



Non-transportation emergency medical service missions – a study based on medical charts and patient questionnaires

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Abstract

Background: In Finland, approximately 40 % of emergency medical service (EMS) missions do not result in transportation of the patient to a hospital by ambulance, and there is wide variability in the nature of non-transportation EMS missions. The aim of this study was to describe the context of these EMS non-transportation missions.

Methods: The data were collected retrospectively between 3 September and 20 October 2014 by investigating non-transportation EMS charts (n=1154) and combining the data with the information from a patient satisfaction questionnaire. Event information and patients' main symptoms were extracted from information found in EMS charts and quantified using content and statistical analyses.

Results: Patients' need for EMS was due to various reasons. In 38.4% of cases the situation or patients' symptoms had sudden onset, while in 14.7% of cases the symptoms had lasted days or weeks before the EMS contact. EMS personnel offered guidance instead of treatment in 79.2% of the missions. Patients' satisfaction relating to non-transportation decisions was good in 76.7% of cases.

Conclusions: Non-transportation missions represent a significant daily work load for the EMS. Although most of the symptoms have acute onset, the majority of these missions involved just the assessment of medical necessity and guidance without any medical treatment. It is questionable whether this use of the EMS is a cost-effective approach to healthcare as a whole.

Introduction

The emergency medical service (EMS) has been developed to provide healthcare for patients requiring urgent medical attention out of hospital. However, a considerable proportion of the EMS missions are evaluated as non-urgent by the emergency medical communication centre (EMCC) dispatchers.¹ Many EMS missions do not **need to provide** patient transportation to hospital by ambulance, not even the most urgent ones.² The reasoning behind non-transportation is the avoidance of unnecessary patient transfers and the reduction in the workload of emergency departments (ED).³ The reform and merging of dispatch centres into one entity in Finland has been found to increase the number of EMS missions, unnecessary use of emergency lights and sirens, as well as increase their inappropriate use.⁴

Medical assessments and decisions about transportation are **challenging** for EMS personnel. Decisions not to provide transportation **may be** influenced by many factors, such as system policies, staff expertise, patient's demands, current availability of the EMS and other healthcare services as well as EMS guidelines. **The recent review** reported wide variability in the nature of non-transportation EMS missions.⁵ For adults, a third of non-transportation missions were for minor traumas^{6, 7, 8} whereas minor traumas and traffic accidents were responsible for over half of the missions for children.^{9, 10, 11} Various outcomes of non-transportation EMS missions have been studied by gathering data such as further EMS contacts, ED visits, in-hospital treatment and mortality rates.^{7, 12, 13, 14} Patient satisfaction has been reported as being good in non-transportation situations and was not related to whether the patient was transported or not.^{11, 15}

This study aims to describe the context of EMS non-transportation missions by exploring the demographics, patients' situations and the type of medical treatment and instructions as being given to patients in these missions. The secondary aim was also to examine patients' satisfaction with non-transportation EMS missions. The structure of the study is shown in Fig. 1.

Methods

Data Collection

The study was carried out **in one fire department EMS** in Northern Finland across five municipalities. Both urban and rural areas were covered, with a population of 220 000. The data were collected retrospectively between 3 September and 20 October 2014 from all EMS charts to examine missions leading to non-transportation decisions. Missions aborted before the patient was reached (due to cancellation by EMCC dispatcher, technical failure etc.) and where a patient was found dead were excluded.

Patients' situations were described using information extracted from the EMS charts. Event information, patients' main symptoms and reported abnormalities were condensed into keywords, then quantified and grouped using content analysis¹⁶ with a statistical matrix. The data relating to the duration of the symptoms or situation, examinations related to the patients' condition, the given treatment and the time frames according to treatment and guidance were categorized and converted into statistical variables.

