



# Ambulance nurses' experiences of using prehospital guidelines for patients with acute chest pain - A qualitative study

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## ABSTRACT

**Background:** Ambulance nurses have an important role in early recognition and treatment often being the first medical contact for patients with acute chest pain. However, there is sparse knowledge on the experiences of ambulance nurses with regard to use of Prehospital Guidelines for patients with Acute Chest Pain.

**Aim:** To explore ambulance nurses' experiences of using prehospital guidelines for patients with acute coronary syndrome.

**Method:** A qualitative descriptive study design. Semi-structured interviews with 22 ambulance nurses recruited through purposive sampling strategy. The material was transcribed and analysed using content analysis.

**Results:** Two main categories emerged from the results. The first category *Sense of professional obligation* included experiences of having an important role in caring for patients with acute chest pain. Understanding this role and the collaboration in the chain of care prompted ambulance nurses to adhere to the guidelines. However, not receiving enough feedback on the provided care made them uncertain whether to use guidelines. The second category *Clinical difficulties using guidelines* consisted of experiences of being surrounded by practical challenges while using guidelines. Ambulance nurses meet these challenges by relying on their clinical experience, which sometimes led to them deviating from the guidelines.

**Conclusions:** The ambulance nurses experienced a mixture of feeling secure and insecure when using the guidelines. Foremost, when encountering patients with unspecific chest pain, they felt a lack of feedback and an insufficient collaboration within the chain of care, which made them deviate from guidelines. To increase adherence in guidelines, post-registration education to update the knowledge and skills about guidelines for acute chest pain is needed followed by formal inter-disciplinary feedback on the care provided.

## 1. Introduction

Ambulance nurses play an important role in the care of patients with acute chest pain as early recognition and treatment is the key to patient survival. Early treatment for acute chest pain of suspected cardiac origin has proven not only to prolong life and reduce suffering but also to decrease the mortality and morbidity rate of those affected [1]. To support evidence based practice, clinical guidelines are used to ensure that the best decisions are made [2]. A gap between guidelines and clinical practice often exists, which may result in patients not receiving appropriate care.

Acute chest pain is an important and frequently occurring symptom in patients with medical emergencies outside of hospitals [3]. There is a wide spectrum of possible diagnoses regarding acute chest pain, which could involve a life-threatening ongoing Acute Coronary Syndrome

(ACS) or Myocardial Infarction (MI). This can also be caused by a variety of non-heart related conditions, such as anxiety, gastritis, pulmonary or musculoskeletal disorders. In prehospital settings, a working diagnosis of acute chest pain is foremost based on a presentation of symptoms, medical history, monitoring electrocardiography (ECG) changes [1].

Despite advancements in care over the past decades, MI continues to be the leading cause of death worldwide [1]. Most deaths occur in prehospital settings just hours after the onset of symptoms [4]. Patients with MI treated early with aspirin in prehospital settings had an 8.5 % lower 1-year mortality rate compared to those who did not receive this medication [5]. Early prehospital initialization of Percutaneous Coronary Intervention (PCI) has also shown to reduce system delay and decrease mortality [6]. In Sweden, Prehospital cardiology-guidelines are used to instruct and support ambulance nurses how to medically treat, evaluate and assess patients with acute chest pain. These guidelines are

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developed by an expert group and are based on evidence and international guidelines [1].

Despite the benefits of early treatment in patients with acute chest pain, research from Sweden reports a low prehospital adherence towards cardiology-guidelines [5,7,8], which is in line with a systematic review based on studies from various countries [9]. International, general prehospital guidelines are shown to be adhered to over a wide range: between 7.8 and 95.0 %, while lowest adherence was found in relation to cardiology-guidelines, varying between 7.8 and 27.5 % [9]. In general guidelines, adherence is shown to be influenced by multiple factors, for instance, implementation strategies [10], the structural basis of guidelines [9], knowledge, attitudes and behaviour [11]. Furthermore, previous research exploring ambulance nurses' experiences of providing care for patients with chest pain shows that they were more secure if they regarded themselves as competent and experienced [12]. However, there is limited research addressing causes of low adherence to prehospital guidelines for acute chest pain. To our knowledge, there are no qualitative studies describing ambulance nurses' perspectives of using such guidelines that contribute an understanding of what influences their use of guidelines. Consequently, the aim of this study was to explore ambulance nurses' experiences of using prehospital guidelines for patients with acute chest pain.

