Predicting syncope in the emergency department using patient characteristics from the prehospital setting.

A prediction study.

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ABSTRACT

BACKGROUND Healthcare professionals working in emergency medical services (EMS) are often the first to provide prehospital care for patients with transient loss of consciousness (TLOC). TLOC can be provoked by multiple disorders, however the majority of patients present with syncope. Approximately 40% of the syncope patients referred to the emergency department (ED) by EMS are at low risk and may not benefit from additional care. However, there is a lack of evidence-based risk assessment strategies, that enable healthcare professionals, to determine between patients with a nonthreatening cause and a serious condition.

AIM To identify patient characteristics, presented by EMS on admission to the ED to predict the diagnosis syncope in patients with TLOC. In order to provide insight into potential risk factors and offer guidance in future decision-making processes of healthcare professionals.

METHODS This retrospective prediction study consisted of patients (≥18 years) with TLOC referred by EMS to the ED. Candidate predictors regarding age, gender and vital signs were collected using the electronic patient records in the ED. Descriptive statistics were executed to describe the differences between syncope versus non-syncope patients. Logistic regression was used to assess the association between syncope and candidate predictors.

RESULTS Of the 1028 included patients, 23.3% was diagnosed with syncope. Candidate predictors identified as statistically significant were: age (OR 0.99 95% CI:0.98–1.00), saturation (1.08 95% CI:1.02–1.14), and heart rate (0.98 95% CI:0.97–0.99).

CONCLUSION Our findings showed that age, saturation, and heart rate were associated with syncope. However, predicting syncope in the ED using only patient characteristics from the prehospital setting is not feasible and other predictors should be included to accomplish a more comprehensive risk assessment. Future research could build on our findings and develop a prehospital risk assessment tool.

Keywords *Syncope, Emergency Department, Emergency Medical Services, Risk Stratification, Prediction Study*.

Het voorspellen van syncope op de Spoedeisende Hulp met behulp van patiëntenkenmerken uit de preklinische setting. Een predictiestudie.

SAMENVATTING

ACHTERGROND Zorgprofessionals op de ambulance zijn vaak de eerste professionals die preklinische zorg verlenen aan patiënten met voorbijgaand bewustzijnsverlies. Voorbijgaand bewustzijnsverlies kan worden veroorzaakt door meerdere aandoeningen, maar de meerderheid van de patiënten heeft syncope. Ongeveer 40% van de syncope-patiënten die door de ambulance naar de Spoedeisende Hulp (SEH) worden verwezen hebben een laag risico op ernstige aandoening en hebben mogelijk geen baat bij verwijzing naar de SEH. Er is een gebrek aan evidence-based risicobeoordelingsstrategieën, zodat zorgprofessionals op de ambulance, kunnen bepalen welke syncope-patiënten verwezen moeten worden naar de SEH.

DOEL Patiëntkenmerken identificeren, die syncope kunnen voorspellen bij patiënten met TLOC die zijn verwezen door de ambulance naar de SEH. Deze patiëntkenmerken kunnen meer inzicht bieden in de risicobeoordeling en begeleiding bieden bij toekomstige besluitvormingsprocessen met betrekking tot het doorverwijzen van patiënten naar de SEH.

METHODE Deze retrospectieve predictiestudie bestond uit patiënten (≥18 jaar) met voorbijgaand bewustzijnsverlies die door de ambulance zijn verwezen naar de SEH. Kandidaat predictoren met betrekking tot leeftijd, geslacht en vitale functies werden verzameld met behulp van het elektronische patiëntendossiers op de SEH. Beschrijvende statistieken werd uitgevoerd om de verschillen tussen syncope en non-syncope patiënten te beschrijven. Logistische regressie werd uitgevoerd om de associatie tussen syncope en kandidaat predictoren te onderzoeken.

RESULTATEN 1028 patiënten werden in deze studie geïncludeerd, waarvan bij 23,2% syncope werd vastgesteld. Statistisch significante predictoren waren: leeftijd (OR 0.99 95% CI:0.98–1.00), saturatie (1.08 95% CI:1.02–1.14) en hartfrequentie (0.98 95% CI:0.97–0.99).

CONCLUSIE Onze bevindingen lieten zien dat leeftijd, saturatie en hartslag geassocieerd zijn met syncope. Het voorspellen van syncope op de SEH met alleen patiëntkenmerken uit de preklinische setting is echter niet haalbaar en andere voorspellers moeten worden toegevoegd om een uitgebreidere risicobeoordeling te bereiken. Toekomstig onderzoek kan voortbouwen op onze bevindingen en een risicobeoordelingstool ontwikkelen voor de prehospitale setting.

