Standardized Care Pathway Versus Conventional Approach in the Management of Patients Presenting with Faint at the University of Utah

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Background: *Despite the availability of guidelines, the evaluation of patients with faint continues to be inconsistent. The purpose of this study was to test the hypothesis that utilization of a new standardized-care pathway (Faint-Algorithm) reduces hospital admissions and improves diagnostic yield when compared to the conventional approach in the evaluation of patients with faint.*

Methods: *We reviewed the data of 154 consecutive patients presenting with faint to the Faint and Fall Clinic at the University of Utah (standardized group) and 100 patients previously evaluated for faint using the conventional approach (conventional group).*

Results: *Using a standardized approach, only 4% of patients were admitted when compared to 20% in the conventional group ($P < 0.001$). The rate of diagnosis at initial evaluation was similar between the groups; however, at 45 days, it was greater in the standardized group when compared to the conventional group (57% vs 45% in the total population, $P = 0.09$; 57% vs 39% in the outpatient subgroups, $P = 0.02$). The number of tests or consultations associated with additional charges was significantly lower in the standardized group when compared to the conventional group (1.9 ± 1.0 vs 2.6 ± 1.2, $P = 0.001$).*

Conclusions: *The use of a standardized approach in the evaluation of patients with faint decreased the number of hospital admissions and increased the rate of diagnosis at 45 days. This was achieved with less utilization of costly tests and consultations. (PACE 2013; 36:152–162)*

syncope, Faint-Algorithm, guidelines

Introduction

In the definition of the recent guidelines of the European Society of Cardiology (ESC),[1] "Transient Loss of Consciousness" (T-LOC) or "Faint" encompasses all disorders characterized by self-limited loss of consciousness irrespective of mechanism, and includes syncope, epilepsy, and psychogenic disorders. Syncope, defined as a transient loss of consciousness due to cerebral hypo-perfusion, indicates specific etiologies as the cause of faint. In the outpatient setting, patients with syncope are often evaluated by several healthcare providers, including cardiologists and neurologists. Despite the availability of guidelines,[1,2] the evaluation of these patients continues to be inconsistent, resulting in a significant number of unwarranted admissions and overutilization of tests.[3–7]

The purpose of this study was to test the hypothesis that utilization of a new standardized-care pathway reduces hospital admissions and improves diagnostic yield when compared to the conventional approach in patients presenting with fainting spells.

Methods

The study was a retrospective comparison of the evaluation of patients with faint using a standardized approach versus the conventional approach. It took place at the University of Utah Hospital and was approved by the University of Utah Institutional Review Board. The search terms used to identify patients with faint included:

Disclosures: M. Brignole and M.H. Hamdan are the co-inventors of the software described in this article (Faint Algorithm, F2 Solutions, Sandy, UT). They have financial interest in the start-up company that has exclusive rights to the software product.

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"faint," "fainting," "fainted," "syncope," "syncope and collapse," "loss of consciousness," "blackout," "blacked out," "passed out," "spell," and "dizzy spell." During the period of December 1, 2010–April 30, 2011, a total of 428 patients sought medical assistance for faint at the University of Utah. One hundred and fifty four patients were seen in the Faint and Fall Clinic (FFC). These patients were evaluated using the standardized approach described below and therefore will be referred to as the standardized group. During the period of September 1, 2009–October 30, 2009, which preceded the opening of the FFC, a total of 172 patients were seen at the University of Utah for evaluation of faint. These patients were evaluated using the conventional approach as determined by the treating physicians and thus will be referred to as the conventional group. Seventy-two patients out of 172 were excluded for various reasons, including inappropriate registration of the diagnosis as the principal reason for evaluation in 51 patients; the index event occurred more than 3 months prior to the visit date in 14 patients; the age was less than 18 years in five patients; and two patients refused to completion of the recommended studies, thus leaving a total of 100 patients. This conventional group served for analysis in a previously published study.[8]

