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# Vasovagal syncope in the older person: differences in presentation between older and younger patients

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## Abstract

**Background:** vasovagal syncope (VVS) has been diagnosed with increasing frequency in older people since the description of the head-up tilt table test (HUTT). There is, however, a paucity of research describing the clinical features of VVS in this group. To address this issue, we investigated the age distribution and differences in clinical characteristics associated with age in patients diagnosed with VVS by HUTT at our tertiary referral centre.
**Methods:** 1,060 consecutive patients with tilt-positive VVS were identified from a prospective database containing the demographic and clinical information of individuals assessed in our unit over a 10-year period. VVS was diagnosed with appropriate haemodynamic changes during HUTT and accompanying symptom reproduction.
**Results:** we found a bimodal age distribution with a small peak at 20–29 years and a larger peak at 70–79 years. Patients aged ≥60 years were less likely to report total loss of consciousness [odds ratio (OR) 0.50, 95% confidence interval (CI) = 0.38–0.64], near loss of consciousness (OR 0.53, 95% CI = 0.40–0.70) or palpitations (OR 0.45, 95% CI = 0.28–0.72) and more likely to present with unexplained falls (OR 2.33, 95% CI = 1.36–4.32). The typical provoking factors of prolonged standing (OR 0.55, 95% CI = 0.40–0.72), posture change (OR 0.61, 95% CI = 0.46–0.82) and hot environments (OR 0.57, 95% CI = 0.42–0.78) were also less common in older patients.
**Conclusion:** in our large study population, VVS was more common in older patients. The clinical presentation differed significantly between the two groups. Older patients were less likely to give a typical history and therefore clinicians need to have a high index of suspicion when evaluating the older patient presenting with collapse or unexplained falls.

**Keywords:** *vasovagal, syncope, falls, elderly*

## Introduction

Prior to the introduction of head-up tilt table testing (HUTT) [1, 2] vasovagal syncope (VVS) was assumed to be uncommon in older people [3, 4]. In the Framingham cohort, the incidence of syncope in community-dwelling older people was 6.2 per 1,000 person-years, with VVS accounting for some 21% of cases. While the precise age-related incidence of VVS is unknown, it is clear that the incidence of syncope rises with age [5].

Work by Del Rosso *et al.* [6] and Alboni *et al.* [7] has shown that older people report the typical symptoms of impending syncope less often than younger people. These include less lightheadedness, dizziness, palpitations, nausea, diaphoresis, weakness and visual disturbance during the prodromal phase [6, 7]. When present, the classical prodrome is often short or absent in the older patient [8, 9]. There have been no published reports describing the typical provoking factors in the older person with VVS. While the occurrence of unexplained falls has been reported in older individuals with carotid sinus hypersensitivity, a neurally mediated disorder related to VVS [10–12], there has only been a case report on unexplained falls as a presenting symptom of VVS [13].

Current clinical guidelines emphasise the importance of the history in the evaluation of the patient presenting with syncope, while the use of HUTT testing is only advocated in situations VVS is suspected but not confirmed following the

initial evaluation [14, 15]. Given that there is now evidence to suggest that older people with VVS may present differently [6, 14], a better understanding of the clinical features of VVS in older individuals is now important as clinicians may need to have a lower index of suspicion for proceeding to HUTT in older patients. To address this issue, we conducted a large retrospective observational study to determine the age distribution of individuals diagnosed with VVS in a tertiary falls and syncope service and to define the differences in clinical characteristics between older and younger people.

## Methods

### Participants

The demographic and clinical information of all consecutive patients aged ≥18 years attending our specialist falls and syncope service between 1992 and 2005 were collected within a prospective database. Patients were assessed in accordance with national [16] and international [17] guidance on syncope evaluation. Detailed clinical histories and physical examinations were performed on all patients evaluated within the unit. Patients were routinely investigated with a 12-lead surface electrocardiogram (ECG), active stand (to exclude orthostatic hypotension, according to previously published protocols) [15, 18] and standard blood tests.