1. INTRODUCTION

Healthcare professionals working in emergency medical services (EMS) are often the first to provide professional prehospital care for patients with transient loss of consciousness (TLOC).[1,2] TLOC is defined by a loss of consciousness with complete recovery.[3] TLOC is a symptom, not a disease, and can be provoked by multiple disorders such as cardiovascular disorders, epilepsy, and metabolic disorders.[3,4] However, it is important to emphasize that the majority of this group includes patients with syncope.[5] Syncope is defined as TLOC due to cerebral hypoperfusion, characterised by a rapid onset, short duration, and spontaneous complete recovery.[3] There are three types of syncope with a different underlying etiology: reflex syncope, syncope due to orthostatic hypotension and cardiac syncope.[3,6] The underlying etiology plays an important role in the estimation of the complaint's severity and associated risks of the event.[3,7]

In the prehospital setting, the initial assessment of patients with syncope is based on an anamnesis of the event, medical history, physical examination and electrocardiogram (ECG) findings.[3] Secondly, an estimation must be made on the risk factors to distinguish between a serious- and a nonthreatening condition.[7,8] Thirdly, healthcare professionals in EMS need to decide which kind of medical care fits best to the patients' needs (i.e. referral (and transportation) to the emergency department (ED) for advanced medical care or treatment on the scene without transportation).[9] Furthermore, the choice to refer patients to the ED can be influenced by multiple factors such as: 1) preferences of the patient or his family, 2) clinical instructions from other clinicians such as the general practitioner, 3) competencies of the healthcare professionals and 4) the level of confidence of the healthcare professionals.[10]

EMS healthcare professionals indicate a need for more information in the guidelines that supports clinical reasoning and diagnoses.[9,10] Approximately 40% of the patients with syncope referred to the ED by EMS are at low risk for serious outcomes, and may not benefit from additional hospital care or transport to a hospital.[11] Essential aspects of management challenges around the care of syncope in the ED are: overuse of diagnostics, lack of a clear lead speciality, long stay at the ED, and unnecessary hospital admission.[12,13] Moreover, in 50% of the cases the cause of the syncope is still unknown after a complete screening at the ED.[14] Improving the patient flow through EMS, can also influence the management challenges in the ED.

However, there is a lack of evidence-based risk assessment strategies that enable healthcare professionals in EMS to determine between patients with syncope that have a nonthreatening cause and patients that have a serious outcome (myocardial infarction and cardiac arrhythmias).[7,8] This lack of risk assessment strategies for the prehospital setting could influence the decision-making process of referring patients to the ED.[15] Previous research is mainly focused on short-term[16] and long-term[14] outcomes of syncope and the prediction of hospitalization.[17] Nowadays, the initial assessment and clinical judgement of the healthcare professional is leading.[18,19] Potentially vital signs that could be obtained in the prehospital setting, could be predictors in the risk assessment for syncope in patients with TLOC. Whereas in the ED information on the diagnosis of syncope is available. Vital signs on admission of patients with TLOC referred to the ED can be used as a proxy for the prehospital setting. Insight in these predictive vital signs for syncope could promote more efficient referral to and treatment in the ED.

2. AIM

To identify patient characteristics, presented by EMS on admission to the ED to predict the diagnosis syncope in patients with TLOC in the ED. In order to provide insight into potential risk factors and offer guidance in future decision-making processes of healthcare professionals in EMS.

3. METHOD

3.1 Design

This was an explorative prediction study with a retrospective, descriptive and observational character. This study investigated whether patients' characteristics on admission to the ED could predict the diagnosis syncope in patients with TLOC who are referred by EMS to the ED. There are four steps in prediction research (1) development, (2) internal validation, (3) external validation, and (4) impact evaluation.[20] Due to the explorative nature of this study, only the first step of prediction research was executed in this study.[20] The study took take place from January 2020 till June 2020.

The REporting of studies Conducted using Observational Routinely collected health Data (RECORD) statement was followed for explicit and comprehensive reporting. This checklist is an extended version of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).[21]

3.2 Population & Setting

The study population consisted of patients (≥ 18 years) with TLOC referred by EMS to the ED. Patients were retrospectively selected from a medium-sized regional hospital with two ED locations in the province of North Holland in the Netherlands. During admission of patients in the ED, the level of urgency from the initial complaint of the patients was assessed with the use of Manchester Triage System (MTS).[22] This system consists of 52 flowcharts, covering patients' major signs and symptoms. Patients on admission to the ED who were assessed with the flowchart *collapse*, *general malaise*, *strange behaviour* and *insult* were included in the study.

Patients who were registered in the flowchart *collapse* were directly included. Patients who were registered in the flowchart *general malaise*, *strange behaviour* and *insult* were screened again, since a lot of other complaints could be classified under these three flowcharts. Patients were included when the registered initial complaint in the obtained dataset consisted of one of the following terms or synonyms: syncope, collapse, fainting, black-out, passing-out, and

unwell. Furthermore, patients with an initial complaint: no diagnosis or whereby the complaint was unknown were also included in the study.