Standardized Approach

We recently developed at the University of Utah a faint algorithm derived from the most recent American and European Guidelines.[1,2] By design, the algorithm integrated the guidelines' recommendations for risk assessment, admission, and diagnosis in a structured pathway. (See appendix for a detailed description of the algorithm.) In order to achieve maximum adherence to the algorithm, we created a Web-based software where clinical data are entered in structured electronic forms (F2 Solutions, Inc., Sandy, UT, USA). In addition to the database features, the software provides the physician with suggestions regarding the most appropriate evidence-based management. This Web-based on-line interactive decision-making tool is currently being used in the FFC at the University of Utah. When using the software, the physician or nurse practitioner is prompted to answer essential questions regarding the clinical history, physical examinations, 12-lead electrocardiogram (ECG), echocardiogram, and appropriate blood test results. Given that information, the software determines the short-term risk and need for hospital admission using previously published criteria.[9] The healthcare provider is given the opportunity to agree or disagree with the software recommendation. If a decision is made not to admit the patient, the software uses the available information to assess whether a certain diagnosis can be made by verifying how much of the information entered meets the diagnostic criteria for a given diagnosis as defined in the recent guidelines. If a diagnosis cannot be made, the software suggests the most likely diagnosis and recommends the appropriate tests to be performed in the most cost-effective way. Since the software was never intended to be a replacement for the healthcare provider's skills and judgment, its utilization still requires the interaction with a physician expert in the field who can take care and manage these patients.

Data collected for both groups included information on admission rates, days of hospitalization, rate of diagnosis at initial evaluation, and after 45 days of work-up. Patients in both groups were given one of the following diagnoses according to the recent ESC guidelines: reflex syncope, orthostatic hypotension syncope, cardiac arrhythmia syncope, cardiac structural syncope, nonsyncopal faint, pending diagnosis, and unknown diagnosis. Pending diagnosis was given if the patient was undergoing prolonged ECG monitoring 45 days after the initial presentation. An unknown diagnosis was given if in the physician's judgment no additional tests were needed and the final diagnosis was not made. All the data collection was performed by N.S and T.L.J.

Statistical Analysis

Data are reported as means ± standard deviation (SD). Continuous and categorical variables were compared between groups by means of Student's *t*-test and Fisher's exact test, respectively. A 2-tailed P-value <0.05 was considered statistical significant. Stepwise logistic regression analysis was performed in order to evaluate the effect of the baseline clinical variables listed in Table I on the outcomes of admission and final diagnoses in the two study groups. Variable with a P-value >0.1 were removed from the model. MedCalc Software (Mariakerke, Belgium) was used for statistical analysis.

Results

Patient Population Baseline Characteristics

Table I outlines the characteristics of the patients in the standardized (n = 154) and conventional (n = 100) groups. Except for age and history of neurologic diseases, the groups were well matched. The average age was 55 ± 22 years in the standardized group and 49 ± 21 years in the conventional group (P = 0.03). The presence of neurological diseases was 14% in the standardized

Table I.

Patients' Characteristics

	Total Population			Outpatients		
	Standardized 154 Patients	Conventional 100 Patients	P Value	Standardized 121 Patients	Conventional 57 Patients	P Value
Mean age (±SD) years	55 ± 22	49 ± 21	0.03	56 ± 22	50 ± 22	0.09
Female gender (%)	93 (60%)	57 (57%)	0.60	74 (61%)	34 (60%)	0.87
Present illness (%):						
First episode	41 (26%)	33 (33%)	0.26	31 (26%)	18 (32%)	0.47
Recurrent syncope	115 (75%)	67 (67%)	0.26	90 (74%)	39 (68%)	0.47
Major injuries (fractures, brain concussion) (%)	13 (8%)	3 (3%)	0.11	12 (10%)	3 (5%)	0.39
Comorbidities (%):						
History of structural heart disease	21 (14%)	22 (22%)	0.09	16 (13%)	13 (23%)	0.13
Previous myocardial infarction	3 (2%)	7 (7%)	0.05	3 (2%)	4 (7%)	0.21
Previous pacemaker or ICD	3 (2%)	5 (5%)	0.3	3 (2%)	3 (5%)	0.39
Hypertension	53 (34%)	27 (27%)	0.27	44 (36%)	18 (32%)	0.61
Hyperlipidemia	46 (30%)	19 (19%)	0.08	36 (30%)	14 (25%)	0.59
Neurological disease	22 (14%)	5 (5%)	0.02	16 (13%)	2 (4%)	0.06
Diabetes	21 (14%)	11 (11%)	0.70	16 (13%)	7 (12%)	1.00
Pulmonary disease	9 (6%)	1 (1%)	0.09	6 (5%)	0 (0%)	0.18
End-stage disease (cancer, dialysis)	0 (0%)	2 (2%)	0.15	0 (0%)	1 (2%)	0.32

ICD = implantable cardioverter defibrillator.

group versus 5% in the conventional group (P = 0.02).

