J R Coll Physicians Edinb 2009; 39:236–42

Syncope: to admit or not to admit

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ABSTRACT Syncope is one element of the broader issue of 'transient loss of consciousness', but is nevertheless a very common clinical problem. Emergency department physicians and general practitioners are often the first physicians to evaluate the patient. After ensuring that any serious injury is treated, the most important task is to decide whether to admit patients to hospital. Physicians usually take the 'safe' approach and, as a result, admit both high- and intermediate-risk patients to hospital. This is understandable, but has implications for both the patient and for the management of the healthcare system. The European Society of Cardiology guidelines and several clinical studies provide helpful advice regarding 'risk stratification' of patients for hospital admission versus discharge from the emergency department or clinic with subsequent outpatient subspeciality evaluation. Syncope management units and a guideline-based approach tend to reduce the number of undiagnosed cases and the hospital admission rate. This review describes this approach for managing these patients effectively.

KEYWORDS Emergency department, guideline-based approach, hospitalisation, loop recorders, risk stratification, syncope management unit

DECLARATION OF INTERESTS No conflict of interests declared.

Published online ***April 2009***

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INTRODUCTION

Syncope is a symptom with many potential causes (see Table 1), and is characterised by a relatively sudden, brief and self-terminating loss of consciousness due to temporary interruption of global cerebral perfusion. As such, syncope is one element of a broader set of conditions that may cause transient loss of consciousness (TLOC), such as epilepsy, concussion or drug intoxication.

Syncope is known to be a relatively common cause of emergency department evaluation and hospital admission, but precise estimates of frequency are hard to establish since many reports do not differentiate clearly betweeen syncope and other causes of TLOC. Nevertheless, with this caveat, it is estimated that syncope accounts for 1–3% of emergency department visits and 1–6% of hospital admissions.

Before a diagnosis of syncope can be made, a broad range of other conditions associated with real (e.g. seizures and concussion) or apparent (e.g. narcolepsy and certain psychogenic disturbances) TLOC must be excluded. Most physicians are primarily concerned not to miss the diagnosis of an epileptic fit (i.e. generalised tonic-clonic seizure), despite the fact that this condition is much less common than true syncope. Indeed, incorrect 'over-diagnosis' of a seizure disorder with the adverse implications of such a 'diagnosis' is far more harmful to patients in most cases. A comprehensive summary of seizure risk assessment is beyond the scope of this review, but Table 2 provides a valuable scoring system.

Once syncope has been identified as the most likely cause of TLOC, clinical assessment of the presumed syncope remains a considerable challenge for a number of reasons. First, the patient has often recovered from the TLOC and is usually asymptomatic on arrival at the emergency department. Secondly, the patient (especially if in an older age group) may not be able to provide a detailed history of the circumstances. Thirdly, the event may not have been witnessed, or if it has been, the observers are often so stressed or taken aback that they may not be able to recollect details. Finally, syncope has many possible causes, ranging from relatively benign, neurally mediated reflex syncope (e.g. vasovagal faint) to potentially life-threatening arrhythmias (see Table 1). Sorting through the possible causes is time-consuming, and not feasible in an emergency department environment. Thus the key question is: 'Does this patient need in-hospital evaluation and monitoring?'

In this article, we aim to provide an overview of acute care risk stratification for patients presenting with presumed syncope. Our goal is to review current evidence regarding optimal strategies for the initial patient evaluation and thereby guide physicians in selecting those patients for whom hospital admission is prudent versus those for whom outpatient clinic evaluation is appropriate.

OVERVIEW OF NEED FOR HOSPITALISATION

Immediate mortality risk is the main factor in determining whether a patient with presumed syncope should be hospitalised for evaluation and, if necessary, treatment. Secondary issues include the potential for physical injury

TABLE 1 Clinical features suggestive of specific causes of real or apparent loss of consciousness (after European Society of Cardiology guidelines)

