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RESEARCH ARTICLE

## Swedish emergency medical services' identification of potential candidates for primary healthcare: Retrospective patient record study

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### ABSTRACT

**Objective:** To investigate patients who called the emergency medical services (EMS) for primary healthcare (PHC) problems.

**Design:** A retrospective and exploratory patient record study from an EMS perspective, comparing two groups: those who were potential candidates for PHC and those who were not. All data were gathered from EMS and hospital records.

**Settings:** The study was completed at the EMS and five hospital areas in the western region of Sweden.

**Subjects:** The patients (n = 3001) who called the EMS in 2011. Data were missing for 10%.

**Main outcome measures:** The frequency and the clinical characteristics of the patients who called the EMS and were actually potential candidates for PHC.

**Results:** Of a total of 2703 patients, a group of 426 (16%) were assessed as potential candidates for PHC and could thus be treated at a level of care other than the emergency department. Patients who were classified as suitable for PHC were found at all priority levels and within all symptom groups, but were younger and healthier than the other group.

**Conclusion:** Numerous patients seeking help from the EMS do not end up at the most appropriate level in the healthcare system.

**Implications:** In the EMS, guidelines are needed to enable pre-hospital emergency nurses to assess and triage patients to the most appropriate level of healthcare.

### KEY POINTS

- Patients calling the emergency medical services do not always end up at an appropriate level of healthcare.
- In total, 16% of patients were identified by the Swedish emergency medical services as potential candidates for primary healthcare.
- These patients were younger and healthier than those needing care at the emergency department.
- They were found at all priority levels and within all symptom groups.

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Assessment, emergency medical services, exploratory, general practice, pre-hospital emergency nurse, primary healthcare, triage, Sweden

## Introduction

Primary healthcare (PHC) is the first contact with the healthcare system, offering continuous, comprehensive, and coordinated care provided to populations undifferentiated by gender, disease, or organ system [1]. PHC centres in Sweden are designed to provide non-urgent care for inhabitants [2]. Such healthcare includes basic medical treatment, nursing care, preventive care, and rehabilitative care that do not require advanced specialist care or higher medical or technical resources [3]. PHC consists of stationary units situated in the municipalities, with greater proximity to each other than the

proximity between emergency departments (EDs) at the hospitals [2]. There are no national directives concerning cooperation between PHC and the emergency medical services (EMS) [2].

The ED should be reserved for urgent care [2,4]. However, there is no consensus on the criteria clearly distinguishing urgent and non-urgent care. Patients call the dispatch centre for medical attention although they do not require it immediately [5].

The dispatch centre (DC) constitutes the first priority level when a patient calls for help. Priority one is for emergency life-threatening conditions (red), priority two

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for urgent but not life-threatening conditions (orange), and priority three for neither life-threatening nor urgent conditions (yellow and green) [6,7]. When the EMS arrive at the patient's side, the pre-hospital emergency nurse (PEN) makes a second priority assessment by using the Rapid Emergency Triage and Treatment System (RETTs) (previously Medical Emergency Triage and Treatment System – METTS) [8]. The RETTS is a triage system developed for use in the ED and it has also been implemented in the EMS. With the support of the RETTS, each patient is given an Emergency Symptoms and Signs (ESS) number, based on symptoms and vital parameters (objective signs), and is assigned a triage colour that serves to indicate the priority and time until contact with the ED physician [8]. Furthermore, the EMS makes its own assessment and decision on priority based on a dialogue with the patient and objective signs. The final destination for the EMS is generally the ED at the nearest hospital [6], because of the lack of national evidence-based guidelines enabling the EMS to triage patients to the most appropriate level of care.

It is a well-known problem in Western countries that patients seek care at the ED using the EMS, although they could be treated at another level of care, thus causing overloaded EDs [9–11] and overexploitation of the EMS [9]. Resources therefore need to be used more efficiently. One way to handle this problem may be to transport patients with non-urgent conditions to PHC units. Possible benefits could be shorter transport times for the EMS and fewer patients in the ED, thus shortening waiting times. Treatment by PHC of patients with non-urgent conditions may be preferable for these patients since they may then experience more continuity and receive better follow-up. This can also be seen as safer care [12,13]. Lack of knowledge and disagreement prevail regarding the frequency of this problem and the clinical characteristics of these patients [12,14,15].