Table I also includes information on baseline characteristics for a subgroup of patients who were evaluated in the outpatient setting (n = 121, standardized group; n = 57, conventional group), thus excluding those who were seen in the Emergency Department or same-day referrals to the FFC from the Emergency Department (n = 33, standardized group; n = 31, conventional group), and those directly hospitalized by the primary care physician (n = 12, conventional group). Akin to the total population, the outpatient subgroups were well matched between the standardized and conventional groups.

Primary Outcomes of Diagnosis and Management

Using a standardized approach, only 4% of the total population and 2% of the outpatient population were admitted following initial evaluation compared to 20% and 16% in the conventional group, respectively (P < 0.001 and P < 0.001, respectively, Table II). Accordingly, hospitalizations were reduced by 81% (RRR = 0.19 [95% confidence interval (CI) = 0.08–0.47]) in the total population and by 87% (RRR = 0.13 [95% CI = 0.04–0.44]) in the outpatient population. The rate of diagnosis at initial evaluation was similar between the groups; however, the rate of diagnosis at 45 days was greater in the standardized group when compared to the conventional group, particularly in the outpatient setting (57% vs 45% for the total population, P = 0.09; 57% vs 39% for the outpatient subgroups respectively, P = 0.02). Reflex mediated syncope was the most common diagnosis given in all groups. In the total population analysis, a greater proportion of patients in the standardized group received a diagnosis of reflex syncope compared to the conventional group (30% vs 17%, P = 0.04).

Factors Predictive of Outcomes

With the stepwise logistic regression, even after correction for the baseline variables listed in Table I, the conventional strategy remained an independent predictor of increased admissions, higher rate of unexplained diagnosis, and lower rate of diagnosis of reflex syncope, both alone and when combined with median age (52 years) and history of structural heart disease. No variable was predictive of cardiac syncope (Table III). Patients evaluated using the conventional strategy were seven times more likely to be admitted compared to those evaluated using the standardized approach (odds ratio 7.4). In

Table II.

Diagnosis and Management

	Total Population			Outpatients		
	Standardized n = 154 (%)	Conventional n = 100 (%)	P value	Standardized n = 121 (%)	Conventional n = 57 (%)	P value
Admission following initial evaluation	6 (4%)	20 (20%)	<0.001	3 (2%)	9 (16%)	<0.001
Days of hospitalization (±SD) after admission	2.5 ± 1.0	3.0 ± 2.4	0.63	1.7 ± 0.6	3.5 ± 2.9	0.32
Diagnosis at initial evaluation	38 (25%)	29 (29%)	0.47	31 (26%)	15 (26%)	1.00
Final diagnosis at the end of work-up	88 (57%)	45 (45%)	0.09	69 (57%)	22 (39%)	0.02
Reflex	46 (30%)	17 (17%)	0.04	33 (27%)	10 (18%)	0.19
Orthostatic hypotension	17 (11%)	7 (7%)[a]	0.38	13 (11%)	6 (11%)[a]	1.00
Cardiac, arrhythmia	8 (5%)	11 (11%)	0.09	8 (7%)	4 (7%)	1.00
Cardiac, structural	1 (1%)	1 (1%)	1.00	1 (1%)	0 (0%)	1.00
Non-syncopal faint	16 (10%)	9 (9%)	0.83	14 (12%)	2 (4%)	0.10
Pseudo-syncope	7	1		6	1	
Epilepsy	2	2		1	1	
Other (falls, vertigo, sleep disorders, etc.)	7	6		7	0	
Pending diagnosis after 45 days (prolonged ECG monitoring)	13 (8%)	3 (3%)	0.11	12 (10%)	1 (2%)	0.06
Unknown diagnosis at the end of work-up	53 (34%)	52 (52%)	0.006	40 (33%)	34 (60%)	0.001

[a]In three patients, the diagnosis of orthostatic hypotension was assumed to be present based on the clinical history without any objective documentation.

the outpatient groups, the conventional strategy was the only independent predictor of increased admission rates, unexplained syncope, and reflex syncope (Table III).

