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Management of medical emergency patients in Danish emergency departments

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ABSTRACT

INTRODUCTION. In many emergency departments (ED), specialised teams are activated to take care of medical emergency patients (MEP). The aim of this study was to describe the organisation of the management of adult MEPs in Danish EDs. The study examined trigger team activation criteria, training and composition of trigger teams.

METHODS. This was a cross-sectional descriptive study. A questionnaire was sent to the head of department and head nurse at each Danish ED. They recruited eligible personnel to answer the questionnaire. Data were obtained between 1 October and 15 December 2021.

RESULTS. We included 23 hospitals and 19 responded (82.6%). Most EDs had a trigger call for MEP (89.5%). In 70.6% of the EDs, trigger calls for MEP were activated > 300 times annually. All EDs used red triage (Danish Emergency Process Triage) as activation criteria for MEP calls. Most respondents received simulation training (82.4%). All respondents felt adequately educated to manage MEP. The MEP trigger teams varied from three to 11 members with great variation with respect to team leaders.

CONCLUSION. Management of MEP varies greatly in Danish Hospitals. A systematic approach to MEP management in line with management of trauma and stroke patients may potentially serve to improve the quality of care for and outcome of this patient group, but further research is needed.

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Every year, thousands of patients are admitted to the Danish emergency departments (EDs) with acute time-critical medical conditions [1, 2]. The initial treatment of medical emergency patients (MEP) requires highly skilled personnel as delays in treatment may be associated with increased mortality [3, 4].

For patients with time-critical diagnoses such as stroke, ST elevation myocardial infarction (STEMI) and trauma, standardised management procedures have been implemented in the EDs in major hospitals in Denmark. For these patient groups, the outcome has significantly improved over the past decades owing to optimisation of management and care. Often, these patient groups are received by defined trigger teams [5-8].

However, a large group of acute patients with severe respiratory, circulatory or cerebral life-threatening problems, MEP, does not fit into the above categories. Previous studies found that MEP account for most EDs

trigger team activations [1, 2, 9]. Even though standardised procedures for management upon arrival to the EDs have been suggested for MEP [10, 11], they have yet to be implemented on a national scale.

MEP are a heterogeneous group presenting with a wide range of problems; and they are subsequently discharged with a wide range of International Classification of Diseases, tenth version (ICD-10) diagnoses. Some of the most prevalent medical problems engaging the trigger teams are obstructed airways, respiratory insufficiency, shock, sepsis and unconsciousness [9, 10].

This diversity challenges endeavours to standardise management of this patient group. Previous studies have found that MEP have much higher mortality rates than other groups of emergency patients, i.e. stroke, STEMI and trauma patients [9, 10]. Whether optimisation in management of MEP may improve the outcome of this patient group has yet to be investigated.

Evidence supports that soliciting multidisciplinary trigger teams improves the prognosis of MEP [12]. However, no guidelines on how to compose the most effective trigger team have been implemented nationally or internationally. Furthermore, no consensus on activation criteria for MEP trigger calls exists. A systematic approach to MEP management may potentially help to improve the quality of care for and outcome for this patient group.

The aim of this study is to describe the management of adult MEPs in Danish EDs. The study examined trigger team activation criteria, training and composition of trigger teams in Danish hospitals receiving MEP [13].

METHODS

This study was designed as a cross sectional descriptive questionnaire study, following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Danish hospitals with EDs receiving MEP were identified through the complete list of emergency hospitals in Denmark published by The Danish Ministry of Health [13]. We also included two minor hospitals that we know receive MEP despite not being listed as such. No private hospitals receive MEP in Denmark. A total of 23 hospitals were contacted. They cover a population of 5,900,000 inhabitants and receive 1,800,000 acute annual contacts [14].

As no patient data were analysed, no ethical committee registration was needed according to the local ethics committee.

Questionnaire

We constructed a questionnaire focused on trigger team activation criteria, training and composition of trigger teams (**Supplementary material, Appendix 1** https://content.ugeskriftet.dk/sites/default/files/2023-06/a11220727-supplementary.pdf). The questionnaire was constructed drawing on a consensus approach and inspired by the work of Weile et al. in their 2018 paper [15]. A link to the questionnaire was sent to the head of department and head nurse at each ED. They were asked to recruit eligible personnel to answer the questionnaire, i.e. doctors and nurses working with management of MEP. The questionnaire was tested in a pilot study where it was sent out to four specialists in emergency medicine. Minor changes were made to the questionnaire to take into account their feedback.

If the questionnaire was not completed within five weeks, the head of department and head nurse were reminded by email to elicit a response. If an answer was not collected within three weeks of the reminder, the department was categorised as non-responding.

If the questionnaire was completed partially, the respondent was contacted by email or phone regarding the

missing answers if permission for contact was given. Only adequately completed records were included for analysis.

Data were obtained between 1 October and 15 December 2021. Data processing was conducted between November 2021 and January 2022.

