

Review article

Syncope in the elderly: An update



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ABSTRACT

Syncope in the elderly is an extremely prevalent clinical condition characterized by high mortality and presence of recurrences. The diagnosis of syncope in the elderly is sometimes difficult and multidimensional geriatric assessment should be carefully administered. Diagnostic algorithms should be applied with attention, although unknown syncope is still frequent. The therapeutic approach to syncope in the elderly is complicated by the high prevalence of neurally-mediated syncope, in which the therapeutic approach is still unknown. The establishment of a "Syncope Unit" has certainly improved the diagnostic-therapeutic approach to patients with syncope, especially in old age where the management is extremely difficult.

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1. Introduction

Syncope is a symptom that consists of a "transient loss of consciousness to spontaneous resolution, which usually leads to fall. The relatively rapid onset and recovery, complete and spontaneous, occurs in a short period of time".¹ The classification of syncope is shown in [Table 1](#). The pathophysiological mechanism underlying syncope is a transient global cerebral hypoperfusion. Any loss of consciousness, even transitory, that does not accurately reflect these characteristics, must be considered as a "pseudo-syncope". Some pathological conditions, in fact, such as epilepsy, disorders of metabolism (hypoxia and hypoglycemia), and poisoning are characterized by a loss of consciousness, but in the absence of cerebral hypoperfusion ([Table 2](#)).

2. Epidemiology of syncope in the elderly

Syncope is a clinical condition of great interest in the geriatric population, due to its high prevalence and significant morbidity.²

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Approximately 3% of urgent visits to the emergency department and 2–6% of hospital admissions, are due to syncope or trauma and these patients are aged 65 years or older in 80% of cases.¹ A recent analysis of data from the Framingham study shows that the incidence of syncope increases exponentially in the elderly and in particular in the 8th decade and 9th decade of life. The incidence of syncope increased from 5.7 per 1000 patients per year in the 7th decade to 19.5 per 1000 patients per year in the 9th decade.² Hip fractures are one of the most feared consequences of syncope in the elderly, as well as the reduction of functional capacity and institutionalization.³ The mortality for syncope in the elderly, however, ranges between 30% and 50% according to the observation time of follow-up (2–5 years) with a frequency of recurrences in a variable range between 25% and 30%.⁴

3. The diagnosis of syncope in the elderly

A previous estimate to the year 2000 indicated that the prevalence of syncope of unknown origin exceeded 40%.⁵ This is due to the fact that for elderly patients, some diagnostic procedures, such as the tilt table test and carotid sinus massage, had been banned as a result of a controversial danger. The Italian Group for the Study of Syncope in the elderly (GIS) has verified

Table 1
Classification of syncope according to the guidelines of the European Society of Cardiology.

Neurally-mediated	Vasovagal	Mediated by emotional stress Mediated by orthostatic stress
	Situational	Cough, sneeze Gastrointestinal situation (swallow, defecation, etc.) Micturition Postexercise Postprandial Others (e.g., laugh)
Orthostatic hypotension	Carotid sinus syncope Atypical forms (without apparent trigger)	
	Primary autonomic failure Volume depletion Drug-induced hypotension Secondary autonomic failure	Parkinson's disease, Lewy body dementia, etc. Hemorrhage, diarrhea, etc. Alcohol, vasodilators, diuretics, etc. Diabetes, amyloidosis, etc.
Cardiac syncope	Arrhythmias	Bradycardia Tachycardia Drug-induced bradycardia or tachycardia
	Structural disease	Cardiac: valvular disease, acute myocardial infarction, etc. Others: pulmonary embolism, acute aortic dissection, etc.

the applicability and the feasibility of these maneuvers in a geriatric population.⁶ The GIS, by applying the diagnostic algorithm of the European Society of Cardiology (ESC),¹ performed a diagnostic screening in a geriatric population (Fig. 1). This approach reveals many of those cases considered to be due to unexplained syncope, reducing the prevalence of these to only 10% (Fig. 2).⁷ The neurally-mediated syncope was considered, until recently, the prerogative of the young adult population and the syncope of cardiac origin were mainly attributed to geriatric age. The data from GIS have clearly indicated the prevalence of neurally-mediated syncope in the elderly (70%) compared to those of a cardiac origin (20%) (Fig. 2).^{6,7}