Further tests included carotid sinus massage, continuous ambulatory ECG, ambulatory blood pressure monitoring and echocardiography. Exercise tolerance testing and cardiac electrophysiology studies were performed if indicated. HUTT was performed in patients with unexplained syncope but with a normal surface ECG [15, 18] and no structural heart disease and in older patients with otherwise unexplained falls and drop attacks [13, 19]. HUTT protocols were conducted per our routine practice and have been described at length elsewhere [16, 18, 20]. Briefly, following at least 10 min of supine rest, the patient is tilted upright on a tilt table with a footplate at a 70° angle with continuous ECG and non-invasive beat-to-beat blood pressure monitoring (Finapres®, Ohmeda, WI, USA or Taskforce®, CNSystems, Austria). The period of head-up tilt varied according to the tilt protocol, with the first-line protocol involving 20 min passive, unmedicated tilt, before the administration of 400 μg of sublingual glyceryl trinitrate, followed by a further 15 min of head-up tilt [21]. The test is immediately terminated if significant haemodynamic changes occur. A positive HUTT was defined as the presence of a characteristic positive haemodynamic response in association with reproduction of the original presenting symptoms.

Information available from the database included patient demographics, clinical features, co-morbidities, medication use, injuries and hospital attendance. A retrospective analysis was performed using our clinical database. All patients diagnosed with VVS following a positive HUTT were included in our study. The age distribution of patients was determined and comparisons were then made between those individuals aged <60 years and those aged ≥60 years. Characteristics compared were clinical presentation, medication use, precipitating factors, prodromal symptoms and clinical sequelae.

Signed informed consent was obtained from all subjects for data entry into the database, and prior consent was also obtained for their information to be used anonymously for future research. Ethical approval had been obtained from the local research and ethics committee.

### Statistical analysis

A histogram of age in decades was plotted to determine the age distribution of our study population. Descriptive statistics were summarised as median (interquartile range) for continuous variables or number with percentages in parentheses for categorical variables. Numbers of medications were compared with the Mann–Whitney *U* test. Comparisons were made between the younger and older age groups using chi-squared ($\chi^2$) test for categorical data. As clinical characteristics could also be presented in 2×2 contingency tables, odds ratios (OR) with 95% confidence intervals (CI) were also calculated for individual characteristics. Logistic regression methods were used to adjust for confounders for selected characteristics. All statistical analyses were performed using SPSS® 15.0. A two-tailed *P*-value of <0.05 was considered statistically significant.

## Results

### Subjects

The records of all 1,083 patients from our prospective database were examined. Twenty-three subjects were excluded due to incomplete data. One thousand and sixty subjects were therefore included in the study. The demographics and clinical characteristics of our study population are shown in Table 1.

### Age distribution

The age distribution of patients diagnosed with VVS at our unit is shown in Figure 1. Between the third and fifth decades, there were a similar number of people diagnosed with VVS, which then rose progressively, peaking in the 70–79-year-old age group.

### Clinical characteristics

Subjects in the older group (≥60 years) had more co-morbidities than the younger group (<60 years) ($P < 0.001$) as shown in Table 1. Cerebrovascular disease, arthritis, hypertension, ischaemic heart disease, peripheral vascular disease and myocardial infarction were all more common in the older patients, whereas epilepsy was more often reported by the younger patients.

Individuals aged ≥60 years were more likely to receive regular prescriptions for analgesics (OR = 1.67, 95% CI = 1.16–2.39), aspirin (OR = 11.18, 95% CI = 6.77–18.46)

Table 1. Differences in age, gender, past medical history and drug history between the young and older age groups