Cause	Features
Neurally mediated syncope • Vasovagal • Carotid sinus syncope • Situational syncope	• Absence of cardiac disease • Long history of recurrent syncope • After sudden or unexpected sight, sound, smell or pain • Prolonged standing in hot, crowded places • Syncope associated with nausea and vomiting • During or immediately following a meal • With head-rotation, pressure on carotid sinus (as in tumours, shaving, tight collars) • After exertion
Syncope due to orthostatic hypotension • Autonomic failure • Drug- and alcohol-induced orthostatic syncope • Volume depletion	• On standing • Temporal relationship with start of medication or changes of dosage • Prolonged standing, especially in hot, crowded places • Presence of autonomic neuropathy or Parkinsonism • After exertion
Cardiac syncope • Sinus node dysfunction • Atrioventricular conduction system disease • Paroxysmal supraventricular and ventricular arrhythmias • Inherited syndromes (e.g. long QT syndrome, Brugada syndrome) • Implanted device malfunction • Drug-induced pro-arrhythmias	• Presence of structural heart disease • During exertion or when supine • Preceded by palpitation • Family history of sudden death
Cerebrovascular syncope • Vascular steal syndromes	• Arm exercise • Differences in blood pressure or pulse in both arms

(e.g. falls risk) and, to a lesser extent, treatment options that require hospital monitoring for safe initiation.

When the aetiology of syncope has been diagnosed after the initial clinical evaluation, the need for hospitalisation depends on the immediate risk posed by the underlying problem and on the proposed treatment. Thus, for example, patients with syncope accompanying complete heart block, ventricular tachycardia, acute aortic dissection or pulmonary embolism should be admitted to hospital and preferably to an electrocardiogram-monitored unit. On the other hand, most patients with vasovagal faint can be sent home after careful discussion of the nature of the problem and simple preventative measures (e.g. hydration, avoidance of hot, crowded environments, etc.). Later clinic follow-up is sufficient in most cases.

For patients with syncope in whom the aetiology remains unknown, the need for hospitalisation is less well defined so 'risk stratification' methods using the patient's clinical features are used. A number of guidelines have been published, including those produced by the Syncope Evaluation in the Emergency Department Study (SEEDS), the Osservatorio Epidemiologico sula Sincope nel Lazio study (OESIL), the San Francisco Syncope Rule study (SFSR), the European Society of Cardiology (ESC) and the American College of Emergency Physicians (ACEP). All use clinical data that are readily accessible to the physician (e.g. patients' symptoms, signs, basic laboratory results and clinical experience) to stratify risk.

WHICH SYNCOPE PATIENTS REQUIRE IN-HOSPITAL EVALUATION?

The following section provides an overview of risk stratification and common circumstances for which hospitalisation is recommended.

Patients with high risk

Several symptoms and prognostic markers identify syncope patients who are at high risk and should be considered for admission and in-hospital evaluation, as follows:

- Acute myocardial ischaemia, acute aortic dissection, signs of congestive heart failure and/or suspicion of underlying structural heart disease (e.g. valvular aortic stenosis, pulmonary hypertension) – highest immediate mortality risk.
- Electrocardiographic (ECG) abnormalities, including high-grade atrioventricular (AV) block, cardiac rhythm pauses of 2–3 seconds or greater, pre-excitation syndromes (e.g. Wolff-Parkinson-White syndrome), suspected arrhythmogenic right ventricular dysplasia/cardiomyopathy (ARVD/C) based on ECG or imaging evidence (although this is not generally available in the emergency department or clinic), long or short QT syndromes (LQTS, short QTS) or Brugada syndrome (Table 3).
- Patients who experience syncope during rather than after exercise (Table 4) and syncope causing motor

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vehicle accidents or severe injury should also be evaluated in the hospital.

- A family history of premature sudden death. This might indicate ischaemic heart disease but may also signal a variety of familial conditions that may first present as syncope (e.g. LQTS, ARVD, Brugada syndrome, etc.). Note that:
  - The SEEDS study designated a family history of unexpected death as an intermediate risk with patients observed in an emergency department-based syncope management unit instead of immediate hospital admission.
  - The ACEP guidelines recommend considering hospital admission.
  - The ESC guidelines designate a family history of unexpected death as a strong recommendation for hospital admission.

In the OESIL study, four characteristics were associated with adverse outcome:

- Age above 65 years
- A clinical history of cardiovascular disease
- Syncope without prodromal symptoms
- Abnormal ECG

Each characteristic scored one point. One-year mortality has been shown to increase with increasing score (0% for a score of 0; 0.8% for 1 point; 19.6% for 2 points; 34.7% for 3 points; 57.1% for 4 points; $p<0.0001$ for trend).