4. The diagnostic algorithm of syncope: First level evaluation

The initial approach to an elderly patient with syncope should take into account three main questions, which should guide the whole diagnostic process: (1) has the loss of consciousness a syncopal origin, or is it a syncope-like condition?; (2) is there heart disease?; and (3) how is the history of syncope? Once detected, the likely origin of syncopal transient loss of consciousness is determined through the initial assessment as the key moment in the diagnosis of syncope, especially in elderly patients: this include a history, a physical examination including an orthostatic hypotension test, and an electrocardiogram (ECG), which very often fails to make a diagnosis certain or highly suspect. It is worth emphasizing the importance of the orthostatic hypotension test that too often is not carried out, especially in the elderly: in these patients, in fact, orthostatic syncope has a very high prevalence. The basic purpose of the first level evaluation is to identify patients at risk for cardiogenic syncope, which always has a worse prognosis than the other causes, regardless of age.²⁻⁴

Table 2
Pseudo-syncope according to the guidelines of the European Society of Cardiology.

With loss of consciousness	Epilepsy Metabolic disorders (hypoxia, hypoglycemia, hypocapnia by hyperventilation) Poisoning Vertebrobasilar transient ischemic attack
Without loss of consciousness	Falls Cataplexy Drop attacks Carotid transient ischemic attack

5. Risk stratification in the diagnosis of syncope

A score to predict the risk of cardiac syncope and mortality from the initial assessment was recently validated as derived from the results of the study “Evaluation of Guidelines in SYNcope Study 2” (EGSYS 2).⁸ The EGSYS 2 risk score is a method of risk stratification that considers independent clinical predictors of cardiogenic syncope: the abnormal ECG and/or the presence of heart disease, the presence of palpitations prior to syncope, a syncopal episode during exertion or supine, the absence of neuroautonomic prodromes, and the absence of precipitating and/or predisposing factors. To each of these variables a score is assigned; a total score of three or more is an indicator of cardiogenic syncope. Thus, prodromal symptoms seem to represent a critical point of syncope diagnosis. However, the GIS study has given us important information about the pre-syncopal prodromal symptoms in the elderly which can predict the type of syncope and address the early diagnosis towards cardiac or non-cardiac etiology. In particular, the presence of nausea, blurred vision, sweating, and premonition of fainting directs the diagnostic suspicion towards a non-cardiac syncope, whereas the presence of dyspnea points towards a cardiac syncope.⁹

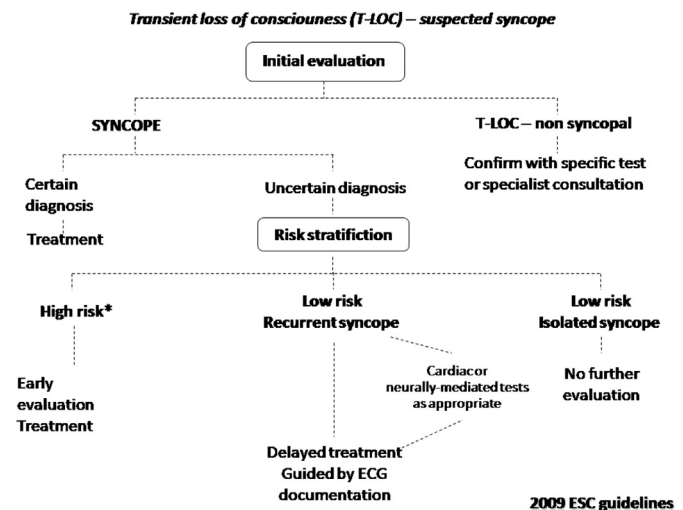


Fig. 1. Diagnostic algorithm according to the European Society of Cardiology.
* High risk patients need early evaluation treatment.