| Characteristics | Younger group (<60 years) (*n* = 453) | Older group (≥60 years) (*n* = 607) | Odds ratio (95% CI) | *P*-value[a] |
|---|---|---|---|---|
| Age, median (IQR) | 42 (28, 52) | 73 (67, 79) | | <0.001[b] |
| Female gender, *n* (%) | 285 (63) | 413 (68) | 1.28 (0.99, 1.65) | 0.06 |
| Cerebrovascular disease, *n* (%) | 10 (2) | 57 (9) | 4.59 (2.32, 9.09) | <0.001 |
| Arthritis, *n* (%) | 25 (6) | 79 (13) | 2.56 (1.60, 5.09) | <0.001 |
| Hypertension, *n* (%) | 24 (5) | 161 (26) | 6.56 (4.11, 10.10) | <0.001 |
| Ischaemic heart disease, *n* (%) | 21 (5) | 167 (28) | 7.81 (4.87, 12.53) | <0.001 |
| Myocardial infarction, *n* (%) | 10 (2) | 36 (6) | 2.79 (1.37, 5.69) | 0.003 |
| Diabetes, *n* (%) | 12 (3) | 25 (4) | 1.58 (0.78, 3.18) | 0.197 |
| Epilepsy, *n* (%) | 14 (3) | 5 (1) | 0.26 (0.09, 0.73) | 0.006 |
| No. of co-morbidities, median (IQR) | 0 (0, 1) | 1 (0, 2) | | <0.001 |
| Medications | | | | |
| Analgesia, *n* (%) | 50 (11) | 104 (17) | 1.67 (1.16, 2.39) | 0.005 |
| Aspirin, *n* (%) | 18 (4) | 192 (32) | 11.18 (6.77, 18.46) | <0.001 |
| Vasoactive medications, *n* (%) | 43 (10) | 256 (42) | 6.95 (4.89, 9.90) | <0.001 |
| β-Adrenoceptor antagonists, *n* (%) | 24 (5) | 79 (13) | 2.67 (1.66, 4.30) | <0.001 |
| Calcium-channel blockers, *n* (%) | 5 (1) | 84 (14) | 14.40 (5.79, 35.79) | <0.001 |
| Diuretics, *n* (%) | 10 (2) | 111 (18) | 9.91 (5.13, 19.18) | <0.001 |
| Long-acting nitrates, *n* (%) | 5 (1) | 52 (9) | 8.40 (3.32, 21.19) | <0.001 |
| Sublingual GTN, *n* (%) | 11 (2) | 69 (11) | 5.15 (2.69, 9.88) | <0.001 |
| Others[c], *n* (%) | 9 (2) | 55 (9) | 8.40 (3.32, 21.19) | <0.001 |
| Antidepressants, *n* (%) | 32 (7) | 44 (7) | 1.03 (0.64, 1.65) | 0.908 |
| Fludrocortisone, *n* (%) | 11 (2) | 16 (3) | 1.09 (0.50, 2.37) | 0.832 |
| Vestibular sedatives, *n* (%) | 19 (4) | 35 (6) | 1.40 (0.79, 2.48) | 0.250 |
| No. of medications, median (IQR) | 0 (0, 2) | 2 (1, 3) | | <0.001[b] |
| ≥4 medications | 39 (9) | 140 (23) | 3.18 (2.18, 4.65) | <0.001[b] |

IQR, interquartile range; CI, confidence interval.
[a]Chi-squared test unless otherwise indicated.
[b]Mann–Whitney *U* test.
[c]Includes angiotensin-converting enzyme inhibitors, nicorandil and α-adrenoceptor antagonists.

and vasoactive cardiovascular medications (OR = 6.95, 95% CI = 4.89–9.90). In addition, older patients were prescribed significantly more medications ($P < 0.001$) and more likely to be using four or more medications (OR = 3.18, 95% CI = 2.18–4.65) compared with younger patients.

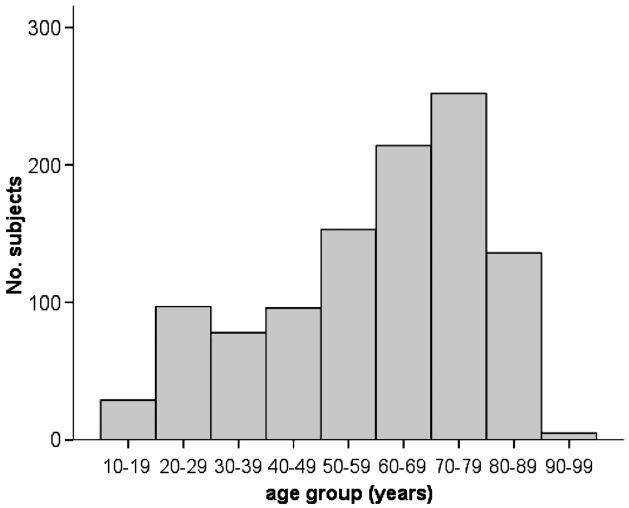


**Figure 1**. A histogram of age in decades versus number of subjects demonstrating the bimodal age distribution of patients diagnosed with vasovagal at our specialist unit.

## Presenting symptoms

Individuals in the older age group were less likely to present with symptoms of total loss of consciousness (OR = 0.50, 95% CI = 0.38–0.64) or near loss of consciousness (OR = 0.53, 95% CI = 0.40–0.70) than those in the younger age group. Those aged ≥60 years were more likely to report unexplained falls (OR = 2.33, 95% CI = 1.36–4.32). The data in Table 2 show unadjusted ORs for likelihood of symptoms of dizziness, total loss of consciousness, near loss of consciousness, palpitations or unexplained falls.