The Finnish National Institute for Health and Welfare patient satisfaction questionnaire for EMS was mailed to each of these patients within two weeks of the EMS contact. The questionnaire contained 20 multiple-choice questions (Likert scale 1 – 5, or yes/no question) and three open questions such as “Informal feedback to EMS provider”. **The five-point Likert scale from Patients' general satisfaction with EMS instrument was combined to three variables (Table 4): helped very much or a lot (Likert scale 5 and 4), helped moderately or a little (3 and 2), and did not help at all (1).** Specific questions concerning the non-transportation event were added to the questionnaire. Patients with more than one EMS contact during the study period received only one questionnaire. Information from the questionnaire was combined with EMS chart information for statistical analyses.

Ethical Considerations

Permission to carry out this study was obtained from both Oulu-Koillismaa fire department and Oulu University Hospital, Unit of Medicine (Centre for Pre-Hospital Emergency Service). This was a retrospective registry study combined with a questionnaire, so, in accordance with the local policies of Northern Ostrobothnia District, approval of the local ethics committee was waived.

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3 *Statistical analyses*

4 The data are described as frequencies and percentages. The data were analysed using IBM SPSS
5 Statistics for Windows, Version 24.0. Pearson's chi-square test was used to compare categorical
6 variables (Fisher's exact test when appropriate) and a p-value <0.05 was considered significant.
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For Peer Review

Results

Demographics

The EMS carried out a total of 3923 missions during the study period, 37.7% (1478) of which did not lead to transportation of the patient. Of these, 324 were excluded because they were aborted before the patient was reached or a patient was found dead. Thus, 1154 non-transportation EMS missions, involving 977 individual patients, were included in the final analysis. The mean age of patients was 52.8 years (range of 0 – 103); 49.3% were male. Some 43.4% of patients were over 60 years old, and 17.0% were over 80 years old. The demographic data are shown in Table 1.

The percentage of patients having two or more EMS contacts during the study period was 25.3%. EMS re-contact occurred within six hours in 3.7% of cases, within 7 to 24 hours in 4.3% of cases, within 1 – 3 days in 4.7% of cases and later than 3 days in 13.2% of cases. Of these re-contacts, 48.6% led to transportation for further treatment and 51.4% were non-transportation missions again.

Patients' situations

The reasons for non-transportation EMS missions derived from the content analysis are presented in more detail in Table 2. According to the EMS charts the situation or symptoms had sudden onset in 38.4% of cases, within 1-2 hours in 9.8% of cases, within 24 hours in 19.3% of cases and over days or weeks in 14.7% of cases. There were 4.7% recorded as chronic symptoms, which were worsening. The speed of onset of symptoms was missing in 13.2% of cases.

EMS documentation indicated that the patient had new symptoms, which had not occurred before in 10.4% of cases, symptoms noted previously by healthcare staff in 19.1% of cases, and chronic symptoms in 10.8% of cases. However, 59.6% of EMS charts did not document whether the symptoms were new or had been previously noted. In 8.3% (96) of missions symptoms were relieved before EMS personnel encountered the patient.

In all study missions (1154), 21.6% of patients were under the influence of alcohol, according to results of breath analyser tests, which ranged from 0 to 4.6 ‰ alcohol (mean 1.6 ‰). Substance use or social problems were reported for 15.5% (179) of EMS missions.

Medical treatment and guidance

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3 EMS personnel consulted a doctor by phone in 38.9% of non-transportation EMS missions. Based
4 on information reported on EMS charts, EMS personnel **offered guidance instead of medical**
5 **treatment** in 79.2% of the missions. The EMS could completely handle the problem or treat the
6 patient at the scene in 13.4% (154) of missions (e.g. lift up, treatment of hypoglycaemia or back
7 pain medication). The documented guidance and instructions given to the patients were categorized
8 as shown in Table 3. There was a significant variation in self-reported healthcare service use within
9 a week, contrary to the given instructions (Table 3).
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16 *Patients' satisfaction with non-transportation EMS missions*

