DEM Journal Club

Article Appraisal

Article: Duration of Electrocardiographic Monitoring of Emergency Department Patients with Syncope

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Background and Study Objective(s):

Syncope constitutes approximately one percent of Emergency Department (ED) visits. Approximately 10% of these patients will have a serious underlying condition as a cause for their syncope, including arrhythmias, myocardial infarction, structural heart disease, pulmonary embolism, and subarachnoid or severe hemorrhage. Alarmingly, research indicates that 30-50% of these serious conditions will not be identified during ED evaluation.

In July 2016, Dr. Venkatesh Thiruganasambandamoorthy published in Canadian Medical Association Journal, his development of the Canadian Syncope Risk Score (CSRS) to predict serious adverse events within 30 days of ED assessment for syncope. The risk score was derived from a prospective multicentre cohort study, conducted at six large ED's in Canada. The risk tool consists of nine predictors, including vasovagal predisposition, pre-existing heart disease, any systolic BP < 90 or > 180 mmHg, troponin >99th percentile, abnormal QRS axis (<-30 or >100), QRS duration >130 ms, or QTc interval > 480 ms, and an ED diagnosis of cardiac or vasovagal syncope. The risk score was designed to be used to estimate the risk of a serious adverse event in the next 30-days, when there is any doubt as to the potential etiology of the patient's syncope.

There is currently a considerable paucity of evidence on the optimal duration of cardiac rhythm monitoring for syncope patients in the ED. The objective of this paper was to describe the time to occurrence of serious arrhythmia relative to time of ED arrival of syncope patients, based on the CSRS risk category, with the ultimate goal of informing management decisions regarding duration, location, and timing of cardiac rhythm monitoring.

Study Design:

This study is an analysis of data that was collected as part of a large multicentre prospective cohort study conducted for the purpose of deriving the Canadian Syncope Risk Score. Adult patients ≥ 16 years presenting within 24-hours of syncope to six large Canadian ED's were considered for enrolment. Patients were excluded if they did not meet the definition of syncope: prolonged LOC, mental status change from baseline, obvious witnessed seizure, or head trauma causing LOC. Major trauma patients requiring hospitalization and patients from whom an accurate history was not possible were also excluded (language barrier, intoxication).

Baseline characteristics, time of syncope and ED arrival, and the Canadian Syncope Risk Score (CSRS) risk category were collected for all patients. Emergency physicians and residents involved in the clinical aspects of the study were

trained on the study protocol during a 1-hour didactic session. This training included assessment of standardized and explicitly defined variables from history and physical exam, and diagnostic criteria for the type of syncope based on the European Society of Cardiology guidelines.

An international panel of experts came together to derive a list of serious outcomes that encompassed all clinically relevant conditions that could lead to syncope, including both conditions that need to be detected in the ED, and outcomes that need to be predicted, such as arrhythmias and death. This list was divided into serious arrhythmic outcomes and serious non-arrhythmic outcomes. The primary outcome of this study was serious arrhythmic outcomes, including pre-defined arrhythmias, interventions for arrhythmias, and unexplained death, occurring within 30 days of the index syncopal episode. Data was derived on every serious outcome that occurred, using a thorough stepwise approach that included a structured review of all available medical records related to the index ED visit, subsequent visits, hospitalizations and/or death, scripted telephone follow-up immediately after 30 days, review of administrative health records for return visits, outpatient investigations, or subsequent hospitalizations, and a search of coroner's reports for deaths of patients unable to be reached by telephone.

Results:

Data was collected from September 2010 to March 2015. 14,946 patients were screened for enrolment at six major ED's in Canada, with a total number of 5,719 patients enrolled. After exclusion of patients who presented to the ED with an easily recognizable serious underlying condition (n=121), and those who were missing CSRS scores (n=17), 5,581 patients were included in the final analysis.

Mean age was 53.4 years, and 54.5% of patients were female. 346 (6.2%) patients had incomplete 30-day follow-up, and were censored at the last follow-up time. 417 (7.5%) patients had a serious outcome, of which 207 (3.7%; 95% CI 3.3%, 4.2%) were arrhythmic (161 arrhythmias, 30 cardiac device implantations, 16 unexplained death). Overall, 4123 (73.9%) patients were classified as CSRS low-risk, 1062 (19.0%) medium-risk, and 396 (7.1%) high-risk. The CSRS accurately stratified subjects as low (0.4% risk for 30-day arrhythmic outcome), medium (8.7% risk for 30-day arrhythmic outcome) and high-risk (25.3% risk for 30-day arrhythmic outcome). One-half of arrhythmic outcomes were identified within 2-hours of ED arrival in low-risk and within 6-hours of ED arrival in medium and high-risk patients. The residual risk after these cut-points were 0.2% for low-risk, 5.0% medium-risk, and 18.1% for high-risk patients. Overall, 91.7% of serious arrhythmic outcomes, including all ventricular arrhythmias, were identified within 15-days. None of the low-risk patients suffered ventricular arrhythmia or unexplained death, whereas 0.9% of medium-risk and 6.3% of high-risk patients suffered them. In total, 15 low risk patients had serious arrhythmic outcomes, of which 6 had sinus node dysfunction, 2 had high degree AV blocks, 4 had new/uncontrolled atrial fibrillation, 2 had SVT, and 1 had pacemaker insertion.