3.3 Sample size

Our sample size calculation was based on the formula of Bujang (2018) that is developed for observational studies which perform logistic regression (LR).[23] The formula (n=100 + xi) contains the constant of 100 in the formula that was fixed based on a previous study which reported that a sample size of 100 or less was not sufficient for LR and could overestimate the effect measure causing bias.[23,24] The *x* represents the event per candidate predictor rate of ≥ 10 to ensure accurate estimation of the regression coefficients.[23] The *i* in the formula represents the number of candidate predictors. With a total of 12 candidate predictors, the required number of syncope events in our study population was calculated on 220 syncope events (n=100 + (10*12) = 220). This formula will yield in a minimal bias between results derived from parameters and statistics.[23,24]

3.4 Data collection

Data was retrospectively collected from electronic patients records in the ED, in a three-year period from January 2017 until January 2020. The data was collected by a data specialist of the participating hospital based on a standardised list (baseline characteristics and candidate predictors) provided by the researchers. For the clinical relevance of this study, the decision was made to work with available candidate predictors which can be obtained both in the prehospital setting and in the ED. Therefore, characteristics like vital signs, age and gender were collected from patients and selected as candidate predictors based on literature and clinical understanding.[25] These selected variables (see 3.4.1 and 3.4.2) can be registered in the prehospital setting and are present in the electronic patient record of patients in the ED. All data used in this study was described as a part of standard care for patients with TLOC who were referred to the ED. All selected candidate predictors were measured with the same equipment, and identical registered, which increased the reliability of the measurements.[26,27]

The researchers received an anonymous dataset without identifiable patient characteristics which cannot lead to patient's private sensitive information.[28,29] The received dataset from the hospital was screened for inclusion and exclusion by two independent researchers. In addition, data extraction and cleaning were executed by the executive researcher and afterwards double-checked by the principal researcher. Ambiguities and disagreements were discussed until agreement was conceived. An agreement was found in all cases.

3.4.1. Baseline characteristics

The collected baseline characteristics were: age, gender, initial registered complaint, MTS flowchart (*collapse, general malaise, strange behaviour and insult*), level of urgency defined by triage colour, submitted specialism, length of stay (LOS) in the ED, International Classification of Diseases and Related Health Problems (ICD-10), Diagnose treatment combination (DBC), the event of syncope, and the conduction of an ECG.

3.4.2. Candidate predictors

The collected candidate predictors were: age, gender, saturation (SpO2), respiratory rate (RR), heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), Glasgow coma scale (GCS), blood glucose (BS), and the numeric rating scale (NRS) for pain. The initial measurements of the patient's vital signs in the ED were collected for this study.

The level of consciousness was measured with the GCS and categorised into three groups: severe (GCS 3–8), moderate (GCS 9–12) and mild to no brain damage (GCS 13–15).[30] The general level of pain experienced by patients was measured with scores from 0 to 10, on the NRS and was categorised into three groups: no to mild pain (NRS 0–3), moderate pain (NRS 4–6), and severe pain (NRS 7–10).[31]

3.5 Data analysis

Statistical analysis was performed with IBM Statistical Package for the Social Science (SPSS), version 25.[32] A descriptive analysis was executed to describe the differences in the baseline characteristics of the syncope and non-syncope patients. In case of missing data, only valid data was used in the descriptive statistics to perform an available case analysis. The number of cases will be reported in the results section since the available case analysis will differ per variable. Categorical variables were reported as absolute values and percentages.[32] Continuous variables were reported with mean and standard deviation (SD) or as median with an interquartile range (IQR, 25^{th} – 75^{th} percentile).[32] Differences between the syncope and non-syncope patients were calculated with the Student T test for normally distributed candidate predictors or with the Mann-Whitney U test for not normally distributed candidate predictors.[32] After the descriptive analysis, an LR analysis was executed to assess the association between the candidate predictors and the diagnosis of syncope. As this study only evaluated the first phase of prediction (model performance), a univariate and multivariate LR analysis were included.[20] Multiple imputation was executed for LR due to a lot of missing values in the dataset.