## 2. Methods

### 2.1. Design

A qualitative descriptive design was applied as the aim was to describe ambulance nurses' experiences. The study was conducted according to Consolidated criteria for reporting qualitative research (COREQ) [13].

### 2.2. Context

The study was performed in southern Sweden, in the county of Skane, a province with 1.4 million inhabitants in an area of approximately 11000 km<sup>2</sup>. In the province, the county council is responsible for the emergency medical service (EMS), which is managed by contracted organizations within the county or by private organizations. Data were sampled between five different ambulance stations located around the region covering both rural and urban areas. In Sweden, an ambulance is staffed with at least one registered nurse, or specialist nurse, and one emergency medical technician (EMT). The education level for registered nurses in Sweden is three years of study, including a bachelor degree, at a university, with addition of one or more years, including a one or two year master respectively, for a specialist nurse. The ambulance nurse with the highest education level has the responsibility and obligation for care provided.

### 2.3. Participants

Participants were recruited at ambulance stations through a purposive sampling strategy. The inclusion criteria were that participants were registered nurses, or specialist nurses, and had experience of using guidelines for patients with acute chest pain. They received a short presentation about the study at morning and night shifts. Those interested were later contacted for further information and planning regarding location and time for the interviews based on participants' preferences. In total, 37 participants agreed to participate in study, but 15 withdrew due to lack of time. For the remaining 22 participants, presented in Table 1, interviews were held by the first author at the participants' working place at ambulance stations, or at the participants' residence, or at the University in which the research was conducted.

**Table 1**  
Background of the participants.

Participants	
Number of participants	22
<b>Age in years</b>	
Range (median)	24–54 (39,5)
<b>Gender</b>	
Men	11
Women	11
<b>Education*</b>	
Registered nurses	4
Specialist ambulance care nurses	12
Specialist anesthetic care nurses	2
Specialist intensive care nurses	1
Specialist emergency care nurses	1
Specialist ambulance- and anesthetic care nurses	1
<b>Years of working experience</b>	Range (median)
working as a registered nurse	4–35 (10,5)
working as a specialist trained nurse	0,5–23 (4,5)
working in ambulance service.	1–21 (5)
working as registered nurse in ambulance service	1–20 (5)
working as specialist trained nurse in ambulance service	0,5–20 (3,5)

\*Registered nurse with 3-years of University studies (Bachelors Programme in Nursing) followed by specialist nurses with additional 1-years of University studies.

### 2.4. Data collection tool

Data were collected through interviews following a semi-structured interview-guide, following the framework of Cabana [11]. However, the questions were modified to fit the purpose of the study. The interview-guide was pilot-tested with two ambulance nurses, not included in the study. Thereafter, one question was slightly refined. All interviews commenced with the opening question and was followed by questions related to use of the guidelines. Probing questions was used to gain a deeper understanding, presented in Table 2.

### 2.5. Data collection procedure

Data were collected by semi-structured interviews. Participants were chosen due to their experience of using guidelines for patients with acute chest pain. The interviews took place during autumn of 2019 and were audio-recorded, ranging in time between approximately 41 min to 104 min (median = 73 min) and transcribed verbatim.

**Table 2**  
Interview-guide.

<u>Opening question</u>
How do you treat patients with acute chest pain?
If I say guidelines for acute chest pain, what do you think then?
<u>Knowledge</u>
What can you tell about the cardiological guidelines for patients with acute chest pain?
<u>Use</u>
How do you use the guidelines?
Why do you use the guidelines this way?
How could you use guidelines differently?
<u>Adherence</u>
What is it that makes you adhere to the guidelines in the way you described?
<u>Probing questions:</u>
Can you tell me more about this?
Can you describe this further?
What are your thoughts about this?
Elaborate.
In what way do you mean?
<u>Concluding question:</u>
Is there anything you want to share that we have not talked about and that you think is important in this context?

2.6. Trustworthiness of qualitative data

In terms of dependability and transferability, sampling was facilitated with a clear description of the context through different locations and with a variation and rich description of the participants' characteristics. Moreover, the research process is clearly described and the results are reported with quotations [14,15]. The study was conducted with a rather large sample size and interview questions were pilot-tested ensuring the credibility of study. With regard to confirmability, the data analysis and representation of findings was carefully examined and processed within the research group.