17 Patient satisfaction questionnaires were sent to 953 individual patients with 320 (33.6%)
18 questionnaires being returned and correctly filled in. Patients' satisfaction, both generally (Likert
19 scaled 1-5) and specifically regarding non-transportation decisions (yes, no or no opinion) was good
20 in three out of four cases (Table 4). **According to the questionnaire replies, the non-**
21 **transportation decision** was made by EMS personnel in 62.2% of cases, the patient in 17.3% of
22 cases, the doctor (by telephone) in 15.3% of cases and a relative, friend or someone else in 5.2% of
23 cases.
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32 There was no statistical relationship between who made the non-transportation decision and
33 patients' satisfaction of both this solution ($p = 0.162$) and their general satisfaction ($p = 0.614$).
34 There was a statistical relationship between categorized event information and patients' satisfaction
35 to a non-transportation decision ($p = 0.02$). There were slightly more unsatisfied patients when the
36 main categories of event information were **organ system**, general condition and **other request for**
37 **help** (Table 4).
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Discussion

This study showed that almost four out of ten EMS missions did not lead to patient transportation by ambulance, similar to other studies in northern Finland.² Our results show that about 40% of non-transportation missions did not need any medical assessment or treatment whereas about 30% were treated at the scene by EMS. Treatment at the scene included a patient's overall examination and care instructions requested from a doctor, along with non-urgent medication or some other treatment usually administered by healthcare professionals. When EMS personnel decided that the patient did not need any **further** medical assessment or treatment, they usually carried out the evaluation by themselves after a patient examination. Content analysis of the EMS documentation indicated that EMS personnel gave guidance and instructions instead of treatment in almost 80 % of these non-transportation missions.

Situations resulting in non-transportation EMS missions were commonly recorded as starting suddenly and, in about 70% of cases, the symptom or situation onset happened over a 24-hour period. **According to the Finnish national dispatch guidelines¹⁷ that patients need help (commonly if they have trauma, have fallen down, have symptoms such as chest pains, breathing difficulties, arrhythmias or neurological symptoms, and/or are under the influence of alcohol), the EMCC dispatchers will dispatch **ems** unit to evaluate the medical necessity or the patient's condition at the scene.** A Swedish study had results, finding that there were only a small percentage of patients who could be advised to use alternative transport by EMCC dispatchers, with most patients needing assessment at the scene.¹⁸ In our series one fifth of EMS charts showed that patients needing help suffered from pre-existing, long-standing symptoms as pains or other needs for help. There was also a significant group of patients who used EMS several times during this short study period. Most of the non-transportation missions occurred out-of-office hours and at weekends considering elderly patients. Currently, the EMS is the only 24/7 healthcare unit that can carry out such work. Is it always the right one? **Is there a possibility to strengthen other homecare services? Or whether calls regarding non-emergency issues to be directed to secondary evaluation by telephone nurses?**

There is an inconsistency between taking care of these kind of out-of-hospital non-urgent situations and EMS personnel training, which focuses on recognizing and treating critically ill or injured

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3 patients, identification of potentially emergent conditions and pre-hospital treatment based on
4 presenting symptoms. According to a previous literature review, paramedics are more capable of
5 making accurate triage decisions and admission predictions when the patient's condition is the
6 result of trauma or if the patient requires critical care.¹⁹ EMS practitioners' education should
7 concentrate more on "treat and release" situations.²⁰ It seems that in many of these non-
8 transportation situations, EMS personnel are not providing the kind of patient care that they have
9 been trained to deliver. Also, specific guidelines for these non-transportation situations for the EMS
10 may be inappropriate because they are not directly applicable to a variety of patient situations.^{21, 22}

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12 **In this study** different **organ systems**, traumas and other requirements for help (including different
13 complaints or problems) were the reason for over 60% of non-transportation EMS missions. Thus,
14 patients' requests for help were more complex and caused by various reasons, as traditionally
15 expected by the EMS.