Utilization of Tests and Consultations

Table IV and Figure 1 show the types of tests and consultations completed in each group. In the standardized group, there was an increase in orthostatic blood pressure measurements, carotid sinus massage, ECG, echocardiogram and tilt table testing and a decrease in brain imaging and neurological consultation when compared to the conventional group. In addition, prolonged ECG monitoring was more often applied in the standardized group, especially among the outpatient subgroup. The increased diagnostic yield in the standardized group when compared with the conventional group was largely due to the increased number of diagnoses made by orthostatic blood pressure measurement (19% vs 4%, respectively, P = 0.001) and tilt table testing (13% vs 1%, respectively, P = 0.001). The contribution of prolonged monitoring using implantable loop recorders could not be fully evaluated, pending results.

The total number of tests performed was slightly higher in the standardized group when compared to the conventional group (3.1 ± 1.2 vs 2.8 ± 1.3, P = 0.06); however, the number of tests or consultations associated with additional charges, that is, all tests listed in Table IV with the exception of orthostatic blood pressure measurement and carotid sinus massage, were significantly lower in the standardized group when compared to the conventional group (1.9 ± 1.0 vs 2.6 ± 1.2, P = 0.001).

Discussion

There are several key findings in this study. First, the use of a standardized approach in the evaluation of patients with faint significantly decreased the number of admissions. Second, the rate of diagnosis at 45 days for outpatients was significantly higher with the standardized approach when compared to the conventional approach. Third, the above endpoints were achieved with less utilization of costly tests and consultations.

The Role of Syncope Units

Several studies have shown improvement in diagnostic yield and cost-effectiveness when a cohesive structured-care pathway is applied either in a syncope facility or in a virtual syncope unit where multiple services are provided. In

Table III.

Factors Predictive of Outcome in the Total Population and Outpatients using Multivariable Logistic Regression Analysis

Independent Variables	Outcome: Admission		Outcome: Unexplained Syncope		Outcome: Reflex Syncope		Outcome: Cardiac Syncope	
	Odds Ratio (95% CI)	P Value	Odds Ratio (95% CI)	P Value	Odds Ratio (95% CI)	P Value	Odds Ratio (95% CI)	P Value
Conventional strategy for the total population	6.9 (2.5–18)	0.0002	2.3 (1.4–4)	0.001	0.4 (0.2–0.8)	0.01	–	–
Age > median (52 years)	3.3 (1.2–9)	0.02	–	–	0.4 (0.2–0.8)	0.005	–	–
History of structural heart disease	3.0 (1.2–8)	0.02	–	–	0.3 (0.1–0.9)	0.03	–	–
Conventional strategy for outpatients ONLY	7.4 (1.9 – 28)	0.004	3.0 (1.6 – 6)	0.001	0.3 (0.2 – 0.7)	0.003	–	–

the largest study reporting on the experience of nine syncope units in Italy,[5] a diagnosis was made in 21% of cases following the initial evaluation and in 61% of the cases within the first 45 days from the first presentation. These results are comparable to the 25% and 57% rates observed in the standardized arm of our study. While this concept showed promise, the general interest in having a syncope unit has been hampered by the observational nature of these studies and absence of large randomized trials. Indeed, a greater interest has emerged toward the adoption of software derived from the guidelines with prompting tools to help the healthcare provider in their approach to patients with syncope.[4]

Present Study

In this study, we found that the rate of admissions was significantly lower with the standardized approach when compared to the conventional approach. This finding was not surprising to us as in clinical practice physicians often err on the side of caution, admitting many patients for observation despite the absence of data to support these admissions. Indeed, in the evaluation of patients with faint, only a small minority of patients are likely to benefit from urgent assessment and even a smaller proportion requires hospitalization. The challenge is how to accurately identify patients with high short-term risk. Using the Standardized approach, we have shown that a reduction in admission rate can be achieved. Multiple factors probably contributed to this result, including the introduction of a standardized guideline-based algorithm, the presence of a syncope specialist, and the utilization of online prompting tools.

