Usefulness of the Calgary Syncope Symptom Score for the diagnosis of vasovagal syncope in the elderly

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Aims
The Calgary Syncope Symptom Score (CSSS) has been validated as a simple point score of historical features with high sensitivity and specificity for the diagnosis of vasovagal syncope (VVS) in younger populations without evidence of structural heart disease. Our purpose was to evaluate the performance of the CSSS in an elderly population with suspected VVS.

Methods and results
Hundred and eighty patients of ≥60 years of age (mean 73.4 ± 7.8) with suspected clinical diagnosis of VVS were studied. The CSSS (VVS score ≥2) was calculated in all patients prior to undergoing head-up tilt test (HUT). A standardized HUT protocol with active nitroglycerin phase was used to reproduce syncopal symptoms as gold standard for diagnosis of VVS. Hundred and forty patients had positive HUT response. Eighty-three patients (42.3%) had CSSS ≥2 suggesting a diagnosis of VVS. The Calgary Syncope Symptom Score sensitivity was 0.51 (95% confidence interval (CI) 0.42–0.59) and specificity 0.73 (95% CI 0.52–0.85) with positive predictive value and negative predictive value of 0.87 (95% CI 0.77–0.93) and 0.30 (95% CI 0.21–0.40), respectively. One hundred (55.6%) patients had previous history of mild cardiovascular disease documented during assessment prior to HUT. In this population sensitivity and specificity was markedly reduced: 0.13 (95% CI 0.05–0.29) and 0.70 (95% CI 0.57–0.80), respectively.

Conclusion
The CSSS has a lower sensitivity and specificity in an elderly population presenting with syncope compared to previously validated data in young adults, particularly in elderly patients with previous history of mild cardiovascular disease. A modified CSSS may be needed to improve specificity and sensitivity in this population.

Keywords
Diagnosis • Elderly • Syncope • Vasovagal

Introduction
Syncope is a frequent clinical problem, causing 1.5–2% of emergency department visits, with up to 25% of these patients being admitted.1–3 Establishing the aetiology of syncope can be challenging, as patients usually present without symptoms at the time of evaluation, leading to significant costs in health care resources.

The most frequent cause of syncope in all age groups is reflex-mediated syncope followed by orthostatic hypotension. The Calgary Syncope Symptom Score (CSSS) is a simple point score based on historical features that identifies patients with vasovagal syncope (VVS) with very high sensitivity (89%) and specificity (91%). The CSSS has been validated in younger populations (mean age 42 years) with no evidence of structural heart disease.4 The CSSS has not been validated in elderly patients, who usually present with atypical forms of VVS, and have increased prevalence of structural heart disease.5 The purpose of this study was to evaluate the performance of the CSSS in an elderly population presenting with suspected VVS.

Methods
All patients undergoing head-up tilt tests (HUTs) performed at the Autonomic & Syncope Laboratory at McMaster University between...
December 2003 and April 2008, were included. Patients aged \( \geq \) 60 years were defined as elderly, and 180 patients (\( n = 180 \)) with \( \geq \) 60 years of age (mean age 73.4 \( \pm \) 7.8, range 60–92 years), with suspected clinical diagnosis of VVS after complete negative cardiac evaluation (24–48 h Holter, exercise testing, 2D-Echo) were included in the study (patients referred with presyncope or dizziness were excluded). This group included 103 male (57.2%, mean age 73 \( \pm \) 7.9 years) and 77 female patients (42.8%, mean age 73.8 \( \pm \) 7.5 years). A significant proportion of cardiovascular risk factors was observed, in this population: 116 patients had hypertension (64.4%), defined as blood pressure \( > 140/90 \) mmHg or on treatment with hypertensive drugs, 46 hypercholesterolaemia (25.6%), and 21 diabetes mellitus (11.7%). Of note, 101 patients (55.6%) had past medical history of significant cardiovascular disease, including clinically relevant coronary artery disease (ranging from stable angina to previous myocardial infarction and coronary artery by-pass surgery); moderate left ventricular systolic dysfunction (defined as LVEF \( < 40\%\)); moderate-to-severe valvular lesions; atrial fibrillation, atrial flutter, or history of supraventricular tachycardia with a documented heart rate of \( > 150 \) bpm; conduction disease or pacemaker implantation; or cerebrovascular disease including stroke and known epilepsy. One hundred and thirty-eight patients (76.6%) were on treatment with at least one cardiovascular drug that could potentially trigger syncope. Patients’ characteristics are summarized in Table 1.

Complete history and physical examination were performed in all patients prior to undergoing HUT. The CSSS was calculated prior to tilt, and a diagnosis of VVS was provided if the CSSS score was \( \geq -2 \) as previously reported.6

A standardized HUT protocol with active phase of nitroglycerin was used to induce VVS.5 Data are reported as mean and standard deviation (SD), as appropriate in variables with little dispersion of values, or median with interquartile rank when non-homogeneous distributions. Comparison of these variables was performed by Student’s t-test. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and likelihood ratio were computed using SPSS v.15. Receiver operating curves were also calculated. The \( \alpha \) level was set at 0.05.