A study in Canada showed that patients who called the dispatch centre for medical attention might in fact be seeking a level of care other than the ED [15]. The extent of the problem is difficult to estimate, because the exact proportion has been reported as ranging from 4.8% to 49% [6,12,15–22]. The reasons for the “incorrect” use of the ED may depend on perceptions of need, referral/follow-up to the ED, familiarity with the ED and trust in the ED [15]. Similar results were found by Beillon et al., where the primary reason for preferring the ED was availability [23]. Moreover, confidence in PHC may be lower than that in the ED when it comes to care and treatment, even if confidence is slowly increasing [24].

Local authority factors sometimes compel nurses to transport patients directly to the ED in certain hospital

areas, although this may not be the case in some other areas. According to Swedish law, the EMS may never force a patient to participate in examination, treatment, or transportation [3]. Treatment in patients' homes without transportation is possible in some areas, this being up to the EMS physician responsible for the local guidelines. Williams suggests that the EMS performs a sorting function that will help the patient to find the appropriate level of care [25] and claims that experienced nurses have the ability to triage patients to the appropriate care level [26]. EMS manned by PENs might be expected to have the necessary competence to assess an appropriate level of care for patients, but there are no national guidelines based on evidence and proven experience.

Therefore, the aim of the current study is to investigate patients who called the EMS for primary healthcare problems, to establish the frequency and the patients' clinical characteristics.

## Material and methods

### *Design and setting*

This study is a retrospective and exploratory study from an EMS perspective, comparing two groups: those who were potential candidates for PHC and those who were not. All data were gathered from EMS and hospital electronic patient records.

In 2011, Sweden had 9.5 million inhabitants, 17% of whom lived in western Sweden [24]. The region is divided into five hospital areas. All priorities totalled about 115 missions/1000 inhabitants annually [27].

This study was performed in interdisciplinary collaboration between observers in an expert group consisting of experienced PENs representing five EMS hospital areas, and three researchers: two in caring science and one in pre-hospital emergency care.

### *Data collection*

The inclusion criteria for participation in the study were: the patients were among the first 50 people to call the EMS via the DC in each hospital area each month in 2011. Moreover, in order to be a candidate for PHC (i.e. having primary healthcare problems), at least one of three given criteria had to be met: (1) the patient was not given care at the ED; (2) the patient was transported to the ED, but no intervention was initiated; (3) the patient was given care at the ED, but, according to the data, the expert group assessed that equivalent care could have been provided by PHC.

The exclusion criteria were (1) missing ESS numbers; (2) too many data missing from the electronic patient

record to enable an assessment to be made; (3) deficient documentation due to the patient being unwilling to register her/his personal data; and (4) patient deceased.

For collecting data, a specific case record form was used including the following patient data: age, gender, clinical history, other clinical data (i.e. difficulties in understanding information given, pain, confusion, choice of final destination, hospitalization), vital signs, priority, RETTS colour, ESS code, care/treatment interventions, and patient's participation in decisions. Two persons in the expert group consulted each other and agreed in making each retrospective assessment, and thus a consensus was reached.

### Analysis

Patients classified as candidates for PHC were compared with those who did not meet any of the inclusion criteria. Analyses for comparisons were performed using Wilcoxon's two-sample test for continuous variables and group distribution (e.g. RETTS colour) and Fisher's exact test was used for dichotomous variables. All analyses were performed using the SAS (statistical analysis software). The limits of significance were set at  $p = 0.05$  [28].

### Results

In all, 3001 patients met the inclusion criteria, while 298 patients (10%) did not take part in the study due to missing data or death on scene. Among the remaining 2703 patients, 426 (16%) met one of the given criteria for being a potential candidate for PHC, i.e. those who called the EMS for primary healthcare problems. In what follows, these patients will be compared with the 2277 (84%) assessed as requiring care at the ED.