The authors conclude that considering the overall risk and risk after 2h ED monitoring for serious arrhythmia in low risk patients is low, 2 hours of ED monitoring is sufficient for these patients, followed by discharge home. Considering the overall risk and risk after 6 hours of ED monitoring for medium-risk patients is moderate, and high-risk patients is high, authors support 6 hours ED monitoring for these patients, with selective admission for some, and 15-day outpatient monitoring for all high- and medium-risk patients being discharged. They also recommend early application of a cardiac monitoring device, preferably at the index visit, for medium and high-risk patients being discharged.

Validity of Results:

This study addressed a clearly focused issue, with a clearly defined population, inclusion and exclusion criteria, objectives, and primary outcome. The primary outcome was appropriate; arrhythmia is a serious outcome with the highest potential of being missed in the ED, and fear of missing a serious arrhythmia often leads to cardiology consult or admission to cardiology from the ED.

Only 78.9% of potentially eligible patients were enrolled. The 1526 patients who were potentially eligible but not enrolled were determined to be similar in age and sex to the enrolled patients, and there were no systemic reasons

identified for non-enrolment. Therefore, although a considerable number of missed patients, this likely did not impact the validity of the results.

The inclusion of "ED diagnosis of vasovagal or cardiac syncope" in the Canadian Syncope Risk Score tool is one source of potential bias, due to its subjective nature. This was predicted in the study design and an attempt to control this factor was undertaken with mandatory didactic training for all those involved in the clinical aspects of the study. In reality, this subjective component may be more of a factor when not controlled for with mandatory education on recent guidelines for syncope diagnosis. Additionally, the decision for outpatient monitoring vs hospitalization, and the time interval to receiving monitoring following discharge, was variable and not controlled for in this study, yet left to the discretion of the treating physician. This could have theoretically impacted analysis, although was unlikely to have done so considering the very thorough stepwise approach to identify serious outcomes at 30 days.

The 346 (6.2%) of patients who were lost to follow-up were younger with fewer comorbidities. Theoretically if there were significantly more adverse events in the low risk patients lost to follow up than those retained in the study, it could bias the results of the low-risk group, but considering how thorough their follow up algorithm was, this is extremely unlikely.

The study population for this analysis was taken from the larger study done by the same author to derive the Canadian Syncope Risk Score. Performing a study on determining the optimal ED length of monitoring using a score that has not been validated is questionable. The risk score should first be validated in a separate study before using it for another purpose.

Overall, this study was performed with sound methodology and thorough algorithms in place to minimize bias. The results are reported with narrow confidence intervals, and show a strong correlation between CSRS category and risk of serious arrhythmic outcome within 30 days of syncope.

Generalizability of Results:

This study was robust in its methodology and the design was appropriate for the clinical question. A large cohort of patients were enrolled at six large urban ED's in Canada, and the results are therefore applicable to urban populations in Canada.

Calibration of the CSRS was demonstrated to be excellent in this study: there was a high correlation between serious arrhythmic outcomes and risk score stratification, with the caveat that this study describes outcomes within the population from which the score was derived. If validated, risk stratification with the CSRS could be a valuable tool to determine risk of serious adverse outcomes following syncope.

The recommendations for monitoring, however, are less generalizable. The authors recommend 2 hours of ED monitoring for low-risk patients, which is not always feasible considering the limited availability of telemetry beds, which are generally being occupied by sicker patients. One concern with the authors' conclusion is whether this recommendation will unduly increase monitoring of low risk patients, contributing to overcrowding and poorer ED flow. This score could be more useful in lowering admission rates in settings like the USA where most patients who present with syncope are hospitalized.

For high and medium-risk patients, the authors recommend 6 hours of ED monitoring followed by select admission for some, and 15-day outpatient monitoring for those being discharged. Considering the lack of availability of 15-day event monitors at most urban EDs, this recommendation is not practical, nor possible.

The Bottom Line:

In summary, this was a descriptive analysis of timing of arrhythmic outcomes within a large derivation study for the CSRS with robust methodology. There was a strong correlation between CSRS risk and serious adverse outcomes at 30 days, and one-half of arrhythmic outcomes were identified within 2-hours of ED arrival in low-risk and within 6-hours of ED arrival in medium and high-risk patients. Two hours of ED monitoring for low risk patients would increase resource utilization and lengthen the current assessment period for these patients. The fact that there were no ventricular arrhythmias or sudden cardiac deaths in CSRS low risk patients is reassuring and an important finding

that should increase provider comfort in discharging these patients with appropriate follow up. For CSRS medium and high-risk patients, approximately 50% of serious arrhythmias were captured with six hours of ED cardiac monitoring, but the residual risk after this cut point was not insignificant. The authors' recommendation for 15-day outpatient monitoring is not a feasible option at most Canadian EDs. Therefore, until further data is obtained, all of these patients will likely be getting a cardiology consult in the ED. It is difficult to say whether these results will change current practice in Canada, as the CSRS risk tool has not yet been fully validated and has not been compared with current standard of care.

References:

1) Venkatesh T, H. RB, L.A. SM, et al. Duration of Electrocardiographic Monitoring of Emergency Department Patients with Syncope. *Circulation*. 2019;0(0). doi:10.1161/CIRCULATIONAHA.118.036088.

2) Thiruganasambandamoorthy V, Kwong K, Wells GA, et al. Development of the Canadian Syncope Risk Score to predict serious adverse events after emergency department assessment of syncope. *Canadian Medical Association Journal*. July 2016. doi:10.1503/cmaj.151469.