2.7. Ethical considerations

The study has been approved by the Swedish Ethical Review Authority (Diary number: 2019-02112). The head of the ambulance stations approved the study. All participants received both verbal and written information about the study aim and that they could withdraw at any time. Thereafter, they were given some days to consider whether they wanted to participate in study or not. Before the interview started, all participants gave an informed and written consent to participate in study. All data have been processed and kept confidential between the authors.

2.8. Data analysis

A qualitative content analysis was made according to Graneheim & Lundman [14], which is a method for analysis frequently used within qualitative research to achieve trustworthiness throughout the analysis. Initially, all transcripts were read thoroughly and examined to get familiarized with the data and a sense of the whole. Then, an identification of specific segments of texts, related to the objective of the study, were identified as meaning units. Meaning units were later condensed into smaller parts, while ensuring that the core meaning was still retained; this was done to make data a manageable representation. Meaning units were later abstracted and labelled with a code. In the final steps, various codes were interpreted and compared for differences and similarities [14]. Those codes relating to each other were charted and sorted into 43 tentative sub-categories. Through discussion and reflection, five sub-categories, and finally two categories, were created. The analysis process was made with a close approach to text, which implies manifest content [14], and with a concrete analysis level [15], presented in Table 3. Three of the authors are nurses, of whom the first author is a specialist ambulance nurse. To handle pre-understanding and to avoid misinterpretation, the coding process was made separately, and phase by phase discussed within the research-group, reaching a mutual agreement reassuring the representation of sub-categories and

**Table 3**  
Example of the qualitative analysis process.

Meaning unit	Condensed meaning unit	Code	Subcategory	Category
"Guidelines also deals with what you do in health centers and in the hospital, so all health organizations get an understanding of each other's tasks in this chain. For me, it is important that it is clear what is expected of us"	Everyone in the chain of care gets an understanding of each other and what is expected.	Consensus within the organization	Emphasizing collaboration  (Codes: Consensus within the organization, Equality framework, Collaboration with colleagues, Workplace culture)	Sense of professional obligation  (Subcategories; Emphasizing collaboration, Importance of feedback)
Participant 4 "Some colleagues are very much like this, they take the name of the patient and just drive. No nitroglycerine or aspirin and such are administered. It's just driving. Then you have read a little yourself and know what to do. I have become better at following guidelines, and I understand more and why"	The more clinical experience the more self-efficient.	clinical experience	Relying on their clinical experience  (Codes: In search of cardiac signs and symptoms, Evaluating the pain, Pharmacological reasoning, Making up one's mind)	Clinical challenges using guidelines  (Subcategories: Relying on their clinical experience, Unclear guidelines, Practical obstacles)
Participant 8				

categories.

3. Results

The results are presented in two categories and five subcategories, respectively, illustrated in Fig. 1. In total twenty-two, ambulance nurses participated in the study, 11 were men and 11 women, demographics are presented in Table 1.

3.1. Sense of professional obligation

Sense of professional obligation included participants' reflections on the use of guidelines to carry out their professional duties. Participants recognized that guidelines helped them to grasp not only what was expected of them but also to understand their role and that of other health personnel in the chain of care. They anticipated their role as one cogwheel in the healthcare organization, meeting patients under short timelines.

Functioning collaboration was seen as an important part in sense of professional obligation as this would contribute to effective work and facilitated their use of guidelines. Their experiences also included reflections on the unique role they had in terms of close clinical observation of the patient, which could later be useful for the continued care:

Above all, patients should receive the same treatment, regardless of which ambulance arrives, from which station, and which work teams and variants you may have. So, I think it's important we do the same. (P4)

However, participant felt a lack of feedback on the work they had done from other health personnel within the chain of care. Not knowing the outcome of patients caused insecurity which affected their adherence to guidelines and sense of professional obligation.