We have also found that the utilization of a standardized approach increased the yield of diagnosis by almost 50% in outpatients with faint, consistent with data published on this subject.[1,10,11] The number of patients diagnosed with reflex-mediated syncope was higher in the standardized group when compared to the conventional approach. Indeed, after controlling for other variables, the use of a conventional strategy remained the strongest independent predictor of a lower rate of diagnosis of reflex syncope. The greater utilization of upright tilt table testing in the standardized group explains in part the higher proportion of patients found to have reflex-mediated syncope in this group.

This study also highlights how the use of a standardized approach can increase the number of appropriate tests and decrease the number of inappropriate tests performed in the evaluation of patients with faint. Orthostatic blood pressure measurement was performed in 99% of patients

Table IV.

Tests and Consultations

	Standardized n = 154 (%)	Conventional n = 100 (%)	P value
Orthostatic BP measurement	152 (99%)	24 (24%)	0.001
Carotid sinus massage	40 (26%)	0 (0%)	0.001
Electrocardiogram	152 (99%)	85 (85%)	0.001
Echocardiogram	141 (92%)	62 (62%)	0.001
Tilt testing	67 (44%)	7 (7%)	0.001
Holter monitor	25 (16%)	21 (21%)	0.40
External loop recorder	17 (11%)	20 (20%)	0.07
Implantable loop recorder	11 (7%)	3 (3%)	0.25
Stress test	15 (10%)	11 (11%)	0.83
Electrophysiological study	6 (4%)	3 (3%)	1.0
Coronary angiography	4 (3%)	5 (5%)	0.32
Brain CT/MRI scan	4 (3%)	22 (22%)	0.001
Neurological consultation	5 (3%)	20 (20%)	0.001

BP = blood pressure; CT = computed tomography; MRI = magnetic resonance imaging.

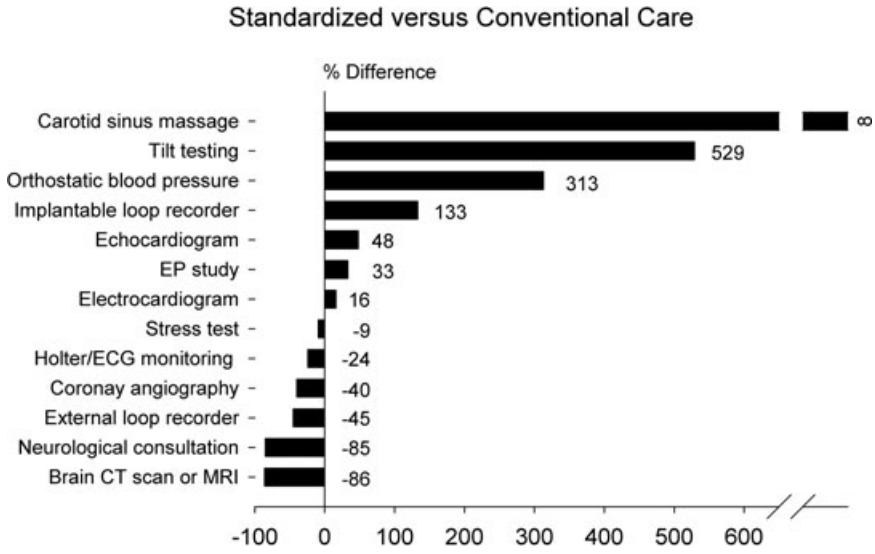

Figure 1. *Percent changes in test utilization in the standardized group versus the conventional group. The absolute numbers are reported in Table IV. Please note that, for some tests (carotid sinus massage, tilt table testing, orthostatic blood pressure measurement, and implantable loop recorder) a relatively small increase in the absolute number is displayed as a significant increase in percentage because of the small number of tests actually performed in the conventional arm.*

in the standardized group and in only 24% of patients in the conventional group. Its routine performance in the standardized group revealed the etiology of syncope in 11% of the cases. While orthostatic hypotension is rarely the cause of syncope in young patients, it is often a cause of syncope in older patients.[1,12,13] More importantly, the cost and risk of orthostatic testing is negligible. Primary electrical disease and structural heart disease are associated with increased risk for sudden cardiac death and overall mortality in patients with syncope.[1,11] ECG and echocardiography can easily screen for these risk factors, thus the rationale for their routine usage in the standardized group. Neurological imaging and consultation are rarely helpful in the evaluation of patients with faint. The guidelines recommend neurological imaging and referral only in the presence of focal neurological deficits or in patients in whom fainting is suspected to be due to epilepsy

rather than syncope.[1,2] Accordingly, a neurologic evaluation was performed in only 6% of patients in the standardized group. To the contrary, over 40% of patients in the conventional approach underwent neurologic imaging or consultation despite their low diagnostic yield. The over-utilization of these tests in our conventional group is consistent with other practices previously reported in the literature.[14–16] Our study highlights again the magnitude of the problem and the advantage of adopting a standardized approach.