First, a univariate LR analysis was performed on the candidate predictors to assess their predictability for syncope. This was done by the Wald-test.[32] A p-value <0.05 was considered statistically significant.[32] Because preselection of candidate predictors based on p-values estimated from univariate analysis may result in unstable prediction models, all candidate predictors were included in the multivariate LR analysis.[33] Secondly, a multivariate LR analysis was performed through a forward stepwise regression to assess associations between syncope and the candidate predictors.[32] After each step in which a candidate predictor was added, all candidate predictors in the model were verified to see whether their significance decreased below the specified tolerance level. Non-significant candidate predictors were removed from the model. The cut-off criteria of the Score-test, to determine the probability for a candidate predictor to enter, was set on a p-value of 0.05. To remove a candidate predictor the p-value was set on 0.10. In this way, the regression analysis will not get into an infinite loop.[32] All candidate predictors were presented with odds ratios (OR) and a 95% confidence interval (CI).[32]

The final model was developed with the enter method.[34] Using five imputed datasets for forward stepwise LR it was not possible to get pooled results, because each dataset could yield a different model. Therefore, the enter method for LR with multiple imputation was required. A candidate predictor was included for the enter method when it occurred three out of five times statistically significant in the five datasets by forward stepwise regression. Subsequently, the statistically significant candidate predictors were added through the enter method. In this step, all statistically significant candidate predictors in the model were verified to see whether their significance decreased below the specified tolerance level.[32] Non-significant predictors were removed from the model until only a statistically significant model remained. The same cut-off criteria were used as described for the univariate and multivariate analysis.

3.5.1. Missing data

In this study, we assumed missing values were missing at random (MAR).[35] The purpose of imputation was not to retrieve the original values, but to make correct inference decisions.[26] By using multiple imputation by MAR, there will be a lower level of bias and the precision will be minimally affected.[25,35] The original data was analysed by a missing value analysis and subsequently multiple imputation was done five times whereby each imputed dataset was assessed.[35]

3.6 Ethical issues

In this study, the ethical principles of the declaration of Helsinki and the Medical Research Involving Human Subjects Act (WMO) were taken into account.[36,37] This study was not WMO obligatory because patients were not imposed on an intervention.[38] Since this study was done retrospectively and no new data was collected a Medical Ethics Committee Review was not required.[37] To ensure the privacy of patients data minimalization was executed as described in the section data collection.[28,29] Based on the study protocol, the participating hospital approved the study.

4. RESULTS

4.1 Baseline characteristics

The obtained dataset consisted of 4925 patients. A total of 1028 patients met the inclusion criteria and were included in the study (Figure 1). Baseline characteristics of the study population were described (Table 1). Approximately, half of the study population was male (51.8%) and the median age was 75 years (IQR 23). The majority of the study population received on triage in the ED the MTS flowchart collapse (50.9%) and most patients were categorised with a triage category 'urgent' (56.8%). Patients were referred by EMS to the ED predominately to physicians of the specialism Internal Medicine (37.4%) and Neurology (33.2%).

[FIGURE 1] & [TABLE 1]

In total 239 (23.2%) patients, of which 123 were female (51.5%), received the diagnosis syncope defined by the ICD-10. The median age of syncope patients was 72 years (IQR 23) and 76 years (IQR 23) for non-syncope patients. The majority of syncope patients were referred by EMS to the specialisms Internal Medicine (68.6%), followed by the specialism Neurology (23.4%). The median LOS in the ED was 154 minutes (IQR 87) for patients with syncope and 180 minutes (IQR 114) for non-syncope patients.

4.2. Candidate predictors

Syncope versus non-syncope patients differed with respect to the vital signs: age (p=0.000), saturation (p= 0.006), RR (p=0.042), HR (p=0.000), SBP (p=0.012), DBP (p=0.010), and NRS (p=0.006) (Table 2). Syncope versus non-syncope patients were comparable regarding: gender, temperature, blood glucose, GCS and AVPU.

[TABLE 2]

Table 3 shows the univariate association between candidate predictors and the binary outcome syncope versus non-syncope in the ED. Four of the 12 candidate predictors independently contributed to the prediction of the outcome syncope. Statistically significant candidate predictors were: age (OR 0.99 95% CI:0.98–1.00), saturation (OR 1.10 95% CI:1.06–1.15), HR (OR 0.98 95% CI:0.97 –0.99), SBP (OR 0.99 95% CI:0.99–1.00).

[TABLE 3]

The multivariate association between candidate predictors and the binary outcome syncope versus non-syncope in the ED showed three significant predictors that contributed to the outcome syncope (Table 4). The odds of the event syncope decreased with an older age (OR 0.99 95% CI:0.98 – 1.00). The odds of the event syncope increased with a higher saturation (OR 1.08 95% CI:1.02 – 1.14). The odds of the event syncope decreased with a higher HR (OR 0.98 95% CI:0.97 – 0.99).

[TABLE 4]

5. DISCUSSION

5.1. Summary of main findings

The aim of the present study was to examine patient's characteristics available in the prehospital setting which were related to the diagnosis of syncope in adult patients with TLOC who were referred by EMS to the ED. Findings showed that age, saturation, and HR were associated with the diagnosis of syncope.