### Results

#### Sensitivity and specificity

One hundred and forty [0.78 (95% CI 0.71–0.83)] patients had a positive HUT response. Eighty-three patients (42.3%) had a CSSS \( \geq -2 \) [mean score \( = -0.80 \) (SD 1.54)] suggesting VVS diagnosis. CCSS sensitivity was 0.51 (95% CI 0.42–0.59) with a specificity of 0.73 (95% CI 0.52–0.85). PPV and NPV were 0.87 (95% CI 0.77–0.93) and 0.30 (95% CI 0.21–0.40), respectively. Likelihood ratio was 1.9 (95% CI 1.0–3.2). The area under the curve (AUC) was 0.62 (95% CI 0.52–0.72) (Figure 1A). Similar results were obtained after the population was characterized by gender (\( P > 0.05 \), non-significant).

In patients with previous history of cardiovascular disease the sensitivity and specificity of the CSSS were 0.13 (95% CI 0.05–0.29) and 0.70 (95% CI 0.57–0.80), respectively, with a prevalence of 0.38 (95% CI 0.28–0.48), and AUC 0.61 (95% CI 0.48–0.73) (Figure 1B, Table 2).

#### The Calgary Syncope Symptom Score variables

History of at least one of the following: bifascicular block, asystole, supraventricular tachycardia (SVT) or DM was present in 114 patients (63.3%). Lightheaded spells or faint with prolonged sitting or standing was referred by 122 patients (67.8%) and absent in 58 (32.2%). Sweating before a faint was reported by

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**Table 1 Patients’ characteristics**

<table>
<thead>
<tr>
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<th>n</th>
<th>%</th>
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<tbody>
<tr>
<td>Hypertension</td>
<td>116</td>
<td>64.4</td>
</tr>
<tr>
<td>Diabetes melitus</td>
<td>21</td>
<td>11.7</td>
</tr>
<tr>
<td>Hypercholesterolaemia</td>
<td>46</td>
<td>25.6</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>50</td>
<td>27.8</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>16</td>
<td>8.9</td>
</tr>
<tr>
<td>CABG</td>
<td>19</td>
<td>10.6</td>
</tr>
<tr>
<td>LVD</td>
<td>12</td>
<td>6.7</td>
</tr>
<tr>
<td>Valvulopathy</td>
<td>7</td>
<td>3.9</td>
</tr>
<tr>
<td>Atrial arrhythmias</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>22</td>
<td>12.2</td>
</tr>
<tr>
<td>SVT</td>
<td>8</td>
<td>4.4</td>
</tr>
<tr>
<td>Conduction disease</td>
<td>14</td>
<td>7.8</td>
</tr>
<tr>
<td>Pacemaker</td>
<td>11</td>
<td>6.1</td>
</tr>
<tr>
<td>Stroke</td>
<td>21</td>
<td>11.7</td>
</tr>
<tr>
<td>Epilepsy</td>
<td>3</td>
<td>1.7</td>
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<tr>
<td>Drugs</td>
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<tr>
<td>( \beta )-Blockers</td>
<td>57</td>
<td>31.7</td>
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<tr>
<td>Calcium-channel blockers</td>
<td>34</td>
<td>18.9</td>
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<td>ACEI–AAR2</td>
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<td>37.2</td>
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<td>Diuretics</td>
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<tr>
<td>Nitrates</td>
<td>8</td>
<td>4.4</td>
</tr>
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CABG, coronary artery by-pass surgery; LVD, left ventricular dysfunction; SVT, supraventricular tachycardia.
only 64 (35.6%), and lightheaded spells or fainting with pain or in medical settings was observed in only three patients (1.7%). In the vast majority of patients syncope started at the age of ≥35 years (163, 90.6%, Table 3).

Vasovagal syncope international study classification head-up tilt test response

Fifty-five patients had a vasodepressor HUT response (VASIS 3) (39.3%), 18 (12.9%) patients cardioinhibitory response (VASIS 2) and 59 (42.1%) patients had a mixed response (VASIS 1). In patients with cardiovascular comorbidities, 32% had VASIS 3 response, 30% VASIS 1 and 9% VASIS 2.

Follow-up

Sixty-four patients referred to our Syncope and Autonomic Disorder Unit were sent back to their hospital and lost to follow-up. One hundred and sixteen patients from our own area continued their follow-up visits in our hospital. After a median follow-up period of 12.8 months (SD 11.62, rank 1–45) 22 patients (12.2%) had syncope recurrence. Permanent pacemaker was implanted in seven patients (6%) at the end of this period. Five due to complete atrioventricular (AV) block, one due to AV node ablation because of uncontrolled atrial fibrillation, and one due to sinus node dysfunction.