Analysis

For the primary analysis, we compared hospsital-level answers. For this purpose, one responder from each hospital was chosen as representative. If more than one record per hospital was received, we chose the most senior respondent. If two respondents from the same hospital had an equal level of seniority, the person who responded first was chosen as representative.

For the secondary analysis, we assessed interpersonal agreement on key questions in hospitals with more than one respondent.

Data are presented as actual numbers and percentages.

As no patient data were analysed, no ethical committee registration was needed.

Data were collected using Research Electronic Data Capture (REDCap) hosted by the Open Patient data Explorative Network in pursuance of Danish laws and with approval of the regional data processing record [16].

Statistical analyses were conducted using Stata V.16 (StataCorp, College Station, TX, USA).

Trial registration: not relevant.

RESULTS

Between 1 October and 15 December 2021, we contacted 23 EDs. Nineteen EDs responded to the questionnaire, which is equivalent to a 82.6% response rate.

Trigger calls

Among the 19 responding hospitals, 17 (89.5%) had MEP trigger calls, whereas two (10.5%) did not. Among the 17 hospitals that had MEP trigger calls, 16 (94.1%) had multiple types of trigger calls, ranging from two to eight. The labelling of the MEP calls varied, as illustrated in **Table 1**. In this study, trigger calls are focused on primary triage upon arrival to the hospital. This study does not take into account secondary or tertiary triage.

TABLE 1 Variations in names of medical emergency patient (MEP) trigger calls.

Label of MEP trigger call	Hospitals, n
Red call	4
Medical red call	3
Medical emergency call	2
Acute call	2
Acute medical call	2
Medical acute call	2
Emergency receiving team	1
Critical call > 12 years	1

We found that 11 of the 17 hospitals (64.7%) had a database where MEP trigger team activations were registered.

Activation and activation criteria for medical emergency patient calls

The prevalence of MEP trigger call activations per ED ranged from a minimum of 50 to > 300 annual activations. In ten of the 17 hospitals (58.8%), MEP trigger calls were activated > 300 times annually.
We found differences as to who activated MEP trigger calls at each hospital; these differences are illustrated in **Table 2.**

TABLE 2 Professions activating medical emergency patient trigger calls.

Profession activating the MEP trigger call	Hospitals, n
Coordinating ED nurse	12
Secretary	2
ED physician	2
Do not know/no answer	1

ED = emergency department; MEP = medical emergency patient.

All 17 hospitals with MEP trigger calls had formalised activation criteria for their calls. They all reported that red triage was used as activation criteria for MEP calls. Most Danish hospitals use the Danish Emergency Process Triage (DEPT) [17, 18]. DEPT is used both pre- and in-hospital to differentiate between stable and life-threatening conditions.

Four hospitals (23.5%) stated that MEP trigger calls may also be activated based on clinical judgement.

Red triage identified patients with a need for immediate treatment based on their vital signs. Red triage thresholds differed in the DEPT system from patient to patient depending on their underlying symptoms.

Training

In 14 of the 17 hospitals (82.4%), MEP trigger team members received simulation training. Three hospitals did not provide simulation training.

Type and frequency of training of the MEP trigger team members varied as illustrated in **Table 3.**

TABLE 3 Type and frequency of training of medical emergency patient trigger team members.

	More than every 6 months	More than once a year	More than every other year	Less than every other year	No training	Do not know	Total
Hands-on + video	1					1	2
Hands-on	3	3	2	2		1	11
Other					3	1	4

Diversity of type and frequency of training of MEP trigger team members for the 17 Danish hospitals, which had MEP trigger calls.

In eight of 17 hospitals (47.1%), MEP trigger team performance was evaluated. Four hospitals evaluated monthly, two every six months and two annually. Two hospitals (11.8%) did not know whether they evaluated. Seven hospitals (41.2%) did not evaluate.

Respondents from 16 out of 17 hospitals (94.1%) felt that they were ‘almost always’ or ‘always’ adequately educated to participate in MEP trigger calls. One respondent did not answer.

Composition of trigger teams

All 17 hospitals that had trigger calls also had specific trigger teams for receiving MEP.

Trigger teams for MEP varied from three to 11 members. The medical specialty of the team leader varied as presented in **Table 4.** The number of physicians on the team varied from one to five. Nine of the 17 hospitals (52.9%) that had MEP trigger teams had at least one emergency physician on the team. This is illustrated in Table 4.

TABLE 4 Trigger team composition in 17 Danish hospitals.

Hospital	Emergency physician	Anaes-thesiologist	Internal medicine specialist	Other medical specialties	Anaes-thesiology nurse	ED nurse	Medical laboratory technician	Radiology technician	Secretary	Service
A			Xx			xx	x			x
B		x	X	x	x	xx	xx		x	
C		x	Xx		x	xx				
D	Xx	x			x	xx	x	x	x	x
E		x	X	x	x	xx	x	x	x	x
F		x	X	x	x	xx	x	x	x	x
G	X	x	X	x	x	x	x			
H	X					xx	x			x
I	Xx	x			x	xx	xx			
J	Xx	xx	x		x	xx	xx			x
K	X					xx	x			x
L	X	x	x			x	x			x
M	Xx	X			x	xx	x	xx	x	x
N			xx	x						
O	X	X	x		x	xx	x		x	
P		X	xx		x					
Q		Xx	xx		x	xx	x		x	

ED = emergency department.
x = 1 employed; X = 1 team leader.