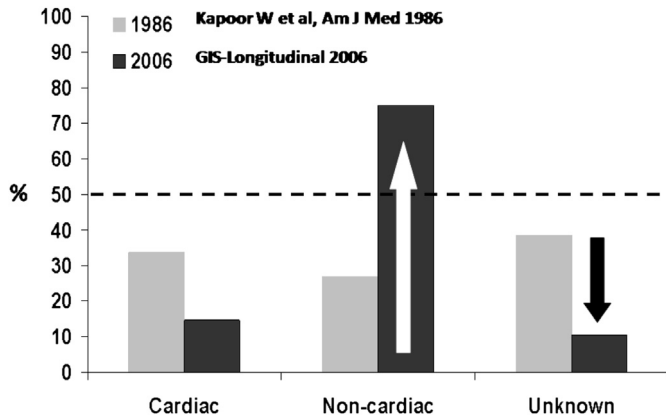


Fig. 2. Prevalence of syncope diagnosis from 1986 to 2006.

6. The multidimensional geriatric assessment

Elderly people are at highest risk of acquired disability, cognitive decline, or admission to residential care, either as a consequence of illness, or as an unfortunate consequence of treatment. Therefore, older people's needs are more complex, with potentially coexistent medical, functional, psychological, and social needs. This can lead to an atypical presentation that can often be misunderstood and requires a different approach to care.¹⁰ One of the cornerstones of modern geriatric care is the comprehensive geriatric assessment (CGA), which is both a diagnostic and therapeutic process and ensures that problems are identified, quantified, and managed appropriately. Usually, patients are cared for by the specialist team, who provide a geriatric evaluation. In a recent meta-analysis 22 randomized controlled trials (10,315 participants) of CGA (whether by mobile teams or in designated wards) compared with usual care were analyzed; patients who underwent CGA were more likely to be alive and in their own homes at the end of scheduled follow-up [odds ratio 1.16 (95% confidence interval 1.05–1.28); $p = 0.003$].¹¹

The importance of a CGA, therefore, becomes essential in the elderly. Recently, the GIS group published an extremely paradigmatic clinical case, which describes the “apparently” accidental fall of the elderly. In fact, the case highlights how in the elderly it is essential to perform the multidimensional geriatric assessment that must accompany and/or precede the application of the diagnostic algorithm of syncope. It is well known that the multidimensional geriatric evaluation by investigating the elderly individual in their entirety, especially with regard to the cognitive, depressive, and self-sufficiency aspects, is able to highlight psychophysical impairments very often underestimated. The described elderly individual says he feels sliding, minimizing the incident (as often happens in the elderly). Multidimensional evaluation, however, showed a cognitive impairment that subsequent investigations correlated to the presence of vascular dementia. The history, therefore, was not likely in this individual and, in fact, the application of the diagnostic algorithm highlighted a sinus node disease that led to a syncopal episode during stimulation of the carotid sinus. In this patient an indication for implantation of a cardiac stimulator was found and follow-up over time showed no more episodes of falling and/or syncope.¹²

Another important aspect of syncope in the elderly is the very frequent condition of disability that leaves the patient unable to stand. Therefore, the risk of permanent brain damage during hypotensive syncope is high in elderly people. A person suffering from “shock” and hypotension should immediately be laid flat on the floor to improve blood flow to the brain. By contrast, sometimes

elderly individuals with syncope are slumped in a chair and this condition may delay laying the person flat. A delay is especially likely in a nursing home, if a resident is sitting in a wheelchair off his or her nursing unit (Fig. 3).¹³

7. The diagnostic algorithm of syncope: Second level investigations

The initial evaluation can suggest a preliminary diagnostic orientation and, therefore, select the second level investigations. Only when the initial assessment suggests “pseudo-syncope” diagnostic tests, such as a cerebral computed tomography, a Doppler ultrasound of the carotid vessels, or an electroencephalogram should be performed. In particular, the CT scan should be performed only in the presence of head injury secondary to the fall, as the electroencephalogram, simple or after sleep deprivation, should be reserved only for patients with suspected epileptic nature of loss of consciousness.¹

