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The San Francisco Syncope Rule vs physician judgment and decision making

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Abstract

Objective: To compare a clinical decision rule (San Francisco Syncope Rule [SFSR]) and physician decision making when predicting serious outcomes in patients with syncope.

Methods: In a prospective cohort study, physicians evaluated patients presenting with syncope and predicted the chance (0%-100%) of the patient developing a predefined serious outcome. They were then observed to determine their decision to admit the patient. All patients were followed up to determine whether they had a serious outcome within 7 days of their emergency department visit. Analyses included sensitivity and specificity to predict serious outcomes for low-risk patients and comparison of areas under the receiver operating characteristic curve for the decision rule, physician judgment, and admission decisions.

Results: During the study period, there were 684 visits for syncope with 79 visits resulting in serious outcomes. The area under the receiver operating characteristic curve was 0.92 (95% confidence interval [CI], 0.88-0.95) for the SFSR compared with physician judgment 0.89 (95% CI, 0.85-0.93) and physician decision making 0.83 (95% CI, 0.81-0.87). Physicians admitted 28% of patients in a low-risk group, with a median length of stay of 1 day (interquartile range, 1-2.5 days). The SFSR had the potential to absolutely decrease admissions by 10% in this low-risk group and still predict all serious outcomes.

Conclusions: Physician judgment is good when predicting which patients with syncope will develop serious outcomes, but contrary to their judgment, physicians still admit a large number of low-risk patients. The SFSR performs better than current physician performance and has great potential to aid physician decision making.

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1. Introduction

Syncope is a transient loss of consciousness with a return to preexisting neurologic function. A common problem, 1 of 4 people will faint during their lifetime, and 1% to 2% of all emergency department (ED) visits and hospital admissions are related to a transient loss of consciousness [1-4].

Patients with syncope create a difficult dilemma for physicians. Most causes are benign, but occasionally, it is a symptom associated with significant morbidity and mortality. Some patients will require emergent hospitalization for workup and treatment of life-threatening or potentially life-threatening causes, others should get outpatient evaluation, whereas some patients need no further evaluation.

It has been suggested that the use of hospitalization for patients with syncope is inefficient and highly variable [5-10]. Many things can cause syncope and the potential diseases that cause it span multiple specialties, making it difficult to develop an optimal disposition for these patients. Accordingly, a survey of physicians revealed that the disposition of patients with syncope was the second most common decision problem for North American physicians [11]. A highly sensitive and specific decision rule that would aid and improve physician decision making could have the potential to significantly reduce health care costs and improve efficiency and patient care.

The San Francisco Syncope Study is a prospective multiphase study. Phase 1 involved derivation of a decision rule using 684 patients to help predict patients at risk for