3.1.1. Emphasizing collaboration

The participants emphasized the importance of a functional collaboration not only within the chain of care but also among the ambulance crew. According to the participants, this was reached through effective collaboration within the ambulance team and with other actors in the chain of care, i.e. emergency department and cardiac unit. Participants perceived the guidelines and the collaboration in chain of care as working most efficiently when monitoring ECG-changes of ST-elevation:

With a suspected STEMI, we have clear guidelines for how we should act. It should be as fast and as good as possible for the patient...  
... The whole chain of care works very well when you get it confirmed on the ECG that it is a STEMI; then you lose no time either. (P7)

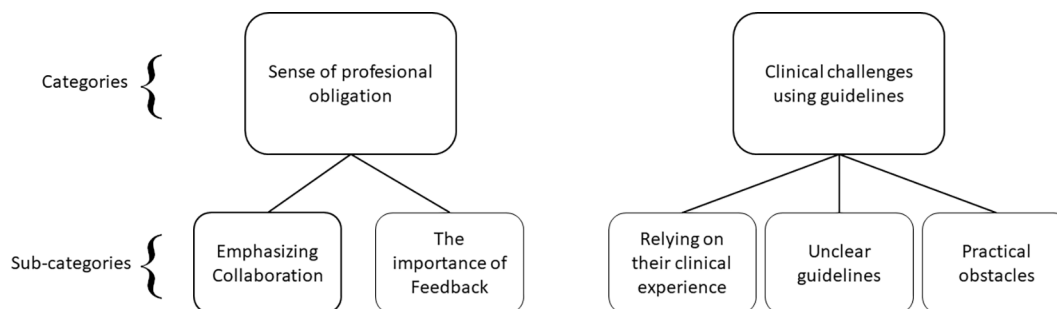


Fig. 1. Figure illustrating ambulance nurses' experiences of using prehospital guidelines for patients with acute chest pain presented in sub-categories and categories.

They reasoned that the collaboration was crucial when using guidelines. Being in full agreement with each other, working efficiently and synchronously, and supporting each other were highlighted as being essential. When the collaboration broke down, feelings of frustration and insecurity arose.

### 3.1.2. The importance of feedback

Participants articulated that more feedback was needed to ascertain their use of the guidelines and on the care they had provided. Not being able to follow-up on the patients' outcome, neither from patient documentation nor through other healthcare personnel within the chain of care, was experienced as a missing element in their practice. The participants asked for feedback from other healthcare professionals in the care chain, for instance from the emergency department and cardiac unit. They argued that they through such feedback could learn to become even better at providing care and thereby influence the patients' outcome. Not knowing the outcome of patients caused insecurity as to whether guidelines were used correctly, that triage was a priority and that treatment was administered or not. In contrast, receiving feedback facilitated the use of guidelines:

In part, I think it's because when you work prehospital you get very little feedback. (P18)

In instances of no or insufficient feedback on care, participants indicated a desire to share experiences with ambulance colleagues and other healthcare personnel. A forum for discussion was suggested not only to share experiences but also to learn about and understand the role of other actors in the chain of care. Receiving more feedback in the form of data from the use of guidelines and associated treatment was described as a motivating factor:

I have no reference to how others perform their duties, but I think it is important to have a discussion forum, and preferably with pertinent actors such as the cardiologist, and the emergency staff, the emergency physicians. (P13)

## 3.2. Clinical challenges using guidelines

Participants found it challenging to ascertain if pain was of cardiac origin, particularly in absence of ECG verified MI, i.e. anticipated coronary syndrome or ischemia. Moreover, the guidelines were perceived as being restrictive. As a result, they deviated from the guidelines and used their clinical experience to find solutions. Guidelines were also experienced as ambiguous and open to individual interpretation. Uncertainty about the origin of the patient's pain led to fears of aggravating the situation through treatment. In contrast, seeing a pharmacological effect when administering medication made the participants feel more confident in using guidelines.

### 3.2.1. Relying on their clinical experience

Participants' extensive clinical experience of prehospital care for patients with acute chest pain facilitated their use of the guidelines. For

instance, having used the guidelines a lot was, metaphorical speaking, akin to driving a car with an automatic transmission gearbox; knowing all the steps involved would give more space for other important work. Some regarded the guidelines as restrictive, thus requiring them to divergent thinking, to deviate from guidelines and to rely on their clinical experience to find solutions:

We have different directive guidelines on what we should do, when we should do it and how we should do it. You try to follow them as much as possible, and for the most part it works. But as I said, not everything is certain in our world; it is not a checklist that we can tick off. Sometimes you have to think a little outside the box and try to find solutions. (P17)