#### Characteristics of patients meeting criteria for PHC

Patients deemed classifiable for PHC were significantly younger, more frequently assessed as being free from serious diseases, and had a lower prevalence of previous cardiovascular disease, pulmonary disease, and malignancy (Table 1).

#### ESS code characteristics

Among the patients who were classified as candidates for PHC, the most frequent ESS codes were (1) nausea, vomiting, diarrhoea; (2) chest pain; (3) unspecified disease. In the group deemed as being in need of the ED, the most frequent ESS codes were (1) chest pain; (2) dyspnoea; (3) nausea, vomiting, diarrhoea. In the group

Table 1. Characteristics and frequency of patients according to age, gender, and previous illness.

	Patients classified for PHC (n = 426)	Patient classified for ED (n = 2,277)	p-Value**
Age (years; median $\pm$ SD) (0.2)	56 $\pm$ 26	66 $\pm$ 22	<0.0001
Gender (female)	51	52	
Previous illness:			
Healthy (7)*	45	24	<0.0001
Kidney disease (10)*	3	4	
Cardiovascular disease (8)*	27	50	<0.0001
Cerebrovascular disease (9)*	11	15	
Pulmonary disease (9)*	8	13	0.004
Malignancy (9)*	6	11	0.005
Immunosuppression (10)*	2	3	
Operated within 3 months (12)*	2	2	
Bleeding tendency (11)*	4	6	0.01
Diabetes (9)*	9	14	0.01

Notes: \*Proportion (%) of patients with missing data. \*\*p-value denoted if  $< 0.05$ . Percentage if not otherwise stated.

deemed as potential candidates for PHC, the ESS codes nausea/vomiting/diarrhoea, seizures/epilepsy, back pain, pain during urination/haematuria, mental illness, and unspecified disease were more common than in the other group (Table 2).

#### Priority and clinical findings

Patients deemed as potential candidates for PHC were given significantly lower priority at the dispatch centre, although 27% were given priority one. They were also assessed as less urgent by the PEN, although 1% were given priority one and 10% priority two. Furthermore, there were fewer patients who were confused and fewer patients with pain. About 50% of these patients were assessed in retrospect as having taken part in the decisions with regard to level of care (Table 3).

#### Vital parameters

Patients classified as suitable for PHC less frequently had a heart rate of more than 100 beats/minute, a breathing rate of more than 20/minute, and oxygen saturation of less than 90%. However, among the potential candidates for PHC in this group, 16% had a heart rate of more than 100/minute, 13% had a breathing rate of more than 20/minute, and 0.6% had oxygen saturation of less than 90%. Finally, 3% had a reduced level of consciousness and 0.7% were unconscious (Table 4).

#### Treatment and/or interventions in the ED among patients who were not hospitalized

Patients classified as suitable for PHC less frequently underwent an X-ray investigation. A substantial

Table 2. Characteristics and frequency of patients according to ESS codes.

	Patients classified for PHC (n = 426) %	Patient classified for ED (n = 2277) %
Represented ESS code (1–53)		
1. Abnormal heart rhythm	2	3
2. High blood pressure	0.2	0.4
3. Bloody cough, nosebleed	1	0.4
4. Dyspnoea, respiratory correlated chest pain	7	11
5. Chest pain	8	14
6. Nausea, vomiting, diarrhoea	12	10
7. Bloody vomiting, melena	0.7	2
8. Icterus, ascites	0	0.09
9. Seizures, epilepsy	5	2
10. Sensibility disorder, tremor	0	0.2
11. Dizziness, vertigo	6	5
12. Stroke, TIA, non-response symptoms	0.5	6
13. Joint pain	0	0.04
14. Back pain	4	2
15. Pain/swollen extremities	2	2
16. Pain during urination, haematuria	2	0.9
17. Genital disorder males	0.2	0.4
19. Headache	0.7	1
20. Fainting, collapse	2	3
21. Genital disorder females	0.5	0.6
30. Injury/trauma to neck/head	5	5
31. Injury thorax/back/pelvis	2	2
33. Injury hand/arm	2	3
34. Injury hip/thigh	3	7
35. Burn, inhalation injury	0.5	0.2
37. Injury/infection eye	0	0.04
39. Trauma	1	1
40. Intoxication by alcohol or other substances	2	4
41. Toxic effects of animals	0.2	0.1
42. Physical abuse	0.5	0.09
43. Allergy/drug reaction	2	1
44. Acute laryngopharyngitis	0.5	0
45. Otitis	0.2	0.04
46. Foreign object in nose/airway	0.2	0.2
47. Fever/infection	7	5
48. Anaemia	0.2	0.04
49. Diabetes	1	0.8
50. Hypoglycaemia	1	0.3
52. Mental illness	4	0.8
53. Unspecified	8	3