5.2 Compare / contrast findings with the literature on the subject

To our knowledge, this was the first study that gives an overview of patients with TLOC who were referred to the ED by EMS with a suspicion of syncope. Consequently, the findings of the present study cannot easily be compared with previous findings in the prehospital setting. It was therefore decided to compare the study's findings with the European Society of Cardiology (ESC) guidelines and clinical decision rules (CDR) in the ED.[3,39–41] Multiple studies investigated and compared the prognostic value of three available CDRs in the ED, (1) Risk Stratification of Syncope in the Emergency Department (ROSE), (2) Osservatorio Epidemiologico sulla Sincope nel Lazio (OESIL), and (3) San Francisco Syncope Rule (SFSR), on its usability and reliability.[18,19,42] These CDRs focused on the same candidate predictors (i.e., age, Spo2, HR and SBP).

The findings of the present study indicated that a lower HR may be a protective predictor for syncope. Thus, a higher HR may be associated with serious outcomes. This finding was inconsistent with the ESC and the ROSE CDR.[3,39] According to the ESC a lower HR could be a sign of arrhythmias and is a high-risk predictor for coronary diseases.[3] Additionally, the ROSE CDR indicated that a low HR (i.e., HR < 50 beats per minute) was a high-risk predictor for serious outcomes.[39] Moreover, our results showed that the odds for syncope may increase with a higher saturation. This finding was in line with the ROSE CDR, which indicated that a lower saturation was associated with serious outcomes such as cardiovascular and pulmonary embolisms.[39] The ROSE CDR considered a saturation lower than 94% as a risk predictor.[39] Finally, results showed that a lower age was more often associated with a nonthreatening condition such as syncope.[3,16] Consequently, a higher age can be associated with multiple other disorders. This finding was in line with the ESC and OESIL CDR, demonstrating that people older than 65 years were more at risk for serious outcomes.[3,41]

As described above most findings of our study were in line with the CDRs and ESC guidelines used in the ED. However, the SFSR included also an SBP (i.e., <90 mmHg) as a predictor in their CDR for serious outcomes.[40] In our study, we found only a significant association between a lower SBP and syncope in the univariate analysis. All these findings were found in a retrospective single centre study and only the first phase of prediction research was executed. In addition, it should be noted that, these statistically significant predictors had a minimal OR meaning that the clinical relevance should be further explored in future research. Therefore, our results can only serve as 'prior' information and could be used in the following steps of a prediction study to develop a risk assessment tool for syncope in the prehospital setting.

5.3 Strengths & Limitations of the study

A strength of this study was the inclusion of the extended version of the STROBE guidelines (RECORD) to report the results of our study.[21] However, our study has several limitations. First, when TLOC has occurred, the vital signs probably are already normalised when patients arrived at the ED. According to the ESC, TLOC is characterised by a short duration, with spontaneous recovery in five minutes.[3] Therefore, deviating vital signs could be missed in the ED and the results of our study could underestimate the association of vital signs and syncope. Future research could investigate the difference between vital signs measured in EMS and the ED. In this way, it can be examined how vital signs would change over time.

Secondly, this study included a lot of missing data. In four candidate predictors: blood glucose, temperature, GCS and AVPU, the percentage of missing values was more than 70%. However, in this study, multiple imputation was executed to cope with missing values and to

make correct inference decisions.[26,35] Nevertheless, the imputed values can show an underestimation or overestimation of the association due to the amount of imputed data. Careful interpretation of the results is therefore required. In this study, none of these mentioned candidate predictors were statically significant.

Thirdly, all patients in this EMS region with a suspicion for heart disease and a possible cardiac syncope were admitted by EMS to the Coronary Care Unit. However, only when the Coronary Care Unit was overcrowded due to insufficient hospitalization capacity, patients were admitted to the ED. Through this situation of overcrowding, the subgroup cardiac syncope patients might be underexposed in this study, what may have caused selection bias. Consequently, the generalizability of the results may be limited due to the not representative subgroup cardiac syncope in the study population and the single centre execution.

5.4 Implications for clinical practice and future research

Despite the observation of these limitations, the results of this explorative study on predictive patient characteristics in the prehospital setting could promote more efficient referral to and treatment at the ED. Further research in patient characteristics of syncope could help EMS to improve knowledge and clinical understanding of risk assessments. To accomplish this, a future risk assessment tool must fit the prehospital setting. In our opinion the following aspects need to be considered in developing a risk assessment tool for the prehospital setting: (1) the limited possibilities in the prehospital setting (needs to be usable in EMS), (2) quick applicability, and (3) offer guidance into the decision-making process of referring patients to the ED or no transportation.