In the SFSR study, a high-risk patient with syncope was defined as having any of the following five risk factors:

- Abnormal ECG (non-sinus rhythm or new abnormality)
- Anaemia (haematocrit <30%)
- Shortness of breath
- Systolic hypotension (<90 mmHg)
- History of congestive heart failure

The SFSR study was found to be 96% sensitive and 62% specific for short-term serious outcomes (within seven days of the initial visit).

Patients with intermediate risk

Risk factors for intermediate risk include:

- Age above 50 years
- History of structural heart disease but without active signs or symptoms
- Certain ECG abnormalities
- Family history of sudden death
- Cardiac devices without evidence of dysfunction
- Symptoms not consistent with vasovagal or reflex-mediated syncope
- Physician's judgement that cardiac syncope is possible

TABLE 2 Point score for the differentiation of seizures from syncope (after Sheldon et al.; see Further Reading)*

Symptom/presentation	Score
Abnormal behaviour noted (see article for details)	1
Loss of consciousness with emotional stress	1
Post-ictal confusion	1
Head turning to one side during loss of consciousness	1
Prodromal déjà vu or jamais vu	1
Waking with cut tongue	2
Any presyncope	–2
Loss of consciousness with prolonged standing or sitting	–2
Diaphoresis before a spell	–2

*Seizures considerably more likely if cumulative score ≥1.

TABLE 3 Results that lead to a diagnosis of arrhythmia-related syncope by ECG (based on ESC guideline)

Sinus bradycardia <40 beats/min or repetitive sinoatrial blocks or sinus pauses >3s
Mobitz II 2nd or 3rd degree atrioventricular block
Alternating left and right bundle branch block
Rapid paroxysmal supraventricular tachycardia or ventricular tachycardia
Pacemaker malfunction with cardiac pauses

TABLE 4 Causes of syncope during exercise

Critical coronary artery disease
Congenital coronary artery anomaly
Severe valvular/subvalvular disease • Aortic stenosis • Hypertrophic cardiomyopathy
Cardiomyopathies
High-grade atrioventricular block
Catecholamine-triggerred ventricular tachyarrhythmias • Long QT syndrome • Idiopathic ventricular tachycardias
(Rare) Exercise/post-exercise variant of neurally mediated reflex faint

In SEEDS, patients with intermediate risk were placed in an emergency department-based syncope management unit, where they received continuous cardiac monitoring for up to six hours, hourly vital signs, orthostatic blood pressure checks and echocardiogram for patients with abnormal cardiovascular examination or ECG findings. During this evaluation, if patients developed high-risk features they were admitted to hospital, otherwise they were discharged to be followed up at an outpatient clinic within 72 hours. For emergency departments without a well-developed syncope management unit, an observation unit similar to that used for 'chest pain' assessment may prove useful.

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The ESC Task Force and ACEP guidelines do not classify an intermediate risk but recommend that patients are considered for hospitalisation if they exhibit any of the following:

- Syncope in supine position (ESC)
- Exertional syncope in younger patients without an obvious benign aetiology (ACEP)
- Age above 60 years (ACEP)
- History of structural heart disease (ACEP)
- Recurrent episodes (ESC)
- Family history of sudden death (ACEP)
- Palpitations shortly before syncope (ESC)

Patients with low risk

Low risk of life-threatening cardiac syncope is indicated by:

- Age below 50 years
- No history of cardiovascular disease and normal cardiovascular examination
- Normal baseline ECG
- Syncope thought to be neurally mediated, reflex or orthostatic

However, 'falls risk' (and potential for physical injury) is still a consideration, especially in older individuals. Low-risk patients can be stabilised in the emergency department or clinic and reassured that they have a good prognosis. Nevertheless, advice regarding hydration, avoidance of provocative factors, driving, leisure activities and occupational risk should be provided, given the real risk of recurrent events before definitive therapy is instituted.