The presenting symptoms were then adjusted for sex differences and the presence of hypertension, ischaemic heart disease, myocardial infarction, cerebrovascular disease, peripheral vascular disease or vasoactive medications using logistic regression. Following the above adjustments, the older patient group was less likely to present with dizziness (OR = 0.64, 95% CI = 0.46–0.90; $P = 0.011$), palpitations (OR = 0.45, 95% CI = 0.28–0.72; $P < 0.001$), loss of consciousness (OR = 0.38, 95% CI = 0.29–0.51; $P < 0.001$) or near loss of consciousness (OR = 0.40, 95% CI = 0.29–0.51; $P < 0.001$). Unexplained falls, however, were no longer statistically significant (OR = 1.58, 95% CI = 0.81–3.10; $P = 0.18$), suggesting that the predominance of unexplained falls in the older age group could be at least partially attributed to sex differences and the presence of hypertension,

Table 2. Associated symptoms, precipitating factors and consequences in both age groups

| | Younger group (<60 years) (*n* = 453) | Older group (≥60 years) (*n* = 607) | Odds ratio (95% CI) | *P*-value |
|---|---|---|---|---|
| Dizziness, *n* (%) | 98 (22) | 117 (19) | 0.87 (0.64, 1.17) | 0.345 |
| T-LoC[a], *n* (%) | 210 (46) | 182 (30) | 0.50 (0.38, 0.64) | <0.001 |
| N-LoC[b], *n* (%) | 150 (33) | 126 (21) | 0.53 (0.40, 0.70) | <0.001 |
| Palpitations, *n* (%) | 47 (10) | 30 (5) | 0.45 (0.28, 0.72) | <0.001 |
| Unexplained falls, *n* (%) | 14 (3) | 42 (7) | 2.33 (1.36, 4.32) | 0.006 |
| Prolonged standing, *n* (%) | 135 (30) | 113 (19) | 0.55 (0.40, 0.72) | <0.001 |
| Posture change, *n* (%) | 121 (27) | 111 (18) | 0.61 (0.46, 0.82) | <0.001 |
| Hot environment, *n* (%) | 104 (23) | 88 (14) | 0.57 (0.42,0.78) | <0.001 |
| Mornings[c], *n* (%) | 57 (13) | 49 (8) | 0.61 (0.41, 0.91) | 0.015 |
| Post-prandial, *n* (%) | 27 (6) | 29 (5) | 0.79 (0.46, 1.36) | 0.394 |
| Fractures, *n* (%) | 12 (3) | 28 (5) | 1.78 (0.89, 3.53) | 0.097 |
| Soft tissue injury, *n* (%) | 62 (20) | 88 (14) | 0.67 (0.48, 0.92) | 0.013 |
| Accident and emergency, *n* (%) | 59 (13) | 73 (12) | 0.91 (0.63, 1.32) | 0.626 |
| Hospital admission, *n* (%) | 63 (14) | 89 (15) | 1.06 (0.75, 1.51) | 0.729 |

[a]Total loss of consciousness.
[b]Near loss of consciousness.
[c]Symptoms worse in the mornings.

occlusive vascular disease or the use of vasoactive medications. The use of vasoactive medications alone, however, did not account for the increased likelihood of unexplained falls in the older age group over the younger patient group (OR = 2.19, 95% CI = 1.14–4.21, *P* = 0.018).

### Precipitating factors

Older individuals were less likely to report typical precipitating factors such as prolonged standing (OR = 0.55, 95% CI = 0.40–0.72), change in posture (OR = 0.61, 95% CI = 0.46–0.82) or hot environments (OR = 0.51, 95% CI = 0.42–0.78). The older patients were also less likely to report worsening of symptoms in the morning (OR = 0.61, 95% CI = 0.41–0.91).

### Consequences

There was no significant difference in fracture rates between older and younger patients (OR = 1.78, 95% CI = 0.89–3.53). However, younger patients were more likely to report a resultant soft tissue injury (OR = 0.67, 95% CI = 0.48–0.92). There were no differences in the rates of presentation to the accident and emergency department (OR = 0.91, 95% CI = 0.63–1.32) or in admission to a hospital ward (OR = 1.06, 95% CI = 0.75–1.51).

## Discussion

In our large study population, a greater number of older than younger patients were diagnosed with VVS using HUTT with the numbers rising sharply after the fifth decade. Older patients were less likely to present with symptoms of loss of consciousness, near syncope or dizziness and more likely to present with unexplained falls. Our older patients were less likely to report the precipitating factors of prolonged standing, hot rooms, posture change and palpitations, which are typically reported by younger patients.