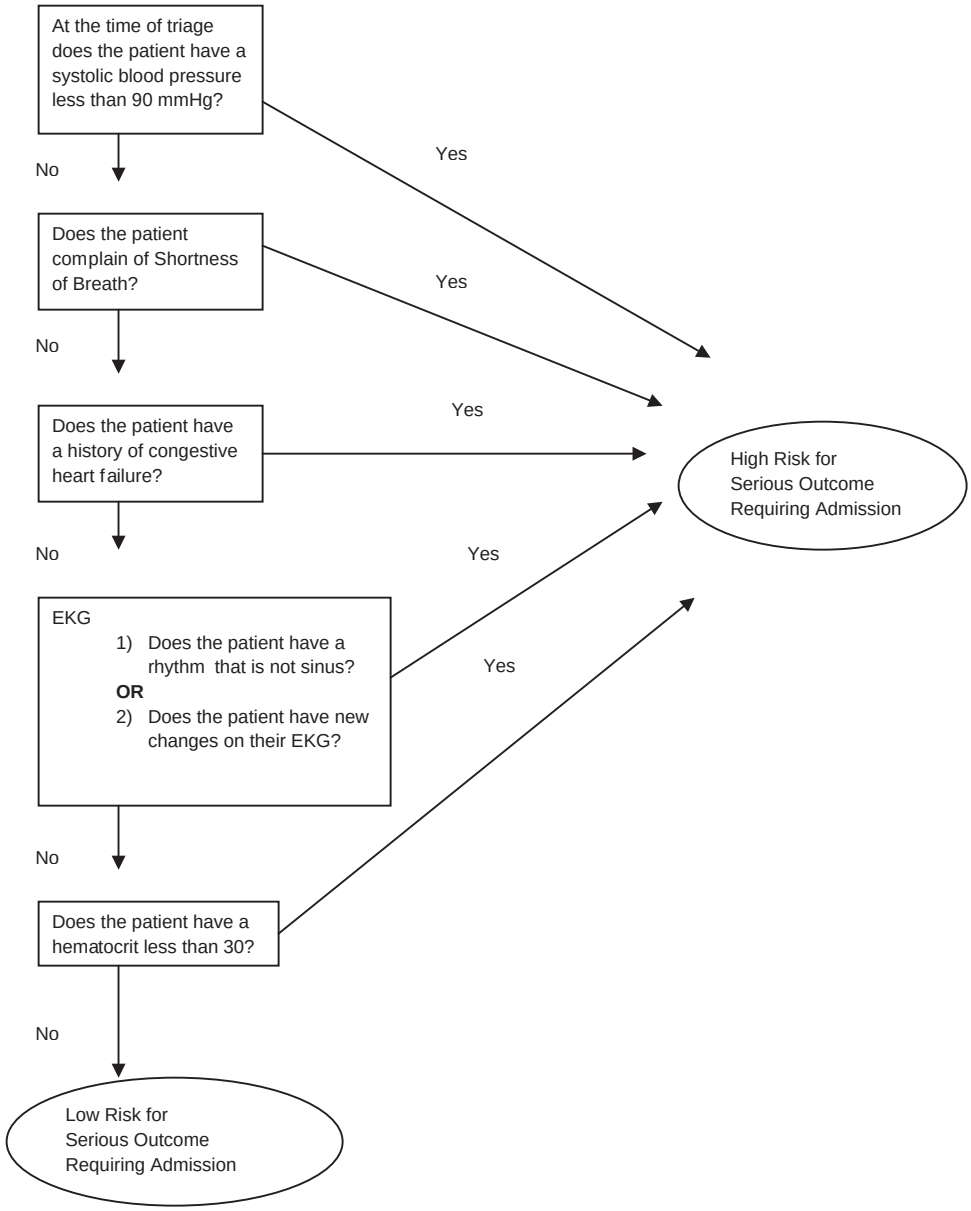

Fig. 1 San Francisco Syncope Rule.

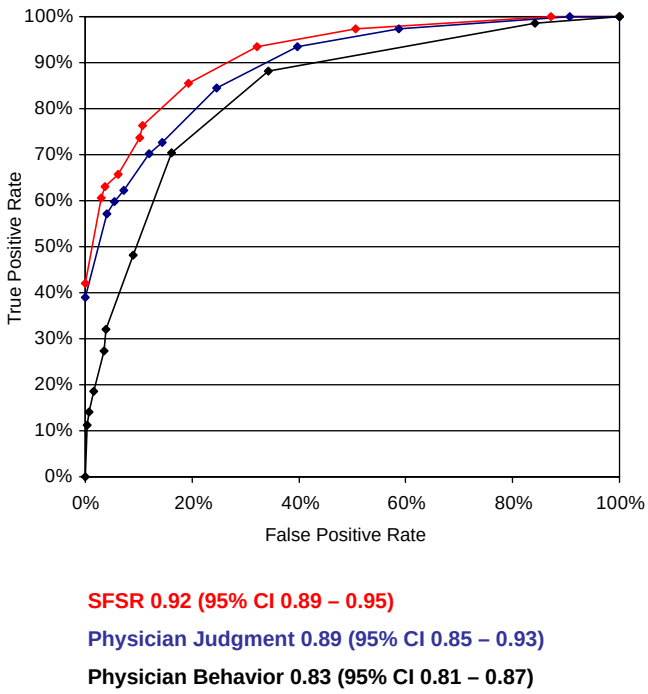

Fig. 2 Receiver operating characteristic curve for predicting patients with syncope with day 7 serious outcomes.

acute outcomes. Variables were assessed for their interobserver agreement and univariate association with acute outcomes. The final San Francisco Syncope Rule (SFSR), derived from recursive partitioning of the most important variables, was found to be highly sensitive and specific (Fig. 1) [12]. To justify the time and effort involved in validating and disseminating a decision rule, it is important to know if the rule can improve upon the diagnostic accuracy and reliability of unstructured physician judgment and eventual decision making. We sought to determine whether the SFSR would have performed better than physician decision making during phase 1 of the study.