Four patients died during follow-up: one was reported as sudden cardiac death (no prior history of coronary artery disease, systolic dysfunction, or intraventricular conduction delay), and the rest from non-cardiac causes (peritonitis, pulmonary cancer, stroke).

Discussion

The main finding of this study was that the CSSS point score was not as sensitive and specific in an elderly population with suspected VVS as has been previously reported in younger populations. Additionally, the association of cardiovascular disease further decreased the CSSS diagnostic ability in this elderly patient cohort. Establishing the aetiology of syncope continues to be a challenge despite sufficient evidence that using a systematic approach may reduce the need of unnecessary tests and admissions.

Syncope is frequently encountered in the community and up to 35% of people is expected to present at least one syncopal episode throughout their lifetime, although less than 50% out of them will seek medical care. Recent studies and registries (GESINUR, RESASTER) indicate that between 1 and 2% of emergency departments visits are related with syncope. This
information is particularly relevant in elderly populations, in which the annual incidence of syncope is as high as 6% and associated with high rates of recurrence, especially in institutionalized patients. Determining the cause of syncope in elderly patients is challenging as this population frequently has an atypical presentation occasionally manifesting as falls with total amnesia of the episode making less reliable history taking and recognition of prodromal symptoms. Some age-associated factors, in addition with higher rates of cardiovascular disease and other comorbidities, impaired adaptation to common physiologic stressors, leading to a multicausal nature of syncope.

A simple method to appropriately establish the diagnosis of vasovagal syncope is the CSSS. The CSSS has been validated as a simple point score of historical features to distinguish VVS from syncope of other causes with very high sensitivity (89%) and specificity (91%) in younger populations without evidence of significant structural heart disease. However, classical manifestations in elderly patients may not be present; prodromes are likely to be short or not existent, and frequently not recalled by elderly patients; and with poor specificity. Similarly, typical precipitating factors such as prolonged standing, postural changes, or hot environments are frequently not reported, potentially limiting the value of clinical features and the applicability of the CSSS for identifying VVS as the cause of syncope in the elderly. Another possibility for the reduced performance of the CSSS in this population is the known fact that multiple causes of syncope are not infrequent in the elderly. In this setting, Romme et al. reported a series of 380 patients with transient loss of consciousness referred to a general hospital in whom CSSS was calculated with a comparable sensitivity, and a significantly lower specificity than that reported in the original study. However, this study has significant methodological issues, as patients with other causes of loss of consciousness were included. Interestingly, in patients aged 50 years or above, sensitivity of the CSSS was reduced (79%).

In this study the overall performance of the CSSS was significantly lower than originally reported. The specificity and sensitivity of the CSSS was further decreased in elderly patients with previous history of mild cardiovascular disease, including most of the point score markers, that are frequently encountered in this population (diabetes, history of SVT or conduction disturbances).

It is important to acknowledge that the original CSSS was developed in patients with no evidence of structural heart disease which was also relatively low in this study. These findings highlight the fact that syncope in the elderly usually has atypical presentation and may be of multi-causal origin. Nonetheless, VVS continues to be the most frequent cause of transient loss of consciousness in this population. Validating a simple point score is relevant in this context but this study suggests that the variables included in the CSSS have poor specificity and sensitivity in the elderly and a modified point score may be needed.

**Limitations**

It is well known that HUT has significant limitations as a gold standard for VVS. However, this approach was used as described in the original CSSS validation cohort. Another limitation may be the diagnostic accuracy of HUT in elderly patients with unexplained syncope. Our findings were in keeping with those reported in subjects younger than 65 years, and our findings are consistent with previous reports.

**Conclusion**

The CSSS demonstrated a lower sensitivity and specificity in an elderly population presenting with unexplained syncope and suspected VVS, compared to the originally reported CSSS cohort. The increased prevalence of cardiovascular risk factors and mild cardiovascular disease further impaired the diagnostic ability of the CSSS.

**Conflict of interest:** none declared.

**References**

Arrhythmogenic remnant of pulmonary vein after lobectomy

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Atrial tachyarrhythmias are frequently observed after lung surgery. A 78-year-old woman underwent left inferior lobectomy for lung cancer. Paroxysmal atrial fibrillation was frequently observed after the surgery not only at acute phase but also at chronic phase. Six months after the surgery, she underwent pulmonary vein (PV) antrum isolation. Two circular mapping catheters placed in left ipsilateral PVs ostium revealed that frequent premature atrial contractions (PACs) and PAC salvos originated from the left inferior PV remnant (Figure). Whether or not surgical truncation impacted on the arrhythmogenicity of PV remnant, this case highlights the importance of antrum isolation of PV.

Conflict of interest: none declared.