8. Suspected diagnosis of cardiac syncope

When in the initial assessment there are elements which lead to a syncope of cardiac origin, echocardiography is mandatory and crucial, especially in the presence of aortic stenosis, a dilated or hypertrophic cardiomyopathy, and a pulmonary embolism. In patients with suspected arrhythmic etiology, who have frequent episodes of loss of consciousness or palpitations shortly prior to a syncope episode, only rarely is a dynamic ECG Holter electrocardiogram diagnostic. The ECG Holter, in fact, is diagnostic only in the rare cases in which an event occurs during syncope or pre-syncope during recording. The presence of a causal association between arrhythmia and symptoms has been demonstrated only rarely; this test may be useful in patients with psychogenic syncope — the demonstration of a normal rhythm during the loss



Fig. 3. Sometimes elderly individuals with syncope slump in a chair and this may delay laying them flat.

of consciousness can have a good predictive value for excluding a real syncope.¹ An electrophysiological study is indicated in all cases in which the initial assessment is suggestive of an arrhythmic cause, such as the presence of heart disease in the clinical history, the presence of electrocardiographic abnormalities, prodromal symptoms characterized by palpitations, and/or a family history of sudden cardiac death. An exercise test is indicated in the case of syncope on exertion, when there is a suspicion of ischemic heart disease. In carefully selected cases in which the suspicion of ischemic syncope is very strong (e.g., in the presence of several risk factors for coronary artery disease and in the absence of other plausible causes of syncope) coronary angiography may be indicated.¹

9. Suspected diagnosis of neurally-mediated syncope

When the initial investigation, however, oriented towards a neurally-mediated syncope, as well as when the first-level tests are negative, the diagnostic procedure involves the carotid sinus massage in supine and standing positions, the Tilt Table Test (TTT)¹⁴ and, in selected cases, ambulatory monitoring of blood pressure over 24 hours, which is especially useful in the case of postprandial or night hypotension. Carotid sinus massage should be performed only by an experienced physician with electrocardiogram control and after objective and/or sonographic exclusion of carotid atherosclerosis. Contraindications to carotid sinus massage are the presence of carotid bruits, recent myocardial or cerebral ischemia, or previous ventricular tachyarrhythmias.¹⁵ The TTT is the test of greater clinical use for the evaluation of neuro-mediated reflexes. In particular, it is the reference test for the diagnosis of neurally mediated syncope in all cases of syncope of unknown origin found on a first level analysis (after the exclusion of an organic heart disease on the basis of clinical history, physical examination, and ECG). There are several protocols for the performance of the TTT, but the most popular is enhanced with nitroglycerin, also validated in the elderly by the GIS.⁶ In Table 3, the various types of response to TTT are indicated: only in the response 2B (heart rate reduction with asystole > 3 seconds) is there a relative indication to the implantation of a cardiac stimulator (Table 3).¹ The carotid sinus massage is the other instrumental examination of great importance in the diagnosis of neurally-mediated syncope in the elderly; the ESC guidelines propose its performance in examinations of the first level, given the high prevalence of carotid-sinus syndrome as a cause of unexplained syncope and falls in this age group (in patients over 85 years old the test was positive in 68% of cases).^{15,16}

10. Orthostatic syncope

Orthostatic hypotension, and related-orthostatic syncope are frequent clinical problems among elderly patients, associated with significant morbidity and mortality.¹⁷ Acute orthostatic hypotension is usually secondary to medication, fluid or blood loss, or adrenal insufficiency. By contrast, chronic orthostatic hypotension is frequently due to altered blood pressure regulatory mechanisms and autonomic dysfunction. In the elderly, diagnostic evaluation

