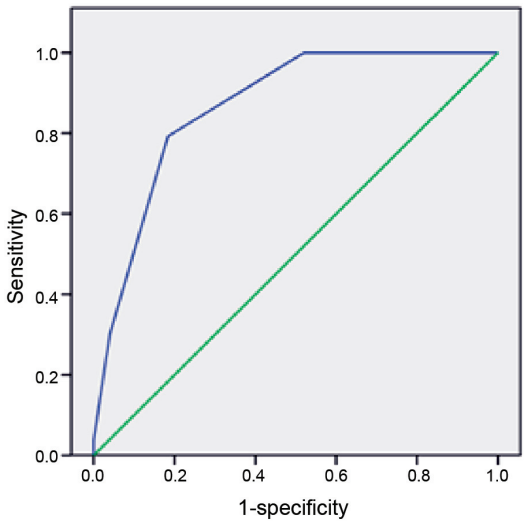

Fig. 1 Receiver operating characteristic (ROC) curve calculated according to OESIL result.

and thus shows that a patient in low-risk group has low risk of developing a short-term serious outcome.

The present study result of high sensitivity and low specificity is consistent with original study of SFSR[3], as well as Thiruganasambandamoorthy V et al[8], Sun BC et al[6] and Quinn J et al[4], which reported sensitivity of 96%, 90%, 89%, and 98% respectively, and specificity of 62%, 33%, 42%, and 56%, respectively.

In contrast to the original study of SFSR that reported that the risk scoring score could help decrease admission rate by 10%, the authors found it increase the admission rate to 41.9% if the physician were to admit all patients in high-risk group.

Osservatorio Epidemiologico sulla Sincope nel Lazio (OESIL)

The authors categorized patients with OESIL score of 0 and 1 as low-risk group and those with OESIL score of 2 or more as high-risk group based on the result of ROC curve analysis, and found that it performed with a high sensitivity of 79.2% and a moderate specificity of 81.6%. However, a low positive predictive value of 64.6% also indicates that a patient in high-risk group does not always yield a short-term serious outcome. Similar to SFSR, a high negative predictive value of 90.3%, in other words a low false negative rate, shows that a patient with OESIL score of 0 or 1 has low risk of developing a short-term serious outcome.

The original study of OESIL score[5] did not report the performance in terms of sensitivity and specificity. Other previous studies of OESIL score included Hing R et al[10] reporting in ROC curve analysis, and Reed MJ et al[7], which reported as percentage of short term serious outcome occurring at different OESIL scores. The results reported in the latter study were 0%, 2.9%, 8%, 22.7%, and 37.5% for OESIL score of 0, 1, 2, 3, and 4 respectively, compared to our study of 0%, 20.8%, 59.1%, 73.7%, and 100%, respectively.

Admission of patients based on OESIL score of 2 or more as high-risk group will increase the admission rate by 25%, which is although less compared to SFSR, but still does not prevent unnecessary admission of patients with syncope.

Further use of SFSR and OESIL score in the ED

The syncope guideline proposed by American Heart Association in 2006[11] did not mention the use of risk stratification scores in diagnosing patients with syncope in the ED. However, after the beginning of this study, a guideline proposed by European Society of Cardiology[12] stated that evaluation of syncope in the ED has changed from attempts to make a diagnosis of the cause to risk stratification, and the use of SFSR and OESIL score are mentioned as two of the four validation cohort studies able to predict syncope outcome.

From the present study, the authors found that both SFSR and OESIL score have good sensitivity in detecting patients at risk for developing short-term serious outcome. Nevertheless, they both do not have satisfying specificity and promote a number of false positive rates, and thus do not help minimizing unnecessary admission. On the other hand, they could increase admission rate compare to physicians' judgment alone. However, due to their low false negative rates, both risk stratification scores might be useful in low risk patients who can be discharged home safely.

Conclusion

San Francisco Syncope Rule (SFSR) and Osservatorio Epidemiologico sulla Sincope nel Lazio (OESIL) both have a good accuracy of 74.7% and 80.9%, a good sensitivity of 90.6% and 79.2%, respectively. They both have a moderate specificity of 68% and 81.6%, and a low positive predictive value of 54.5% and 64.6%, respectively, indicating a lot of false positive rates and thus increasing admission rate.