An implication for future research is to execute this study in a prospective design to minimalize missing data and to add more prehospital predictors that we could not include in this study with ED data, due to the privacy of patients and the Dutch regulations and laws.[28,29] To include possible interesting predictors about triggering factors for the syncope event could help with developing a more comprehensive risk assessment tool. Furthermore, no interpretation from an ECG could be obtained in our study. Although, other studies indicated that the prognostic value of an ECG was an important aspect of the risk assessment.[1,39–41] In future research, the assessment of an ECG must be included. In addition, a multicentre study is desirable to generalize the results to a general population. For future research, it is interesting to build on our findings and conduct the other steps of prediction research to develop a risk assessment tool for the prehospital setting.

5.5 Conclusion

In conclusion, we demonstrated that age, saturation, and heartrate were associated with syncope. However, predicting syncope in the ED using only patient characteristics from the prehospital setting was not feasible and other predictors should be included to accomplish a more comprehensive risk assessment for patients with TLOC. Therefore, the current guidelines and clinical judgement of the healthcare professional in the prehospital setting remains leading. Although, a functional and reliable CDR is needed to support healthcare professionals in EMS during the initial assessment to make a deliberated decision of referring patients to the ED.

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TABLES & FIGURES

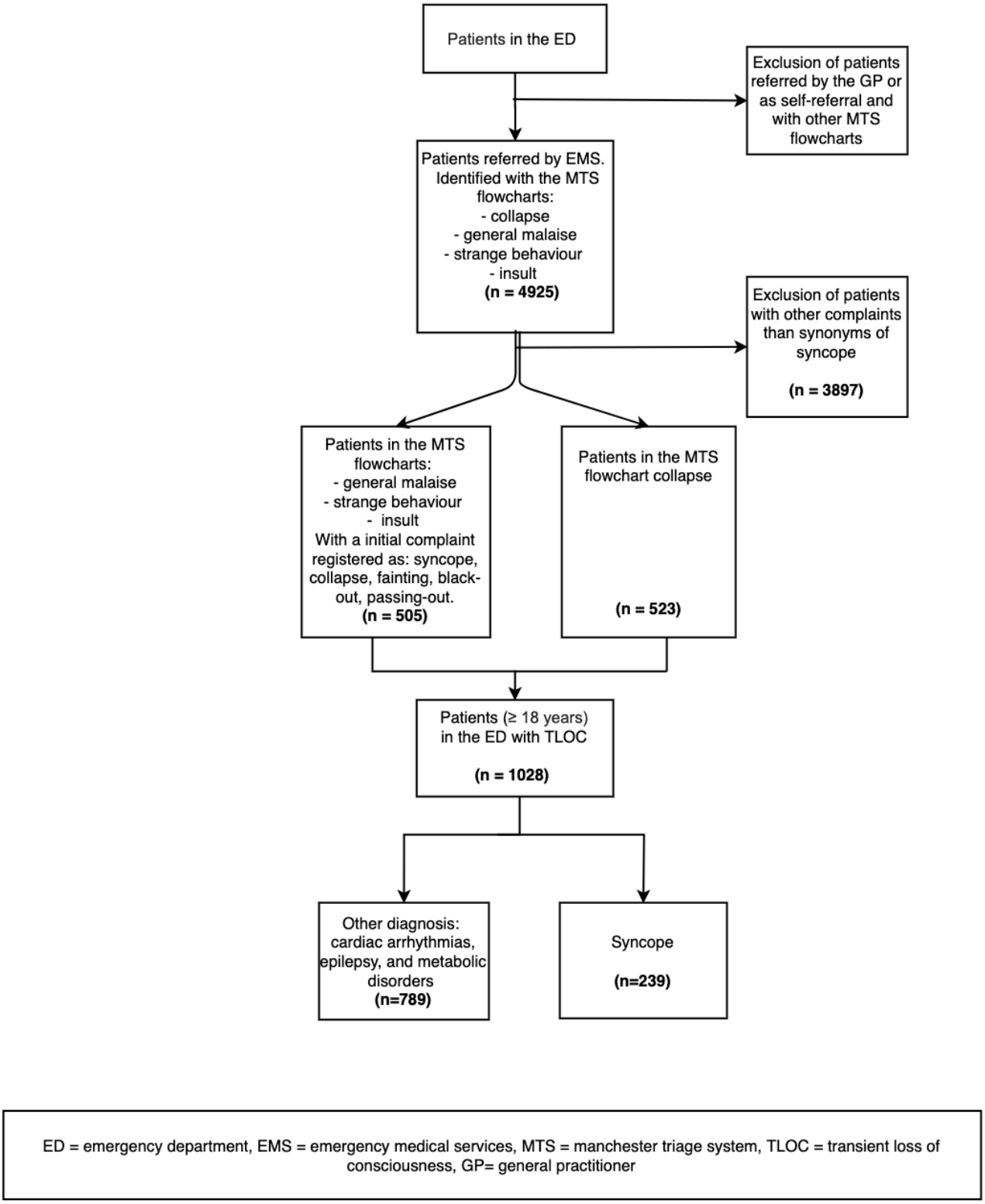

Figure 1: Sampling flowchart

TABLE 1: BASELINE CHARACTERISTICS DESCRIPTIVE

Characteristics	**Total (n = 1028)**	**Syncope (n = 239)**	**No syncope (n = 789)**
Age, *median (IQR)*	75 (IQR 23) (range 18 – 103)	72 (IQR 23) (range 18 - 95)	76 (IQR 23) (range 18 - 103)