Our results contrast with those of Alboni *et al.* [7] who reported that 18% of VVS patients were from the 70–79 age group and 16% were within the 20–29 age group [7]. In our study, the proportion of patients within the 70–79 age group was nearly three times higher than those within the 20–29 age group; 23.3 and 9.0%, respectively. This may have occurred because other clinicians are more likely to confidently diagnose VVS in the younger individual with isolated episodes of syncope, and hence more likely to refer the older individual for further investigation at a tertiary referral syncope unit. The converse may, however, be true with older patients being under-represented in prospective interventional studies from which the data from Alboni *et al.* [7] were derived. With the sharp rise in the incidence of syncope with age and the cause of syncope unknown for a large proportion in previous epidemiological studies [5], it is not entirely surprising that VVS is far more common in older people than was previously thought.

Prolonged standing, change in posture and hot environments are common precipitating factors for VVS [17]. Our older patients were, however, significantly less likely to report the above symptoms. The reduction in presyncopal symptoms, dizziness and palpitations in our older patients was also reported by Del Rosso *et al.* [6]. The lack of clear precipitants and warning symptoms for many older patients with VVS underscore the need for specialist evaluation of the older patient presenting with transient loss of consciousness or unexplained falls. The absence of typical presentations of VVS in the older person should be borne in mind when applying current guidelines in routine clinical practice [17].

As mentioned earlier, the association between unexplained falls and VVS is not well established in the literature. Our study, therefore, represents the first case series suggesting an association between unexplained falls and VVS. Parry *et al.* [22] have reported the presence of amnesia for loss of consciousness in 95% of individuals who presented with unexplained falls due to carotid sinus hypersensitivity [22]. Amnesia or loss of consciousness may also be the rationale behind unexplained falls and the lack of prodromal symptoms in older individuals with VVS.

Multivariate analyses suggest that the increase in unexplained falls in the older patient group may be confounded by the increase in female sex and the presence of hypertension, occlusive vascular disorders or vasoactive drug use. Hypertension, vascular disorders and use of vasoactive medications are also factors associated with ageing, which may account for the increase in these disorders in our patients. These findings should be interpreted with caution in the absence of an older control group. The selection of a suitable healthy control group for VVS is a major challenge because VVS is highly prevalent within the population [23].

The fracture rates for subjects in our study were similar in both study groups (5% for the older and 3% for the younger group, NS). VVS is traditionally thought of as a benign condition, but the serious injuries seen in our patients are noteworthy. While both groups reported soft tissue injuries secondary to VVS, younger patients tended to report them more than older patients. This may be real or due to inaccurate reporting, with older individuals being less likely to report minor injuries either due to cognitive issues or stoicism. The potential biases in referral patterns mentioned earlier may also contribute to this difference, as may the possible preferential referral of more highly symptomatic younger patients to our service. However, while our service is a tertiary referral unit, only 15% of our referrals are for a tertiary opinion. The vast majority are from primary care and the emergency department, making our results more widely applicable. Larger observational studies preferably of prospective design are now required to accurately evaluate injury rates as well as other clinical factors associated with VVS in older patients.

## Conclusion

We have shown that VVS is a common diagnosis in older people. In our large cohort of tilt-positive VVS, we found significant differences in the clinical presentation of VVS between older and younger patients, with those aged ≥60 years less likely to report complete or near loss of consciousness and more likely to report unexplained falls than those aged <60 years. Typical precipitants and prodromal symptoms were also less common in our older patient group. An accurate diagnosis of VVS is, therefore, less likely to be made based on historical features alone in older patients. The corollary is of course that more intensive investigation is needed for many older patients presenting with transient loss of consciousness or unexplained falls. The differing characteristics of VVS in older patients also have major implications for studies evaluating the pathophysiological process underlying VVS and the development of future treatment strategies for this condition.

## Key points

- Vasovagal syncope is commonly diagnosed in the elderly.
- Older individuals are less likely to report the typical provoking features of syncope such as prolonged standing, warm environments or change in posture.
- Older patients are less likely to report total or near loss of consciousness, but more likely to report unexplained falls.

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## Conflicts of interest

None declared.

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# Hospital use, institutionalisation and mortality associated with delirium

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## Abstract

**Background:** delirium is a disorder affecting consciousness, which gives rise to core clinical features and associated symptoms. Older patients are particularly prone, owing to higher rates of pre-existing cognitive impairment, frailty, co-morbidity and polypharmacy.

**Objectives:** the aim of this study was to investigate the hypotheses that delirium affects the most vulnerable older adults and is associated with long-term adverse health outcome.