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18 Many previous studies have focused on the paramedics' ability to decide about ambulance
19 transportation safely. There is no study-based consensus of whether such EMS personnel decisions
20 are safe and accurate.²³ **Low clinical effectiveness in the safety "treat and release" carried out by**
21 **paramedics at the scene has been reported.** There are no evidence-based clinical practice guidelines
22 or cost-effectiveness studies.²⁴ For example, "treat and release" of hypoglycaemia patients on the
23 scene by the EMS is one of the rare patient groups for which medical guidelines were established in
24 the 1990s.¹² However, only 1.5% of missions were to hypoglycaemia patients in this study. Seizures
25 were the reason for missions in one out of 10 patients. **This study showed that EMS personnel**
26 **documented the evaluations and treatments precisely, but the guidance and advice given to**
27 **the patients were inadequately documented, which could affect the safety issues.**

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30 The conclusion of many previous studies has been that non-transportation situations were related to
31 the risk of patients' later need for healthcare or hospital admission. However, a patients' need for
32 healthcare after a non-transportation event does not indicate an EMS failure.^{13, 14, 25} EMS personnel
33 instructed patients to contact municipal healthcare either the next morning, the next working day or
34 later, in almost 60% of non-transportation missions. Nevertheless, these patients, who had been
35 advised by the EMS, used a variety of healthcare services after EMS contact. Also, the next EMS
36 contact after a non-transportation situation resulted in another non-transportation decision in over
37 half the cases.

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3 A previous study of paediatric patients found that parents were very satisfied with non-
4 transportation decisions made by the EMS.¹¹ Patients' general satisfaction in this study was $4.0 \pm$
5 **SD 1.1**. A previous study in Helsinki found that transportation decisions were not related to
6 patients' general satisfaction. In that study, general satisfaction levels of all EMS patients for the
7 service were $4.6 \pm$ **SD 0.7** and $4.5 \pm$ **SD 0.6** for two different years. An earlier study showed that
8 patients' general satisfaction varied according to the main reason for the mission.¹⁵ In this study,
9 patients were less satisfied if the reason for wanting help was in one of the categories **organ system**
10 or **other request for help**.
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18 *Limitations*

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20 This study has some limitations. The study period was short, about 6.5 weeks, raising risks of
21 missing longer temporal variations. In retrospect, other limitations lie in the study's design. The
22 main limitation is that the study results are based on what was documented in EMS charts, not on
23 prospective EMS missions. A lack of documentation influenced data processing, because some
24 variables were missing in the data due to a disparity between documentation and study questions.
25 However, EMS chart documentations are based on short repetitive phrases, which helped when
26 carrying out the content analysis. The EMS charts may not have been complete because of difficulty
27 in extracting information from uncooperative patients or because of EMS personnel not filling the
28 information in correctly.²⁶ One fifth of these study patients were under the influence of alcohol.
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30 **Additionally, the response rate for the patients' satisfaction questionnaires was not complete.**
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40 **Conclusion**

41 Non-transportation missions represent a significant daily workload for the EMS. **The context of**
42 **these missions was more complex as patients seeking help for various reasons.** Although most of
43 the symptoms had acute onsets, the majority of these missions resulted in an assessment of the
44 medical condition of the patient without any medical treatment being given and EMS instructing
45 patients to follow-up at home or contact healthcare later in non-urgent matter indicating that EMS
46 provides primary healthcare during out-of-office hours. The overall patient satisfaction for non-
47 transportation missions was good. It is questionable whether this is a cost-effective approach to
48 healthcare as a whole.
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Table 1. Demographic data.

Total number of missions	N=3923	100%
Non-transportation missions	n=1478	37.7
Included non-transportation missions	n=1154	%
The patient did not need any medical assessment or treatment	480	41.6
The patient was treated at the scene by emergency medical service	378	32.8
The patient was transported to the hospital by means other than ambulance	171	14.8
The patient refused treatment	97	8.4
The patient was handed over to the police	27	2.3
Missing data	1	0.1
EMS calls priorities		
A: highest, priority immediate	35	3.0
B: priority immediate	266	23.0
C: patient reached within 30 min	588	51.0
D: lowest, patient reached within 120 min	265	23.0
Time of the missions		
8:00 – 16:00	363	31.5
16:00 – 08:00	779	67.5
missing	12	1.0
Weekday		
Monday	137	11.9
Tuesday	120	10.4
Wednesday	143	12.4
Thursday	165	14.3
Friday	179	15.5
Saturday	229	19.8
Sunday	181	15.7
The number of missions for individual patients (n=977) during 6.5 week study period		
1 mission	730	74.7
2-5 missions	228	23.3
6 -13 missions	19	1.9

Table 2. The reasons for the non-transportation emergency medical service (EMS) missions, categorized by the event information collected from EMS charts.