The respondents in 15 of the 17 hospitals (88.2%) stated that their trigger team composition did not vary during evenings, weekends or holidays. Two hospitals (11.8%) stated that they did not know whether there was variation in trigger team composition.

Interpersonal agreement

In five of the 17 hospitals (29.4%) that had MEP trigger calls, more than one person responded (Supplementary material, Appendix 2-3). In one of the five hospitals (20.0%) with multiple records, the respondents agreed on all key questions.

DISCUSSION

We found that MEP trigger team activation, training and composition varied greatly among Danish EDs.

Though not coordinated nationally, having a trigger team call for MEP is recognised as important by most Danish EDs. Additionally, all details regarding MEP differed between EDs.

No agreement existed on the labelling of the MEP trigger team, and only 65% of EDs with MEP trigger teams had a database where the calls could be registered.

Regarding the difference in patients received annually by the EDs, it was unsurprising that a substantial variation was observed in the amount of MEP trigger calls. Almost 60% of Danish EDs receive at least one MEP daily.

No official and common activation criteria exist, but most hospitals used DEPT red triage, which defines life-threatening conditions based on vital signs connected to specific symptoms [17, 18]. No national agreement exists on who should activate the trigger calls.

Fortunately, training of MEP trigger teams seems to be prioritised as shown by the existence of training programmes in more than 80% of the hospitals with trigger teams. Even so, the content and the setup of the training provided varied between EDs. Probably because of the training received, most MEP team leaders felt adecuately educated.

The individual experience level based on number of trigger call participations varied among the respondents. However, most of the respondents were senior physicians who had all been certified in at least one of the emergency medicine courses (Advanced Life Support (ALS), Advanced Medical Life Support (AMLS), Advanced Trauma Life Support (ATLS), Prehospital Trauma Life Support (PHTLS) or similar) within the past two years.

A lack of follow-up on MEP trigger calls exists as less than half of EDs had implemented evaluation of their calls.

The variation in MEP trigger team composition is unsurprising. This was also shown for trauma teams in Denmark [15]. There seems to be no variation in the team composition by time of day or weekday. Patients are received by the same team 24/7.

Low interpersonal agreement was observed on the activation and composition of MEP trigger calls in the hospitals where more than one person answered. This reflects the lack of standardisation, even within each ED.

A Danish study found that trigger calls for MEP are more frequently activated than stroke, STEMI and trauma trigger calls, measured as activations per patient year [9]. Furthermore, the mortality of MEP is much higher than that of other groups of acute patients, such as stroke, STEMI and trauma patients. The mortality level for MEP was also shown to be high in Germany [10], which shows that the high mortality rate is not simply a local challenge. Approaches have been made, mostly in Germany, to focus on the standardisation of MEP trigger calls [10, 11], but these suggestions have not yet been implemented in Denmark.

Less frequent trigger calls, such as stroke, STEMI and trauma calls, have been standardised, which has improved the outcome for these patient groups [5-8]. This also applies for patients with sepsis following the implementation of a standardised approach [19]. Accordingly, it seems likely that a similar approach may reduce the mortality of MEP. To our knowledge, no research has been published regarding the treatment outcome following the implementation of a standardisation in this field.

Our results illustrate the diversity of the MEP management in hospitals in Denmark. Each hospital has different prerequisites for receiving MEP due to major differences in the composition of trigger teams. Thus, patients with similar symptoms are managed differently depending on what hospital they are treated in.

The results of this study emphasise the need for further and more thorough investigation of MEP management to determine whether standardisation of procedures may improve the outcome for this patient group. With the aim of improving patient outcome, a promising avenue lies in optimising and standardising regional and national MEP trigger call guidelines, followed by evaluation of their impact.

Limitations of the study

We only received a single response from most hospitals. Therefore, the answers are not necessarily representative of the knowledge among ED staff in general. This became obvious when reviewing the cases in which we had received several questionnaire answers from a single hospital.

As to how well educated the responders felt, the senior physicians are expected to be and feel more adequately educated than are younger doctors. Therefore, selection bias might exist in the study as the respondents were mostly senior physicians. Younger doctors might not feel as adequately educated. Furthermore, the differentiation regarding younger doctors' educational level was not thoroughly investigated in the questionnaire.

The results show that differences exist in the management of MEP in Danish EDs. To some degree, this may be due to imprecise formulations or misconceptions in the questionnaire. The length and complexity of the questionnaire may explain why only few hospitals provided more than one response.

CONCLUSION

Though most Danish EDs have a specific trigger call for MEP, the definition, management, training and follow-up of these calls vary greatly. This study provides a general overview of the management of MEP in Denmark. This knowledge may be used as a base for future standardised recommendations for the management of MEP and the study of the impact of such recommendations.

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