Limitations

The information obtained in both groups was based solely on what has been documented in the electronic health records. Additional tests performed before the visit were not accounted for. However, these tests clearly did not lead to a diagnosis in both groups, thus reinforcing the need for a standardized approach. We used a historical group for our control at a time when the ESC guidelines were not published. Therefore, extrapolation to current practice may be incorrect. The mean age in the conventional group was less than the standardized group; however, the patients' characteristics were overall similar with no differences noted in the outpatient groups. Attempting a randomized parallel study would have been practically impossible due to referral bias. Similarly, a comparison between different hospitals would have been limited by differences in baseline clinical characteristics and diagnostic criteria. Finally, this is a retrospective study. A prospective randomized trial is needed for further validation of the current software.

The standardized approach we utilized in this study consists of several components, including the standardized guideline-based algorithm, the presence of a syncope specialist, and the on-line prompting tools, that is, faint software. Accordingly, the relative contribution of each component to the observed improvement in patient care when compared to the conventional approach is hard to ascertain.

Conclusion

In this study, we found that using a standardized approach in the evaluation of patients with faint decreased the number of hospital admissions and increased the rate of diagnosis at 45 days. In addition, the use of a standardized approach increased the number of appropriate tests performed and significantly decreased the number of inappropriate tests performed, such as brain imaging and neurological consultation. Our findings highlight the need to adopt a standardized approach in our evaluation of patients with faint.

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Appendix – The Faint-Algorithm

The Faint-Algorithm in use at the FFC of the University of Utah integrates the guidelines' recommendations for risk assessment and admission in a structured diagnostic pathway. Based on the data of the initial evaluation, which consisted of history, physical examination, 12-lead ECG, transthoracic echocardiogram, and laboratory findings, the first step was to determine if the patient met any admission criteria as reported in the guidelines. The second step consisted of verifying whether enough criteria were met to make a certain diagnosis. If no certain diagnosis was made, the third step addressed what would be the most likely diagnosis, that is, cardiac, noncardiac with recurrent or severe symptoms, noncardiac with rare and mild symptoms, and nonsyncopal faint (Fig. A1).

Admission Criteria

At the end of data entry, the algorithm states whether an admission is "indicated" or "not indicated."

There are 26 admission criteria derived from history, physical exam, 12-lead ECG, transthoracic echocardiogram, and laboratory findings. They are classified under four categories including (i) cardiac-arrhythmic causes, (ii) cardiac-ischemic causes, (iii) cardiovascular and pulmonary structural causes, and (iv) noncardiovascular causes. The list of the admission criteria with the above classification and the diagnostic tools used are provided in Table AI as previously published (see Ref. [12]).

Diagnostic Criteria for Certain Diagnosis

The second step consisted of verifying whether enough criteria were met to make a certain diagnosis. The established criteria for diagnosis at initial evaluation of the Faint-Algorithm are reported in Table AII.

Diagnostic Rules for Uncertain Diagnosis

If no certain diagnosis was made, the third step addressed what would be the most likely diagnosis given the data provided at the initial evaluation. This included (i) cardiac, (ii) noncardiac with recurrent or severe symptoms, (iii) noncardiac with rare and mild symptoms, and (iv) nonsyncopal faint. In addition, the most useful tests to be performed are suggested as shown in Table AIII.