Main category	Sub-category	n	%
ORGAN SYSTEM		387	33.5
	Symptoms in the limb or in the trunk (e.g. swelling of the leg)	66	5.7
	Chest pain	58	5.0
	Breathing difficulties	47	4.1
	Stomach pain	44	3.8
	Back pain	43	3.7
	Arrhythmia	32	2.8
	Headache	25	2.2
	Problems with urine or faeces	21	1.8
	Symptoms in the eye, nose, ear, mouth or throat	19	1.6
	Nausea or vomiting	13	1.1
	Fever, flu, cough	10	0.9
	Haematuria or blood in faeces	5	0.4
	Skin symptom	4	0.3
INCIDENTS AND SEIZURES		325	28.2
Trauma	Fall	84	7.3
	Traffic accident	42	3.6
	Violence	33	2.9
	Other trauma	31	2.7
	Wounds	17	1.5
Seizures	Epilepsy, convulsion	29	2.5
	Panic attack, hyperventilation	19	1.6
	Hypoglycaemia	17	1.5
	Syncope	14	1.2
Other incidents	Wrong medicine or dosage, side-effect of medicine	14	1.2
	Other intoxication	11	1.0
	Choking episode	7	0.6
	Allergy symptom or suspicion	7	0.6
OTHER REQUESTS FOR HELP		415	36.0

	Multiple complaints or problems	58	5.0
	Abnormal measured value (usually blood pressure)	31	2.7
	Need for a lift support, medicine, escort or something else	18	1.6
	Misunderstanding, need for other help	18	1.6
	Problem involved previous operation/wound	9	0.8
	Problem involved medical catheter or tube	5	0.4
General condition	Not able to get up	38	3.3
	Impaired general condition, feeling sick or unwell, weakness	35	3.0
	Incoherence, paramnesia	25	2.2
	Unable to walk	14	1.2
Alcohol related	Related to the use of / withdrawal from alcohol or drugs	46	4.0
	Passed out, unable to be woken up	34	2.9
Neurological symptoms	Dizziness	25	2.2
	Other neurological symptoms	16	1.4
	Tremor, trembling, sweatiness	12	1.0
	Numbness	7	0.6
Psychiatric problems	Mental problems	24	2.1
	Information missing	27	2.3
Total		1154	100%

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Table 3. Frequencies of non-transportation missions in which emergency medical service (EMS) personnel gave documented medical treatment or only guidance to patients.

Documented medical treatment	% (n)	Healthcare service use in 1 week* (n=292)	
		Yes (n=114)	No (n=178)
		n	n
Medication	6.6 (76)		
Other help (e.g. bandage, ice bag, lifting the patient)	6.8 (78)		
No information/ missing	7.4 (85)		
Guidance only	79.2% (915)		
Total	100 (1154)		
Main given guidance documented in EMS chart	% (n)		
Contact ED/112 again if needed	13.4 (155)	19	32
Contact municipal healthcare centre if needed	5.1 (59)	4	6
No need for ED care	24.9 (287)	23	40
Further investigation later	12.6 (145)	13	19
Follow-up at home	22.3 (257)	26	62
Contact treatment by own transport	13.3 (153)	29	19
No information / missing	8.4 (98)		
Total	100 (1154)		

*patients' self-reported healthcare service use with same request within one week after non-transportation EMS mission.

Table 4. Patients' satisfaction of non-transportation decision and general satisfaction in non-transportation emergency medical service (EMS) missions.