The Risk stratification Of Syncope in the Emergency department (ROSE) study was conducted to compare the performance of an OESIL score and SFSR recommendations with emergency department guidelines for a single centre in the UK (the Royal Infirmary of Edinburgh). The emergency department guideline was based on ESC, American College of Physicians and ACEP guidelines. The goal was to determine which risk stratification tool best predicted short-term (one week and one month) and medium-term (three months) serious outcomes for patients presenting with syncope. Each of the scores was able to identify an increased probability of medium-term serious outcome in patients with syncope. The SFSR recommendations showed good sensitivity at the expense of an increased frequency of admission to the hospital. On the other hand, the UK centre's own guideline and the OESIL score were not sufficiently sensitive to be able to reduce admissions without missing patients at risk of serious outcome.

SYNCOPE MANAGEMENT UNITS

When a cause of syncope cannot be determined immediately, current practice is to take the 'safe' approach and admit high- and intermediate-risk patients to hospital. In a recent study, Bartoletti et al. evaluated the frequency with which physicians elected hospitalisation or outpatient evaluation in a group of patients presenting with true syncope (see Further Reading). The physicians were trained to follow the ESC guidelines for syncope (and with regard to hospital admission recommendations). During the two-year study, of 1,124 patients deemed to have true syncope, 440 (39%) had at least one marker supporting admission for further evaluation; 393 of these 440 patients (89%) were admitted. In contrast, 684 patients met no evident admission criteria; 511 of those 684 patients (75%) were appropriately discharged, but 25% were admitted. This high admission rate (25%) in low-risk patients, despite training and awareness of guidelines, shows that there are unresolved problems that need to be addressed to reduce unnecessary hospital admissions.

It is not yet clear whether syncope management units can solve this problem of an over-admission of low- and intermediate-risk patients. Two recent prospective observational studies demonstrated improved syncope management in the hospital by using guideline-based decision-making software and a team of specially trained personnel in a syncope management unit (SMU). The SEEDS study examined the utility of an SMU in the emergency department for patients with syncope who are considered at intermediate risk for adverse cardiovascular outcome. In this prospective, single-centre, unblinded randomised study, 103 patients were randomised to 'standard care' or SMU after initial assessment with a complete history, physical examination and electrocardiogram. The study found that a presumptive diagnosis of the cause of syncope was significantly increased from 10% in the standard care patients to 67% among those who underwent SMU evaluation; hospital admission was reduced from 98% among the standard care patients to 43% among the SMU patients; and the total length of patient-hospital days was reduced by more than 50% for patients in the SMU group. On the other hand, during follow-up, all causes of mortality and recurrent syncope events were similar between the standard care patients and SMU patients.

The potential for the ESC guidelines to facilitate the management of syncope patients referred to emergency departments in 11 Italian general hospitals was investigated in the Evaluation of Guidelines in Syncope Study (EGSYS-2). The application of guidelines to clinical circumstances was facilitated by the use of purpose-designed software in addition to personnel training at test sites. A diagnosis was established in 98% of cases, with the vast majority being either neurally mediated or

orthostatic faints. The initial evaluation (history, physical examination and electrocardiogram) established a diagnosis in 50% of cases. The investigators compared the outcomes of 745 patients managed with this 'standardised care' system to 929 patients managed with usual care. In the group designated to standardised care, hospitalisations were fewer, in-hospital stay was shorter, fewer tests were performed per patient and cost per patient and mean cost per diagnosis were lower. An EGSYS-2 score was derived from this study to predict cardiac syncope at initial evaluation. An abnormal ECG and/or heart disease, palpitations before syncope, syncope during effort or in supine position, an absence of autonomic prodromes and an absence of predisposing and/or precipitating factors were found to be predictors of cardiac syncope. A score from +4 to –1 was assigned, and a score ≥3 identified cardiac syncope with 95% sensitivity and 67% specificity.

IMPLANTABLE LOOP RECORDERS

The mechanism of syncope can be difficult to determine in patients with recurrent syncope when initial investigations are negative or inconclusive. In recent years, implantable loop recorders (ILR) have been developed to identify underlying arrhythmic aetiology in this group of patients.