Gender			
Male	532 (51.8%)	116 (48.5.%)	416 (52.7%)
Female	496 (48.2%)	123 (51.5%)	373 (47.3%)
Flowchart MTS			
Collapse	523 (50.9%)	168 (70.3%)	355 (45%)
General malaise	397 (38.6%)	55 (23%)	342 (43.4%)
Strange behaviour	87 (8.5%)	15 (6.3%)	72 (9.1%)
Insult	21 (2%)	1 (0.4%)	20 (2.5%)
Triage colour (Initial)			
Red (immediate)	67 (6.5%)	4 (1.7%)	63 (8%)
Orange (very urgent)	208 (20.2%)	26 (10.9%)	182 (23.1%)
Yellow (urgent)	584 (56.8%)	167 (69.9%)	417 (52.9%)
Green (standard)	166 (16.1%)	40 (16.7%)	126 (16%)
Blue (not urgent)	3 (0.3%)	2 (0.8%)	1 (0.1%)
Triage colour (Final)			
Red (immediate)	69 (6.7%)	4 (1.7%)	65 (8.2%)
Orange (very urgent)	213 (20.7%)	26 (10.9%)	187 (23.7%)
Yellow (urgent)	587(57.1%)	170 (71.1%)	417 (52.9%)
Green (standard)	157 (15.3%)	37(15.5%)	120 (15.2%)
Blue (not urgent)	2 (0.2%)	2 (0.8%)	0 (0%)
Submitted specialism			
Internal Medicine	384 (37.4%)	164(68.6%)	220 (27.8%)
Neurology	341 (33.2%)	56 (23.4%)	285 (36.1%)
Geriatric	127 (12.4%)	3 (1.3%)	124 (15.7%)
Cardiology	65 (6.3%)	12 (5%)	53 (6.7%)
Chirurgic	54 (5.3%)	1 (0.4%)	53 (6.7%)
*Others**	57 (5.4%)	3 (1.3%)	54 (6.8%)
Disease types**			
Syncope	239 (23.2%)	239 (100%)	-
Nervous system	212 (20.6%)	-	212 (26.9%)
Cardiovascular system	106 (10.3%)	-	106 (13.4%)
Trauma	100 (9.7%)	-	100 (12.7%)
Respiratory system	56 (5.4%)	-	56 (7.1%)
Digestives system	47 (4.6%)	-	47 (6%)
Urinary system	27 (2.6%)	-	27 (3.4%)
Endocrinological system	20 (1.9%)	-	20 (2.5%)
Haematological system	16 (1.6%)	-	16 (2%)
Psychiatric	8 (0.8%)	-	8 (1%)
Others	196 (19.1%)	-	196 (24.8%)
Missing	1 (0.1%)	-	1 (0.1%)
Execution of an ECG			
Yes	644 (62,6%)	149 (62.3%)	495 (62.7%)
LOS in the ED (minutes) *median (IQR)*	173 (IQR 110) (range 3 – 705)	154 (IQR 87) (range 29 – 484)	180 (IQR 114) (range 3 – 705)

* Others: *Paediatric, Pulmonary, Gastroenterologist, Nephrology, Oncology, Orthopaedic, Urology.*
** Disease types defined by the classification of the ICD-10.