Main categories of event information	Patients' satisfaction with non-transportation decision (n=301*)		Patients' general satisfaction with EMS (n=303*)		
	Yes	No or no opinion	(5, EMS helped very much; 4, EMS helped a lot; 3, EMS helped moderately; 2, EMS helped a little; 1, EMS did not help at all)		
	% (n)	% (n)	Helped a lot or very much % (n)	Helped a little or moderately % (n)	Did not help at all % (n)
Organ system	71.3 (82)	28.7 (33)	71.9 (82)	19.3 (22)	8.8 (10)
Incidents and seizures					
Trauma	87.2 (41)	12.8 (6)	91.8 (45)	4.1 (2)	4.1 (2)
Seizure or incident	96.4 (27)	3.6 (1)	89.7 (26)	6.9 (2)	3.4 (1)
Other request for help	67.4 (29)	32.6 (14)	63.6 (28)	29.5 (13)	6.8 (3)
General condition	70 (21)	30 (9)	75 (21)	21.4 (6)	3.6 (1)
Alcohol related	75 (9)	25 (3)	69.2 (9)	30.8 (4)	0 (0)
Neurological symptom	86.4 (19)	13.6 (3)	81.8 (18)	18.2 (4)	0 (0)
Psychiatric problems	75 (3)	25 (1)	75 (3)	25 (1)	0 (0)
Total	76.7 (231)	23.3 (70)	76.6 (232)	17.8 (54)	5.6 (17)

* A total of 320 questionnaires were returned, but not all questions were fully answered

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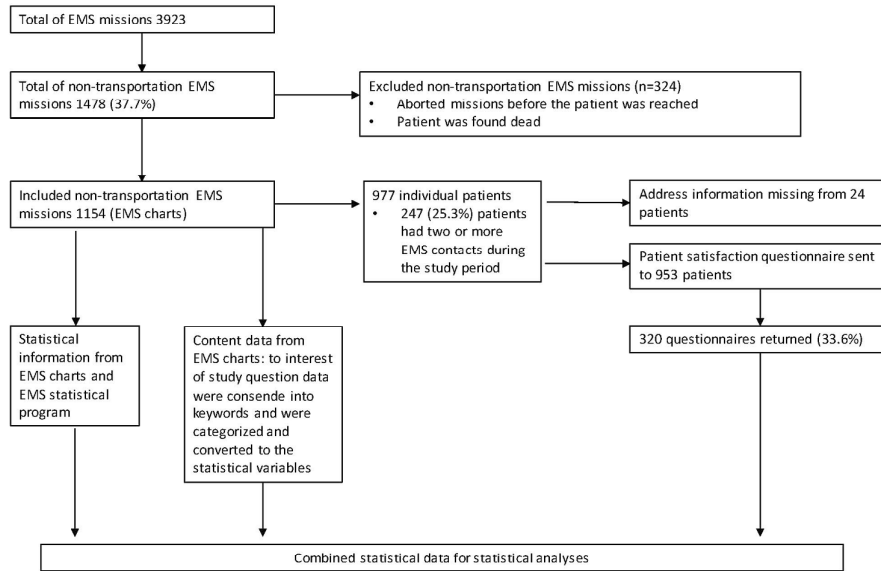


Figure 1 Study structure

Review

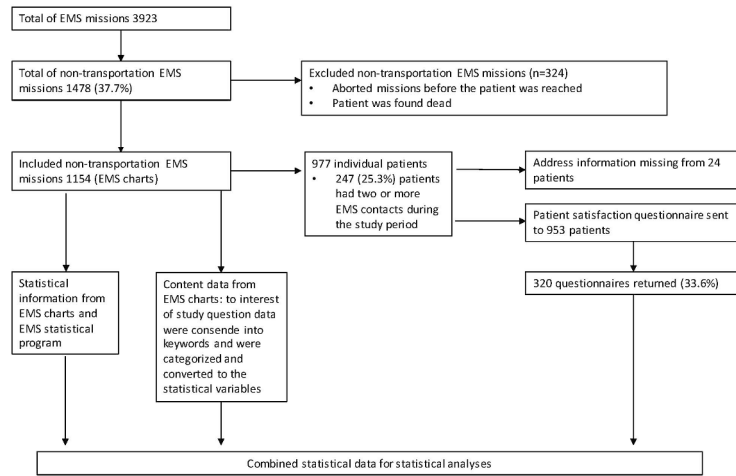


Fig. 1. Study structure

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Peer Review