Nevertheless, they both have a high negative predictive value of 94.4% and 90.3%, respectively, which indicate low rate of false negative, and thus may be helpful in low risk patients who can be discharged home.

What is already known on this topic?

SFSR and OESIL score are among the risk stratification scoring system proposed by European Society of Cardiology to be used to identify patients presenting with syncope who are at future risk of serious morbidity. External validation of SFSR demonstrated the scoring system to have high sensitivity and low specificity, along with decreasing admission rate. As for OESIL score, its performance in the form of sensitivity and specificity has never been demonstrated, only an ROC curve analysis and reports as percentage of short-term serious outcome occurring at different OESIL scores were documented.

What this study adds?

With the ROC curve added into our study, we were able to determine a cut point of 1 and categorize patient into high-risk (score 2-4) and low-risk (score 0-1) group when using OESIL score, and thus calculation of sensitivity and specificity were made possible and then used in comparison to SFSR. As predictive values were also added to our calculations in the study, both scores demonstrated low positive predictive value, leading to high false positive rates and thus increasing admission rate. Nevertheless, both scores showed high negative predictive value, including low rate of false negative, and thus may be helpful in discharging low-risk patients home.

Potential conflicts of interest

None.

References

1. Quinn J. Syncope. In: Tintinalli JE, Stapczynski JS, Ma OJ, Cline DM, Cydulka RK, Meckler GD, editors. Tintinalli's emergency medicine: a comprehensive study guide. 7th ed. New York: McGraw-Hill; 2011: 399-405.
2. Soteriades ES, Evans JC, Larson MG, Chen MH, Chen L, Benjamin EJ, et al. Incidence and prognosis of syncope. N Engl J Med 2002; 347: 878-85.
3. Quinn JV, Stiell IG, McDermott DA, Sellers KL, Kohn MA, Wells GA. Derivation of the San Francisco Syncope Rule to predict patients with short-term serious outcomes. Ann Emerg Med 2004; 43: 224-32.
4. Quinn J, McDermott D, Stiell I, Kohn M, Wells G. Prospective validation of the San Francisco Syncope Rule to predict patients with serious outcomes. Ann Emerg Med 2006; 47: 448-54.
5. Colivicchi F, Ammirati F, Melina D, Guido V, Imperoli G, Santini M. Development and prospective validation of a risk stratification system for patients with syncope in the emergency department: the OESIL risk score. Eur Heart J 2003; 24: 811-9.
6. Sun BC, Mangione CM, Merchant G, Weiss T, Shlamovitz GZ, Zargaraff G, et al. External validation of the San Francisco Syncope Rule. Ann Emerg Med 2007; 49: 420-7.
7. Reed MJ, Newby DE, Coull AJ, Jacques KG, Prescott RJ, Gray AJ. The Risk stratification Of Syncope in the Emergency department (ROSE) pilot study: a comparison of existing syncope guidelines. Emerg Med J 2007; 24: 270-5.
8. Thiruganasambandamoorthy V, Hess EP, Alreesi A, Perry JJ, Wells GA, Stiell IG. External validation of the San Francisco Syncope Rule in the Canadian setting. Ann Emerg Med 2010; 55: 464-72.
9. Birnbaum A, Esses D, Bijur P, Wollowitz A, Gallagher EJ. Failure to validate the San Francisco Syncope Rule in an independent emergency department population. Ann Emerg Med 2008; 52: 151-9.
10. Hing R, Harris R. Relative utility of serum troponin and the OESIL score in syncope. Emerg Med Australas 2005; 17: 31-8.
11. Strickberger SA, Benson DW, Biaggioni I, Callans DJ, Cohen MI, Ellenbogen KA, et al. AHA/ACCF Scientific Statement on the evaluation of syncope. Circulation 2006; 113: 316-27.
12. Moya A, Sutton R, Ammirati F, Blanc JJ, Brignole M, Dahm JB, et al. Guidelines for the diagnosis and management of syncope (version 2009). Eur Heart J 2009; 30: 2631-71.