requires a CGA, with particular attention to symptoms of autonomic nervous system dysfunction, careful blood pressure measurement at various times of the day and after meals or medications, and laboratory studies.¹⁷ Recently, in a case-control study enrolling 1000 elderly patients, the prevalence of orthostatic hypotension (OH) decreased (from 35.0% to 28.0%) in the CGA intervention group, whereas its prevalence increased in the control group (from 32.8% to 40.8%).¹⁸ It is very important to exclude diagnoses of neurodegenerative diseases, amyloidosis, diabetes, anemia, and vitamin deficiency as causes of orthostatic hypotension. Elderly patients with symptoms often benefit from a stepped approach with initial non-pharmacological interventions, including avoidance of potentially hypotensive medications and the use of physical counter maneuvers. Successively, several pharmacotherapeutic agents can be added, including vagolytic substances, such as disopyramide, fludrocortisone, midodrine, and nonsteroidal anti-inflammatory drugs. With a correct evaluation and management, the occurrence of adverse events, including falls, fractures, functional decline, and myocardial ischemia, can be significantly reduced.¹⁷ Finally, the association of clinostatic hypertension and orthostatic hypotension described as the "Hyp-Hyp phenomenon," has been found in up to 50% of patients with orthostatic hypotension. The importance of clinostatic hypertension/orthostatic hypotension in clinical practice is mainly due to the presence of troublesome symptoms, end-organ damage, and difficulties in its clinical management.¹⁹

11. Syncope with undetermined etiology

As mentioned above, unknown etiology remains in at least 10% of all cases of syncope in the elderly.⁷ A large number of diagnostic tests were undertaken in patients with unexplained syncope, without providing conclusive data. By contrast, the Implantable Loop Recorder (ILR) revealed or contributed in establishing the mechanism of syncope in the vast majority of patients. The ILR is a recorder that is implanted under the skin with a simple minimally invasive procedure. It has a memory duration of 36 months and allows evaluation of the heart rhythm at the time of syncope. The unit has an internal memory capable of recording arrhythmic events, either automatically or after activation by the patient at the onset of the prodrome, or after the resumption of consciousness. The ILR is implanted with the following indications: (1) when, after various assessments, the mechanism of syncope remains unclear in patients with symptoms and ECG suggesting arrhythmic origin of syncope; and (2) in patients with recurrent syncope associated with trauma.²⁰ The findings support the recommendation in current guidelines that an ILR should be implanted earlier rather than late in the evaluation of unexplained syncope.

12. Treatment of syncope in the elderly

A proper treatment of syncope in the elderly requires an accurate diagnosis. In cardiac syncope, both with organic disease (e.g., severe aortic stenosis) and arrhythmias (e.g., sinus node disease), the therapeutic indication is unique: valve replacement in the case of aortic stenosis and cardiac stimulator in case of sinus node disease.¹

The treatment of neurally-mediated syncope in elderly patients, however, deserves particular attention. In this regard, it should be stressed that this type of patient presents age-related alterations that make one more vulnerable to this type of syncope and which may significantly influence the effectiveness of therapeutic aids adopted.^{7,9} The classic dietary and behavioral approaches indicated in the treatment of neurally mediated syncope (to avoid extreme

Table 3
Different responses to Tilt Table Test.

Response	Arterial pressure	Heart rate
VASIS 1	↓	↓ >10% (≥40 bpm > 10 s)
VASIS 2A	↓	↓ with asystole ≤ 3 s
VASIS 2B	↓	↓ with asystole > 3 s
VASIS 3	↓	↓ ≤10%

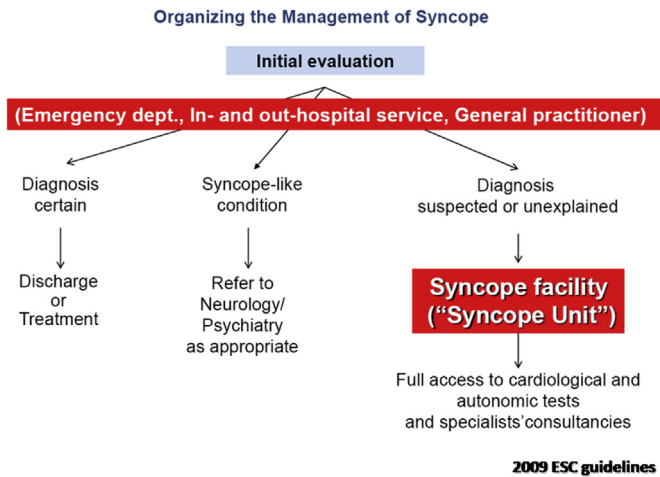


Fig. 4. Syncope Unit as a central point of management of syncope in the elderly.