2. Methods

The multiphase San Francisco Syncope Study was undertaken with reference to previously described guidelines for developing clinical decision rules [13,14]. In particular, outcomes were clearly defined and predictor variables were carefully chosen before the study began. A significant number of patients independently assessed by 2 physicians to measure agreement for subjective variables and appropriate multivariate methods were used to derive the rule [11].

This prospective cohort study was conducted at a large university teaching hospital and included patients presenting with acute syncope or near syncope as a reason for their ED visit. Patient enrollment was achieved by prospectively screening patients with complaints of syncope, loss of consciousness, fall, collapse, seizure, light-headedness, tachycardia, bradycardia, shortness of breath, and chest pain. Patients were excluded if they had altered mental status, alcohol- or illicit drug-related loss of consciousness, a definite seizure, or transient loss of consciousness caused by head trauma. A dedicated research nurse reviewed daily patient logs and ensured enrollment of all possible patients. All attending physicians and house staff were asked to carry their normal assessment and disposition of each patient. After their clinical interaction, each physician completed a standardized data form with assessments of historical and physical findings. In addition to information about potential clinical decision rule variables, physicians were also asked to prospectively estimate the probability (0%-100% at 11 different prediction intervals) that the patient would have a serious outcome within 7 days. This judgment was based only on their clinical assessment and considered the occurrence of 1 of the following outcomes within the next 7 days: death, myocardial infarction, arrhythmia, pulmonary embolism, stroke, subarachnoid hemorrhage, significant hemorrhage, or any condition causing a return ED visit and hospitalization for a related event. When feasible, a second physician was asked to independently fill out a study form to assess physician agreement. A study nurse completed follow-up on all patients to determine whether they had a serious outcome. The Committee on Human Research at the University of California, San Francisco, approved the study protocol without the need for written informed consent. Patients followed up by direct contact had the opportunity to give verbal consent during the telephone interview.

Using data at the various prediction intervals, receiver operating characteristic (ROC) curves were constructed for judgment alone eventual admission decision and the SFSR. Areas under the ROC curves with 95% confidence intervals (CIs) were analyzed. An arbitrary low-risk threshold of a 2% or less chance of a serious outcome was used to help determine the potential value of the SFSR for helping with admission decisions in a low-risk group of patients.

3. Results

This phase of the San Francisco Syncope Study took place from June 30, 2000, to February 28, 2002. There were 684 visits analyzed and their characteristics are summarized in Table 1. Fifty-five percent of all patients were admitted, 59% were female and the average age was 62 years. All patients had some form of follow-up. Ninety-six percent of patients had direct confirmation of their outcome with less than 4% requiring indirect follow-up through checks to local hospital and the death registry. Seventy-nine (11.5%) patients developed serious outcomes by day 7 with 49 of these occurring after their ED visit.

The respective areas under the ROC curves for predicting short-term serious outcomes were physician judgment 0.89 (95% CI, 0.85-0.93), physician decision to admit

Table 1 Patients presenting with syncope (N = 684)

Mean age (y)	62.1
Female	403 (58.9)
Admitted	376 (54.9)
Syncope as primary complaint	500 (73.1)
Serious outcome by day 7	79 (11.5)
Death	5 (0.7)
Cardiac causes	56 (8.2)
MI	21 (3.1)
Non–Q-wave MI	12 (1.8)
Arrhythmia	30 (4.4)
Structural	5 (0.7)
Pulmonary embolism	5 (0.7)
Significant hemorrhage	12 (1.8)
GI bleed	10 (1.5)
Spontaneous ruptured spleen	1 (0.2)
Ruptured ectopic pregnancy	1 (0.2)
Subarachnoid hemorrhage	3 (0.4)
Stroke syndromes	3 (0.4)
Other	5 (0.7)

Some patients had more than 1 serious outcome. Values are presented as number (%) or otherwise indicated. MI indicates myocardial infarction; GI, gastrointestinal.

0.83 (95% CI, 0.81-0.87), and the SFSR 0.92 (95% CI, 0.89-0.95) (Fig. 2).

Physicians classified 54% of patients in the cohort as having a less than 2% chance of serious outcome by day 7 and we categorized these patients as low risk (Table 2). Among this low-risk group, there were no deaths, 1.4% had serious outcomes, and 28% were admitted. Admitted patients stayed a median of 1 day (interquartile range, 1-2.5 days). Physician judgment had a sensitivity of 94% (95% CI, 86%-98%) for predicting patients at low risk with a specificity of 52% (95% CI, 51%-53%). For comparison purposes, the SFSR had good overall sensitivity of 96% (95% CI, 92%-100%) and specificity of 62% (95% CI, 58%-66%) (Table 3), and if used to guide admission decisions in this low-risk group, the SFSR would have predicted all serious outcomes and that only 18% of patients needed admission in this group, providing a potential absolute decrease of 10% in those patients admitted without missing a serious outcome.