proportion either had medication or underwent a laboratory or X-ray examination (Table 5).

## Discussion

### Statement of principal findings

Some 16% of the patients were classified as being potential candidates for PHC. They were significantly younger and healthier than those assessed as being in need of care at the ED. Most ESS codes and all priority levels were involved for these patients, but the highest proportion was recruited from priority two. However, the proportion of patients given the highest priority was surprisingly high. One cannot exclude the

Table 3. Characteristics and frequency of patients according to priority, patient participation, and other clinical data.

	Patients classified for PHC (n = 426) %	Patient classified for ED (n = 2277) %	p-Value**
Priority at the dispatch centre (0.04)*			<0.0001
Priority one: life-threatening conditions (red)	27	35	
Priority two: urgent but not life-threatening (orange)	58	55	
Priority three: not life-threatening or urgent (yellow and green)	16	11	
RETTS (0.9)*			<0.0001
Red	1	10	
Orange	10	34	
Yellow	31	43	
Green	47	13	
Speaks poor Swedish (8)*	4	3	
Confused (7)*	1	7	<0.0001
VAS*** > 0 (65)*	19	34	
VAS (middle $\pm$ SD)	0.9 $\pm$ 2.3	1.9 $\pm$ 3.2	<0.0001
Transported to hospital (0)*	43	100	
Patient participation in decision (38)*	53	6	<0.0001
If transported to hospital, hospitalized	7	77	

Notes: \*Proportion (%) of patients with missing data. \*\*p-value denoted if <0.05. \*\*\*Visual analogue scale; a pain score.

Table 4. Characteristics and frequency of patients according to vital parameters.

	Patients classified for PHC (n = 426) %	Patient classified for ED (n = 2277) %	p-Value**
Vital parameters: Heart rate (beat/min) (6)*			
>100	16	24	0.0001
<50	0.3	0.7	
Systolic blood pressure (mmHg)(8)*			
>160	20	25	0.04
<100	2	5	0.05
Respiratory rate (breaths/min)(16)*			
>20	13	27	<0.0001
<10	0	0.4	
Saturation (%) (8)*			
<90	0.6	10	<0.0001
Temperature ( $^{\circ}$ C) (45)*			
>38	7	11	
<36	14	14	
Consciousness grade (1):*			
Normally awake	95	92	0.02
Reduced consciousness	3	5	
Unconscious	0.7	2	

Notes: \*Proportion (%) of patients with missing data. \*\*p-value denoted if <0.05.

possibility that some of these patients were given excessively high priority by the DC. There was no difference in the distribution of gender between those who were potential candidates for PHC and those who were not.

Table 5. Characteristics and frequency according to caring and interventions at ED without hospitalization.

	Patients classified for PHC (n = 426) %	Patient classified for ED (n = 2277) %
Interventions at ED:		
Medication (8)*	21	30
X-ray (12)*	10	40
Laboratory samples (2)*	50	60
Other actions	39	50

Note: \*Proportion (%) of patients with missing data

### Strengths and weaknesses in the study

In this study, the observers were the expert group studying the early chain in the EMS system where findings before and after hospital admission were considered. The observations were sometimes considered but not recorded. In Sweden, general practitioners (GPs) are not involved in this chain in the same way as in other countries, for example Norway [29]. Thus the caller in this study was with few exceptions the patient or a bystander and not a GP. The ambition of this study is to suggest organizational changes.