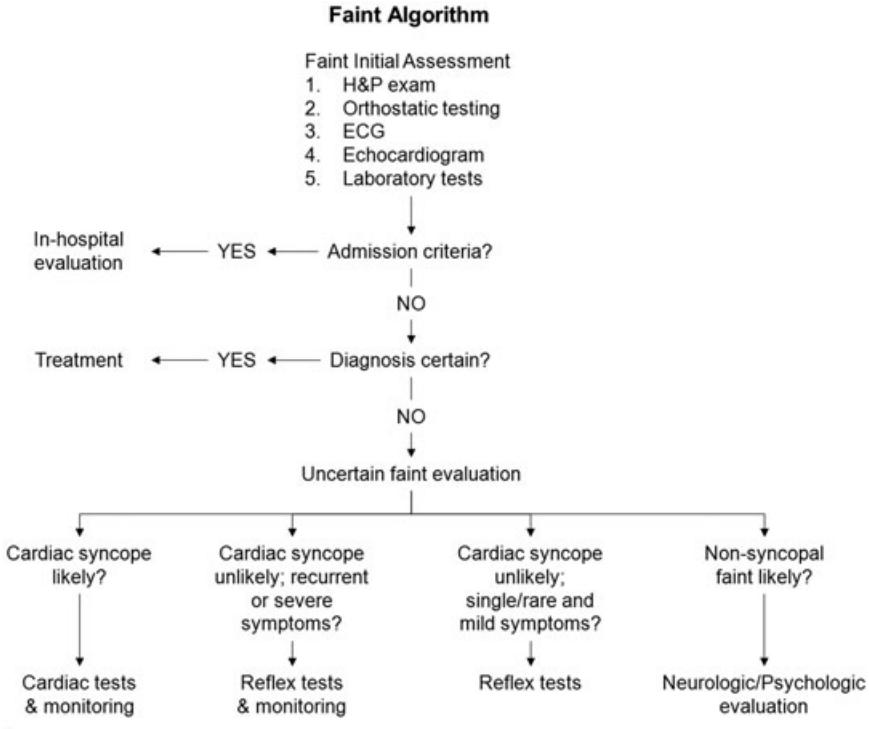

Figure A1. *A flowchart summarizing the Faint-Algorithm used in the Faint and Fall Clinic at the University of Utah.*

Table AI.

Faint-Algorithm Admission Criteria (Adapted from 2009 ESC Guidelines on Syncope)

Reason for Admission	Diagnostic Criteria
• **Cardiac-Arrhythmic causes**	
1. Sinus bradycardia <40 beats/min or pauses >3 seconds	12-lead standard ECG
2. Mobitz II or 2:1 second-degree or third-degree atrioventricular block	
3. Alternating left and right bundle branch block	
4. Sustained supraventricular tachycardia	
5. Sustained ventricular tachycardia	
6. Pacemaker (ICD) malfunction with cardiac pauses	
7. LBBB or RBBB + Left/Right axis deviation	
8. Long-QT pattern	
9. Brugada pattern	
10. ARVD pattern	
11. WPW pattern	
• **Cardiac- Ischemic causes**	Chest pain and troponin abnormal
12. Cardiac ischemia	
• **Cardiovascular and Pulmonary Structural causes**	
13. Prolapsing atrial myxoma, tumor	Echocardiogram (items 13–19 and 21)
14. Severe aortic stenosis	
15. Respiratory insufficiently defined as shortness of breath and O_2 saturation <70%	
16. Acute aortic dissection	
17. Pericardial tamponade	
18. Severe hypertrophic obstructive cardiomyopathy (HOCM)	
19. Severe prosthetic valve dysfunction	
20. Sustained (≥2 measurements at >5 minutes) supine systolic hypotension ≤80 mmHg	Systolic blood pressure measurement (item 20)
21. Severe systolic dysfunction (e.g. <40%)	
22. History of myocardial infarction with mild LV dysfunction (LVEF>40%) and absence of criteria for vasovagal syncope or orthostatic hypotension	Echocardiogram + patient's history (item 22)
• **Non-Cardiovascular Causes**	
23. Acute hemorrhage	Hematocrit <30
24. End-stage diseases (cancer, renal dialysis, etc.)	Patient's history
25. Major physical injuries secondary to syncope	Physical examination
26. Minor physical injuries and symptomatic orthostatic hypotension	Physical examination and orthostatic blood pressure measurement

ESC = European Society of Cardiology; ICD = implantable cardioverter defibrillator; LBBB / RBBB = left/right bundle branch block; ARVD = arrhythmogenic right ventricular dysplasia; WPW = Wolff-Parkinson-White; LVEF = left-ventricular ejection fraction.