Table 2 Classification of performance of physician judgment to predict a 2% or less chance of a serious outcome by day 7

Physician judgment	Serious outcome	
	Yes	No
>2%	74	287
<2%	5	318

Sensitivity = 94% (95% CI, 86%-94%); specificity = 52% (95% CI, 51%-53%); κ = 0.44 (95% CI, 0.34-0.54).

Table 3 Overall performance of the SFSR to predict patients with serious outcomes

Decision rule	Serious outcomes	
	Yes	No
Yes	76	230
No	3	375

Bootstrap estimates for CIs: sensitivity = 96.2% (95% CI, 92%-100%); specificity = 61.9% (95% CI, 58%-66%).

4. Discussion

Overall physician judgment is good for discriminating those patients with syncope at risk for serious outcomes. However, unstructured physician judgment is problematic. It still misclassifies a small number of important outcomes, and more importantly, because it is unstructured and variable among physicians, physicians do not trust their judgment and thus decide to admit many low-risk patients. This study has shown that the SFSR performs better than overall physician decision making and there appears to be an important opportunity, especially among low-risk patients, to allow more efficient medical decisions.

The problems associated with unstructured physician judgment, combined with the potential for rare adverse consequences, lead to the inefficient use of admissions for patients with syncope. Overall physicians admitted 55% of patients in this derivation set, including 28% whom the physicians felt were at low risk. Physicians even admitted 9% of patients in the study whom they felt had zero chance of having a serious outcome. In the derivation set, the SFSR suggests that admission rates could potentially be lowered to less than 45% overall, and in the low-risk group defined in this study, we also found that admissions could have been potentially decreased by 10% [12]. This improvement in efficiency could reduce health care costs and improve patient care.

Instead of focusing on all patients, we focused this analysis on this low-risk group for several reasons. These patients represented a large percentage of the cohort, and because physicians still admitted a large number of these low-risk patients, we felt that it presented the best opportunity for the rule to influence decision making and change behavior. We felt that physicians would consider discharge of low-risk patients when the decision rule predicted them at low risk than discharging patients whom they felt were moderate or high risk although the rule predicted the patient to be low risk. We thus feel that this group represents a tremendous opportunity to improve the efficiency of admissions for patients with syncope who present to the ED.

It is possible that some of the admissions in the low-risk group were not for syncope, but for another medical or social condition requiring admission. It should be noted that the rule was designed to risk stratify patients and

predict patients at risk for serious outcome by day 7 as a proxy for those requiring emergent medical admission. Our rationale being that if a serious outcome happened 7 days after an initial ED visit, it would be hard to justify that an emergent admission 7 days earlier was the only way to diagnose and treat that patient. Some may argue that an acute admission could be warranted for diagnosing a serious condition that could present as a serious outcome in 14 days, 1 month, or even a year; that rationale assumes that only important diagnosis can be made as an inpatient and that outpatient follow-up is inefficient or unavailable. Although this may be a reason for admitting some patients, our study like others showed that majority of low-risk patients stay only 1 day in the hospital and have very little if any testing [6]. Thus, it is unlikely that the large numbers of admissions in this low-risk group could be solely attributed to poor follow-up on discharge and thus need to admit to provide workup of these patients.

Finally, by including patients who by definition already had their serious outcome on presentation, the ROC curve for physician judgment is likely an overstatement of the performance of physician judgment. However, we felt that it was only fair to include all outcomes for physician judgment when we were using all outcomes to demonstrate the performance of the rule. Most important is that regardless of the cases included in our analysis, the decision rule always had a greater area under the ROC curve. Although the significance of the differences in the areas of the ROC curves is debatable, the rule appears to perform better, and because it adds structure and reliability to unaided judgment, we feel that it has the potential to be a valuable aid in physician decision making.

5. Conclusions

The limitations of physician judgment have resulted in the variable and inefficient use of admissions for patients presenting with syncope. In the first phase of this study, we have developed a highly sensitive and specific rule and demonstrated its value compared with physician judgment alone for identifying patients at acute risk for serious outcomes and guiding admission decisions. The SFSR is currently under prospective validation. We believe that a reliable decision rule will guide and lead to more efficient medical decision making.

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