Having an expert group is nevertheless regarded as strength in the study [28]. As there is no generally accepted definition of the way different healthcare needs should be classified, especially with regard to non-urgent patients, certain criteria were to some extent chosen specifically for this study. For example, "The patient was transported to the ED, but no intervention was initiated" was one such criterion. However, the assessment of the other criteria was a subjective assessment made by the expert group. Because different people from the expert group collected the data, different interpretations are possible but the number of audited records (2703) should give a satisfactory picture of the target population in the region.

There was variability in the proportion of patients with missing information, from 0% for transport to a caring unit to 45% for body temperature. However, for most of the variables, the rate for missing data was less than 10%. There were two main reasons for having missed data: (1) the patient was transported to a medical facility where access to the current electronic patient record was missing; and (2) the quality of the reported data was so poor that some variables could not be discerned.

One significant limitation in this study is that, due to the large number of p-values created, there is a risk of type I error. An inter-observer reliability check was not performed.

One more limitation is that the retrospective assessments of data gathered from patient records assume

that the diagnoses arrived at by physicians are accurate. However, according to Croskerry [31], many diagnostic errors are caused by cognitive bias. Finally, GPs were lacking in the group of observers. The presence of one or more would have contributed additional knowledge to the study.

### Findings in relation to other studies

The proportion of patients who were assessed as potential candidates for PHC was estimated at 16%. The result is lower than expected, but is in line with other studies from the USA [5] and England [20]. However, other studies have reported higher figures [6,12,15,17,19,22]. A study from Brazil showed that 24% of EMS assignments were associated with the inappropriate use of the ED, but this study also included patients visiting the ED without EMS involvement [30]. Beillon et al. found that one-third of the patients who called the EMS could have been transported to a level of care other than the ED [23].

Feasible explanations for the variations in these results are, first, disagreement on what constitutes a non-urgent patient; second, national and international differences in the ability to treat patients at the PHC; and third, from whose perspective the problem is described [12,14]. The present study indicates that patients suitable for PHC are younger and healthier than those needing the ED. Similar findings were presented in Canada [15]. One Swedish study suggests that patients who need transport to the ED are younger and have symptoms of shorter duration [14].

The ESS code that was most common among patients classified as suitable for PHC was the group with nausea, vomiting, and diarrhoea (12%). A Canadian study demonstrated that the most common symptoms among patients in need of PHC were extremity pain, minor trauma, follow-up, abdominal pain, and chest pain without a cardiovascular genesis [15]. Sharfer et al. reported that minor trauma, minor respiratory disorders, and muscular disorders were the most common symptoms among those in need of PHC [5]. A Swedish study found that respiratory symptoms, usually infection or allergy, were the most common symptoms if there was a need for PHC, followed by muscular, skeletal, genital, and urinary symptoms [14]. These major differences between studies are probably due to a variation in the definition and distribution of symptoms but also to contextual and cultural differences relating to the extent to which the patients are allowed to influence the source of medical care.

The only ESS code for which almost all patients were assessed as being in need of the ED was stroke/transient

ischaemic attack. About half of all patients assessed as being potential candidates for PHC participated in the decision concerning the level of care. These results suggest that person-centred care has also been introduced in the pre-hospital setting. Since the evaluation was performed retrospectively and the rate of missing data was high, the existing data must be interpreted with caution.

No ESS code showed a result in which the total number of potential candidates for PHC exceeded the number of non-candidates. However, in the case of ESS code 52 (mental illness), the total numbers in the two groups were nearly equal, which highlights the difficulties of triaging these patients to the most appropriate level of care. The figures presented here should be regarded as estimates and as a guide for future research.

### **Clinical implications**

In the EMS, guidelines are needed to enable PENs to assess and triage patients to the most appropriate level of care. This study could assist in developing such guidelines. The size of this patient group may affect the flow of emergency cases through the ED.

### **Conclusion**

Numerous patients seeking help from the EMS do not end up at an optimal level of care, which underlines the need for PENs to be able to assess and triage patients to the most appropriate level of care.

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### **Ethical approval**

This study was approved by the Regional Ethics Review Board in Gothenburg (Dnr 372-12).

### **Declaration of interest**

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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