heat and crowded places and prolonged orthostatic position, to increase fluid intake and salt, to use elastic stockings, to make counter-pressure maneuvers), sometimes overlooked, are to be used early in the elderly.¹ Moderate exercise, combined with a fixed position during sleep (inclination of 10°), or periods of tilt-training, have provided conflicting data in preventing or reducing the syncopal episodes in the elderly. The drug history plays a key role in the management of elderly patients: the use of diuretics, vasodilators, drugs, and beta-blockers can, in fact, further and/or cause syncope.¹ Sympathomimetic drugs such as midodrine (Gutron), methylphenidate (Ritalin) and etilefrine (Effortil) were completely ineffective in the treatment of vasovagal syncope.²¹ Similarly, beta-blockers are not effective, whereas antidepressants such as paroxetine (Seroxat) achieved significant results, even if the data has not been confirmed yet. In some selected cases, the effectiveness of disopyramide (Ritmodan), an antiarrhythmic drug with anticholinergic effects, in the prevention of neurally mediated syncope, has been demonstrated. Finally, fludrocortisone (Florinef), a corticosteroid with marked sodium-retentive activity, has been used successfully in recurrent neurally-mediated syncope.²¹

The efficacy of cardiac pacing in preventing syncopal recurrences in patients with neurally-mediated syncope is controversial. In the Third International Study on Syncope of Uncertain Etiology (ISSUE-3) trial, patients older than 40 years that experienced ≥ 3 syncopal episodes in the previous 2 years were studied.²² The 2-year estimated syncope recurrence rate was 57% with pacemaker OFF and 25% with pacemaker ON. The risk of recurrence was reduced by 57%. Thus, dual-chamber permanent pacing is effective in reducing recurrence of syncope in patients ≥ 40 years old with severe asystolic neurally-mediated syncope and 57% reduction in syncope recurrence supports this invasive treatment for the relatively benign neurally mediated syncope.²²

Finally, the treatment of syncope in old age, especially neurally-mediated treatment, is accomplished through a “multiple” approach in order to resolve the various pathogenetic components characteristic of the elderly patient.²³

13. The syncope unit

Recently, due to the complexity in managing patients with syncope, who often undergo expensive and inappropriate tests that prolong hospitalization, and increase health spending without reaching a correct diagnosis, the “Syncope Unit” was established.

The Syncope Unit is a functional organization with various areas of multidisciplinary expertise within the hospital. When present, patients with syncope access the Syncope Unit after the assessment of the first level did not clarify the etiology of the syncope or those with specific risk conditions. This scenario is very frequent in elderly patients with syncope (Fig. 4).¹ The coordination of the activities of the Syncope Unit must be carried out by medical staff who have extensive experience in transient loss of consciousness and have full access to all diagnostic and therapeutic procedures (geriatrician, cardiologist, emergency physician, internist, neurologist). This structure allowed the reduction of incongruous tests, such as cerebral CT scans, electroencephalography with an effective containment of healthcare costs, and an improved diagnostic accuracy.^{24,25}

14. Conclusions

Syncope in the elderly is extremely prevalent and is characterized by high mortality and the presence of recurrences. The definition of the cause of syncope in the elderly is not easy, but it can be improved with careful consideration of the history and with the multidimensional geriatric assessment. The therapeutic approach to syncope in the elderly is complicated by the high prevalence of neurally-mediated syncope, the treatment of which is not well defined yet. The establishment of a “Syncope Unit” has certainly improved the diagnostic-therapeutic approach to patients with syncope, especially in old age, where management becomes extremely complex.

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