The ILR is a subcutaneously implanted device that is smaller than a typical permanent pacemaker, and is equipped with built-in electrodes (no cardiac leads are needed) capable of providing a single-lead ECG. The ILR is usually implanted in the left prepectoral region (similarly to a conventional pacemaker) using local anaesthetic. It continuously records a sensed electrogram signal that is stored in a circular buffer. After a spontaneous syncopal event the patient can 'freeze' a rhythm strip which can later be downloaded and printed for analysis. Some ILRs are capable of transmitting stored data immediately via wireless telephony. In older and many contemporary devices, the method of downloading is similar to that used in most pacemakers: a radiofrequency wand is placed near the device and the information is then transmitted.

The International Study on Syncope of Uncertain Etiology (ISSUE-2), along with a number of other smaller studies, has shown that the ILR is a useful diagnostic tool for recurrent syncope of unknown origin. Although not a perfect solution to the syncope diagnosis dilemma, the ILR has been shown to make a symptom–rhythm correlation in a large percentage of patients with recurrent syncope. The use of ILRs early in the diagnostic process is now increasingly encouraged; the number of accurate diagnoses increases, and the cost per correct diagnosis diminishes substantially.

CONCLUSION

Syncope is a very common clinical problem that is often first evaluated by busy emergency department physicians and general practitioners. Determining the underlying aetiology and the risk of adverse outcome is often challenging, especially when time is limited. Given this scenario, several studies have advocated risk stratification criteria that can be implemented in daily practice to guide the decision-making process regarding immediate patient admission or the safety of discharge with later clinic assessment. None of these systems is perfect, but they do offer reasonable strategies for identifying high-risk, intermediate-risk and low-risk patients. The high-risk patients need to be admitted to the hospital for further diagnosis and treatment. The intermediate-risk patients can be evaluated in SMUs. More widespread development of such units is strongly encouraged; they have been shown to reduce both hospital costs and the number of undiagnosed cases. Finally, low-risk patients can be safely discharged with counselling and later follow-up in the ambulatory care clinic.

KEY POINTS

- Syncope associated with acute myocardial ischaemia, signs of severe congestive heart failure and certain ECG abnormalities (e.g complete heart block, Wolff-Parkinson-White syndrome, long QT syndrome, Brugada syndrome, arrhythmogenic right ventricular dysplasia) is thought to have the highest immediate mortality risk and requires immediate hospital admission.
- In patients with syncope and no evidence of structural heart disease, with a normal baseline ECG, symptoms are typically due to neurally mediated reflex or orthostatic causes and hospital admission is not needed.
- Patients with syncope and intermediate risk factors for adverse outcome can be evaluated in an emergency department-based syncope management unit before deciding on hospital admission.
- Syncope management units and the training of emergency physicians with respect to ESC guidelines (particularly with regard to hospital admission recommendations) significantly reduce hospital admissions for syncope.
- The implantable loop recorder is a useful diagnostic tool for the evaluation of recurrent syncope of unknown origin.

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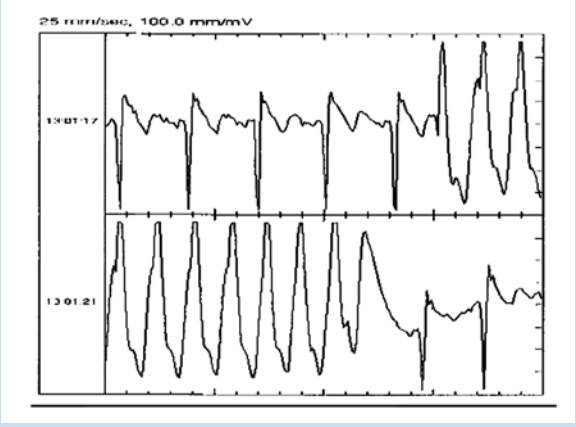
SELF-ASSESSMENT QUESTIONS

1. A 23-year-old male patient without any previous history of structural cardiopulmonary disease was admitted to the emergency department after an episode of syncope during exercise. His ECG showed a QTc of 550 ms. Which ONE of the following approaches would be the appropriate management in the emergency department?

A. Admit patient to the hospital for further diagnosis and treatment.
B. Admit the patient only if there is evidence of reversible cause of QT prolongation.
C. Admit to a syncope management unit and monitor for six hours, then discharge if there is no evidence of either reversible cause of QT prolongation or arrhythmia.
D. Admit the patient to the hospital if there is a history of unexpected sudden death in the family.
E. Discharge with follow-up in a cardiology clinic if there is no evidence of reversible cause of QT prolongation.