TABLE 2: CANDIDATE PREDICTORS – DESCRIPTIVE

	Number of measurements^ (syncope % - no syncope %)	Syncope	No syncope	P-value
Age°	1028 (100% - 100%)	72 (IQR 23)	76 (IQR 23)	**0.000**
Gender	1028 (100% - 100%)			
Male	532 (51.8%)	116 (48.5%)	416 (52.7%)	0.278
Female	496 (48.2%)	123 (51.5%)	373 (47.3%)	
Vital signs				
Spo2 (%)°	892 (85.4% - 91.2%)	97 (IQR 3)	97 (IQR 4)	**0.006**
RR (bpm) °	589 (53.1% - 57.3%)	27 (IQR 16)	25 (IQR 14)	**0.042**
HF (bpm)°	844 (87.4% - 80.5%)	71 (IQR 20)	80 (IQR 29)	**0.000**
SBP (mmHg)*	864 (88.7% - 82.6%)	142 (± 30)	148 (± 32)	**0.012**
DBP (mmHg)*	864 (88.7% - 82.6%)	80 (± 16)	82 (± 19)	**0.010**
BS (mmol/l)°	14 (1.3% - 1.4%)	4.0 (IQR 6)	6.0 (IQR 7)	0.294
Temperature (°C)*	67 (5.4% - 6.8%)	36,5 (± 0.5)	36.9 (± 1.1)	0.136
GCS	305 (100%)	66 (27.6%)	239 (30.3%)	
12- 15	297 (97.4%)	65 (27.2%)	232 (29.4%)	0.134
9 - 11	4 (1.3%)	1 (0.4%)	3 (0.4%)	
≤ 8	4 (1.3%)	0 (0%)	4 (0.5%)	
AVPU	203 (100%)	40 (16.7%)	163 (20.7%)	
Alert	182 (89.7%)	38 (15.9%)	144 (18.3%)	0.220
Verbal	13 (6.4%)	1 (0.4%)	12 (1.5%)	
Pain	2 (1%)	1 (0.4%)	1 (0.1%)	
Unconsciousness	6 (3%)	0 (0%)	6 (0.8%)	
NRS	515 (100%)	120 (50.2%)	395 (50.1%)	
0 – 3	428 (83.1%)	110 (46%)	318 (40.3%)	**0.006**
4 - 6	70 (13.6%)	6 (2.5%)	64 (8.1%)	
7 - 10	17 (3.3%)	4 (1.7%)	13 (1.6%)	

^ Number of measurements differs per variable. Therefore, % of syncope group is deposed against the no syncope group
***** mean + SD
° median + IQR

bpm, beats or breaths per minute; BS, blood sugar; DBP, diastolic blood pressure; LOS, length of stay; SBP, systolic blood pressure; SPO2, percutaneous oxygen saturation, GCS, Glasgow coma scale, NRS, numeric rating scale pain.

TABLE 3: CANDIDATE PREDICTORS – UNIVARTIATE LR – SYNCOPE GROUP

Parameters	B	SE	OR + CI 95%	P-value
Age	-0.012	0.004	**0.99** (0.98 – 1.00)*	**0.004**
Gender				
Female			**1** (referent)	
Male	-0.168	0.148	**0.85** (0.63 – 1.13)	0.256
Vital signs				
RR (bmp)	0.010	0.007	**1.01** (0.99 – 1.03)	0.204
Spo2 (%)	0.096	0.020	**1.10** (1.06 – 1.15)	**0.000**
HR (bpm)	-0.019	0.003	**0.98** (0.97 – 0.99)	**0.000**
SBP (mmHg)	-0.006	0.002	**0.99** (0.99 – 1.00) *	**0.007**
DBP (mmHg)	-0.009	0.004	**0.99** (0.98 – 1.00)	0.064
BS (mmol/l)	0.009	0.065	**1.01** (0.87 – 1.17)	0.899
Temperature (°C)	-0.023	0.145	**0.98** (0.66 – 1.44)	0.883
GCS				
12 – 15			**1** (referent)	
9 - 11	-4.299	1834.576	**0.01** (0.00 - .)	0.998
≤ 8	-0.152	1.468	**0.86** (0.02 – 43.02)	0.922
AVPU				
Alert			1 (referent)	
Verbal	-0.583	1.023	**0.56** (0.04 – 7.08)	0.591
Pain	0.530	0.746	**1.70** (0.23 – 12.65)	0.513
Unconsciousness	-4.174	1519.181	**0.02** (0.00 – .)	0.998
NRS				
0 - 3			**1** (referent)	
4 - 6	-1.137	0.505	**0.32** (0.09– 1.14)	0.070
7 – 10	0.218	0.562	**1.24** (0.30 – 5.15)	0.713

B, coefficient, SE, standard error, OR, odds ratio, CI, confidence interval,

* The results of the OR in the table have been rounded to two decimal places. Therefore, the CI occasionally concerns 1.

TABLE 4: CANDIDATE PREDICTORS – MULTIVARIATE LR – SYNCOPE GROUP

Parameters	B	SE	OR + CI 95%	P-value
Age	-0.012	0.004	0.99 (0.98 – 1.00)*	**0.007**
Vital signs				
Spo2 (%)	0.076	0.027	1.08 (1.02 – 1.14)	**0.005**
HF (bpm)	-0.020	0.005	0.98 (0.97 – 0.99)	**0.000**

B, coefficient, SE, standard error, OR, odds ratio, CI, confidence interval,

* The results of the OR in the table have been rounded to two decimal places. Therefore, the CI occasionally concerns 1.