Table AII.

Criteria Used to Establish a Certain Diagnosis (Derived from the 2009 ESC Guidelines on Syncope)

Reflex syncope

- *Classical vasovagal syncope* is diagnosed if syncope is precipitated by emotional distress (such as fear, severe pain, instrumentation, blood phobia) or prolonged standing and is associated with typical prodromal symptoms due to autonomic activation (intense pallor, sweating, nausea, feeling of warmth, an odd sensation in the abdomen, and lightheadedness or dizziness).
- *Situational syncope* is diagnosed if syncope occurs during or immediately after specific triggers:
  - Gastrointestinal stimulation (swallow, defecation, visceral pain)
  - Micturition (postmicturition)
  - Postexercise
  - Postprandial
  - Cough, sneeze
  - Others (e.g., laughing, brass instrument playing, weightlifting)

Orthostatic syncope is diagnosed when the history is consistent with the diagnosis and during an active standing test there is documentation of orthostatic hypotension (usually defined as a decrease in systolic blood pressure $\geq$ 20 mmHg or a decrease of systolic blood pressure to $<$ 90 mmHg) associated with syncope or presyncope (a fall $>$30 mmHg is needed in hypertensive subjects).

Arrhythmia-related syncope is diagnosed by ECG (including ECG monitoring) when there is:

- Sinus bradycardia $<$ 40 beats/min or repetitive sino-atrial blocks or sinus pauses $>$3 seconds in the absence of medications known to have negative chronotropic effect
- Second-degree Mobitz II or third-degree atrioventricular block
- Alternating left and right bundle branch block
- Paroxysmal supraventricular tachycardia or ventricular tachycardia
- Pacemaker (ICD) malfunction with cardiac pauses

Cardiac ischemia-related syncope is diagnosed when symptoms are present with ECG evidence of acute ischemia with or without myocardial infarction

Cardiovascular syncope is diagnosed by echocardiography performed at initial evaluation when syncope presents in patients with prolapsing atrial myxoma or other intracardiac tumors, severe aortic stenosis, pulmonary hypertension, pulmonary embolus, or other hypoxic states, acute aortic dissection, pericardial tamponade, obstructive hypertrophic cardiomyopathy, and prosthetic valve dysfunction.

Table AIII.

Diagnostic Rules for Uncertain Diagnosis

Suggested Diagnosis	Suggested Investigations
Cardiac mechanism is suspected when ECG abnormalities such as those listed are present: - ECG abnormalities - Presence of definite structural heart disease - Absence of prodromes (in patients with history of fainting $<$4 years or age$>$45 years) - Syncope while supine - Syncope during an exercise - Sudden onset palpitations immediately before - Ejection fraction $\leq$30%	Cardiac evaluation (electrophysiological study, stress testing, and prolonged ECG monitoring including implantable loop recorder) is recommended as first step.

Table AIII.

Continued

Suggested Diagnosis	Suggested Investigations
Reflex (neurally mediated) syncope and delayed orthostatic hypotension are suspected when cardiac syncope is unlikely and the patients have recurrent (>3 last 2 years) or severe (traumatic or occurring without prodromes or in high risk occupation) syncopal episodes	They include tilt testing, carotid sinus massage, ECG monitoring, and often further necessitates of implantation of an implantable loop recorder. Carotid sinus massage is indicated in older patients without suspicion of heart or neurological disease and recurrent syncope. Orthostatic challenge (i.e., head-up tilt test) is indicated when loss of consciousness is related to standing.
Likely reflex syncope is suspected when cardiac syncope is unlikely and the patients have single/rare (<3 last 2 years) and mild (no trauma or presence of prodromes and no high-risk occupation) episodes	Laboratory tests (carotid sinus massage, tilt testing) for confirmation are usually performed, if appropriate.
Non-syncopal faint is suspected when syncope is unlikely and the following diagnosis/features are present: - Epilepsy - Psychogenic pseudo-syncope (functional) - Unexplained falls, dizziness (vertigo) - Cataplexy - Drop attacks - Intoxication: medications/alcohol - Intoxication: illicit drugs - Hypoxia - Hypoglycemia - Transient ischemic attack (TIA), stroke	Consult specialist