ประโยชน์ของแนวทางการประเมินความเสี่ยงผู้ป่วยหมดสติชั่วคราวในห้องฉุกเฉิน

คัมภีร์ สรวมศิริ, บริบูรณ์ เชนธนากิจ, อภินันท์ ตันติวุฒิ, บวร วิทยชำนาญกุล

ภูมิหลัง: *การวินิจฉัยและรักษาการหมดสติชั่วคราว (syncope) ในห้องฉุกเฉินเป็นเรื่องที่ทำได้ยากเนื่องจากยังไม่มีแนวทางปฏิบัติที่ชัดเจน ปัจจุบันได้มีการสร้างแนวทางการประเมินความเสี่ยงเพื่อคัดแยกผู้ป่วยที่มีโอกาสเกิดโรคร้ายแรงขึ้นหลายแนวทาง เช่น San Francisco Syncope Rule (SFSR) และ Osservatorio Epidemiologico sulla Sincope nel Lazio (OESIL) score*

วัตถุประสงค์: *เพื่อศึกษาความแม่นยำของแนวทางการประเมินความเสี่ยง SFSR และ OESIL ในผู้ป่วยที่มารับการรักษาในโรงพยาบาลมหาราชนครเชียงใหม่*

วัสดุและวิธีการ: *การศึกษาเป็นแบบ prospective descriptive analysis study เก็บข้อมูลผู้ป่วยผู้ใหญ่ที่เข้ารับบริการตรวจรักษาในห้องฉุกเฉินด้วยอาการหมดสติชั่วคราว (syncope) หรือ ใกล้หมดสติชั่วคราว (near syncope) ระหว่างวันที่ 1 ตุลาคม พ.ศ. 2552 ถึง 24 เมษายน พ.ศ. 2553 และนำมาประเมินตามแนวทางการประเมินความเสี่ยง SFSR และ OESIL score เพื่อประเมินความเสี่ยงต่อการเกิดโรคร้ายแรงระยะสั้น ติดตามอาการของผู้ป่วยที่ 7 วัน และ 1 เดือน วิเคราะห์ข้อมูลคุณสมบัติของแนวทางการประเมินความเสี่ยงโดยคำนวณและแสดงเป็น accuracy, sensitivity, specificity, predictive values และ likelihood ratio*

ผลการศึกษา: *ผู้เข้าร่วมในการศึกษาทั้งหมด 178 ราย มีผู้ป่วยที่เกิดโรคร้ายแรงระยะสั้นจำนวน 53 ราย แนวทางการประเมินความเสี่ยง SFSR มีความแม่นยำร้อยละ 74.7 ความไวร้อยละ 90.6 ความจำเพาะร้อยละ 68 positive predictive value ร้อยละ 54.5 negative predictive value ร้อยละ 94.4 likelihood ratio positive (LR+) 2.8 และ likelihood ratio negative (LR-) 0.1 ในขณะที่แนวทางการประเมินความ เสี่ยง OESIL score มีความแม่นยำร้อยละ 80.9 ความไวร้อยละ 79.2 ความจำเพาะร้อยละ 81.6 positive predictive value ร้อยละ 64.6 negative predictive value ร้อยละ 90.3 likelihood ratio positive (LR+) 4.3 และ likelihood ratio negative (LR-) 0.3*

สรุป: *แนวทางการประเมินความเสี่ยง SFSR และ OESIL score มี accuracy และ sensitivity ในการเลือกผู้ป่วยที่มีความเสี่ยงต่อการเกิดโรคร้ายแรงระยะสั้นอยู่ในเกณฑ์ที่ดี แต่มี specificity ค่อนข้างต่ำและมี false positive มาก ทำให้ไม่สามารถประเมินผู้ป่วยที่มีอาการหมดสติชั่วคราวโดยใช้แนวทางการประเมินความเสี่ยงเพียงอย่างเดียวได้ อย่างไรก็ตามแนวทางการประเมินความเสี่ยงทั้งสองมี false negative น้อย จึงอาจใช้ช่วยในการตัดสินใจให้ผู้ป่วยที่มีความเสี่ยงต่ำกลับไปสังเกตอาการต่อที่บ้านได้*