2. A 35-year-old female patient with a history of recurrent syncope presents to the emergency department following a syncopal event resulting in the dislocation of her shoulder. An implantable loop recorder (ILR) had been fitted three months prior to this owing to syncope of unknown origin after a negative extensive work-up including normal ECG, echocardiogram and tilt-table test. The ILR was activated during her most recent episode (Figure). Which ONE of the folllowing is correct with regard to the management and ILR recording of this patient?

A. The ILR recording is very noisy and non-diagnostic. Her shoulder can be relocated in the emergency department followed by discharge home.
B. She should be admitted to the hospital due to her severe injury for further work-up for syncope of unknown origin.
C. The ILR recording before the syncope shows a rapid arrhythmia; she should be admitted to hospital.
D. It is most likely that she experienced a vasovagal faint and can be discharged with outpatient clinic follow-up.
E. She has low risk for adverse outcome since she has no underlying structural heart disease and can be discharged from the hospital once her shoulder is relocated.

3. A 65-year-old male patient with a history of hypertension presented to the emergency department due to loss of consciousness following a meal with a moderate amount of alcohol. This was the first time this had happened. He had been getting into his car and suddenly felt dizzy and nauseated and fell to the ground. He was found, cold and clammy, by his son. In the emergency department, his vital signs, physical examination and electrocardiogram were within normal limits. Which ONE of the following is the most likely diagnosis and does the patient need hospital admission?

A. The patient had a neurally mediated reflex syncope and does not need to be admitted to hospital.
B. The patient has an intermediate risk for adverse outcome owing to his history of hypertension and needs to be admitted for observation.

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C. The patient needs a tilt-table test to diagnose vasovagal syncope and should be admitted for this test.
D. The patient has a high risk for adverse outcome due to his age and history of hypertension and needs to be admitted to the hospital for further work-up.
E. He should be admitted to hospital and an echocardiogram should be requested to rule out structural heart disease.

4. A 78-year-old female nursing home resident was brought to the emergency department after being found unconscious in her chair. She regained consciousness but remained confused. Her ECG monitor showed sinus bradycardia at 37 beats/min with occasional pauses of 3.5 seconds. Her blood pressure was 85/65 mmHg. She has a history of hypertension treated with atenolol 50 mg/day. After one hour her ECG showed sinus rhythm at 65 bpm, and she was conscious and oriented. Basic laboratory values were within normal limits. Which ONE of the following is the best immediate treatment for this patient?

A. Atenolol should be stopped and the patient observed in the emergency department for a few hours for evidence of recurrent bradycardia.
B. The patient should be admitted to the hospital for further evaluation and treatment because of the significant bradycardia on the ECG.
C. Atenolol should be stopped and she can be discharged from the emergency department with follow-up in a cardiology clinic within 72 hours.
D. An echocardiogram should be ordered in the emergency department to evaluate whether there is structural heart disease.
E. The patient has a low risk for adverse outcome and can be discharged to the nursing home on her usual medications.

5. A 45-year-old male with an ischaemic cardiomyopathy presented to the emergency department with temporary loss of consciousness and three shocks from a previously placed implantable cardioverter defibrillator (ICD). He recalled having palpitations, but no other symptoms, before he lost consciousness. In the emergency department his heart rate was 65 bpm and his blood pressure was 110/80 mmHg. His physical examination was within normal limits except for a grade 2 atypical pansystolic murmur. Which ONE of the following is the best treatment option for this patient?

A. Observe in the emergency department for six hours and if there is no electrolyte abnormality or cardiac ischaemia the patient can be discharged for follow-up in cardiology clinic.
B. He is a high-risk patient and should be admitted to the hospital for further treatment and a device check.
C. Three ICD shocks indicates normal ICD function and he can be discharged from the emergency department in the absence of electrolyte abnormalities or cardiac ischaemia.
D. His device should be interrogated in the emergency department and if all therapies were appropriate he can be discharged home.
E. Admit to the hospital only if there is evidence of cardiac ischaemia or electrolyte abnormality to trigger ICD therapies.

Originally published as part of the Acute Medicine module in the RCPE Online Continuing Medical Education Programme.

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