Some ambulance nurses highlighted difficulties in evaluating patient's symptoms. Clinical examination was seen as conducting detective work to find cardiac signs and symptoms. Having encountered many patients with MI facilitated their work in evaluating patient symptoms. Using clinical assessments, signs and symptoms, medical history, patient age and risk factors as a means to forming their diagnosis towards an overall evaluation would lead to the use of guidelines. Making a preliminary diagnosis to work with was often experienced as difficult as patients could not always explain their symptoms and some had atypical symptoms:

Women usually experience a sense of fullness and maybe discomfort in the back. They may think it is a case of overstretching... but it can still be the heart. Middle-age and older men usually have the classic signs like discomfort in the upper body, such as in the arms and the neck; all the others are vaguer, experiencing breaking out in a cold sweat, and so on. That's what's fun, it's a detective job. (P15)

ECG was one examination that facilitated the detective work of trying to identify whether the patient had a MI. When confirmed, the decision to use the guidelines was evident:

The simplest patients are the ones who show a myocardial infarction on an ECG; then we do not need to go any further and think. But it is all those who have a normal ECG who are a little tricky. (P5)

In contrast, patients with nonspecific chest pain were perceived as challenging to interpret and assess, thus causing the participants uncertainty about whether to use guidelines and the need for clarification on how to handle these patients. In these cases, ambulance nurses rather relied on their clinical experience. Chest pain was expressed as multifaceted, being so much more than just a STEMI, not knowing if the pain was of cardiac origin or something else:

People express chest pain in different ways. Some think it hurts in the middle of the chest, some think it hurts in the shoulder, others think it hurts in the back. I find that bit difficult when interpreting a patient's symptoms, because in such instances I do not think I have enough support from the guidelines to interpret the patient's symptoms. (P1)

Another diagnostic tool used by some of the participants trying to

determine whether the patient had an MI was the use of the pharmacological effect, i.e. using nitroglycerine as a diagnostic tool. Seeing a pharmacological effect increased their suspicion of cardiac origin, which made participants feel more secure in adhering to the guidelines. In contrast, not being able to see or follow-up the effects of treatment caused uncertainty and resulted in a preference for treatment that give an immediate effect:

If there is an effect, then it is easier to choose drugs that have a timely effect and allow me to follow up that effect. I can never follow up on aspirin. I can never follow up on that drug. I will never know if it had an effect, or what effect it had. But I can follow up both nitroglycerine and oxygen. (P3)

### 3.2.2. Unclear guidelines

Guidelines was experienced to be ambiguous, open to interpretation and used in a wide-spread variation. Some participants disclosed that patients did not receive treatment if the ECG-monitor did not show signs of ST-elevations. Others desired clarification of the guidelines, when to use medications and when not to. They added that the ECG-monitor itself cannot exclude an ongoing MI. Participants also found it challenging to decide whether patients were suffering from ACS, thereby making them uncertain to adhere to guidelines:

Our guideline is vague because it says that you should give ACS: I think it only says ACS symptoms such as unstable angina and ST elevation...

... The symptoms, on the other hand, can be anything, because there is chest pain, worry, anxiety, nausea, which I think is.... (P22)

Other participants found keeping up with guidelines-updates demanding. New updates and their implications were difficult to monitor and easily led to gossip between colleagues. Additionally, some participants argued that they were not always informed why changes were made, thus leaving them with unanswered questions. Others explained that it helped when the workstations during a weekly directive went through one guideline-topic, making it easier keeping up with updates:

In all honesty, I feel that I actually have no real idea when guideline was last updated. (P18)

### 3.2.3. Practical obstacles

Participants encountered challenging practicalities that interfered with their adherence to the guidelines. Some revealed difficulties administering medication when patients were feeling dizzy, nauseous, or when vomiting. An example was aspirin, which was found to be arduous to administer as the tablets were large, dry and difficult to chew or swallow. Others faced difficulties medicating after applying oxygen-mask to patients with dyspnoea:

Aspirin is quite large, and old people who have bad teeth or have difficulty swallowing can find it a bit troublesome; and they can be in a reclining position as well. (P7)

Other impediments to following the guidelines were language barriers or patients with an impaired cognitive status such as dementia. Additionally, some participants encountered problems with wandering baselines in ECG, while others faced logistical challenges when moving patients from small elevators, narrow staircases or practical hinders inside the ambulance:

... i'm belted and the medicine bag is too far away. I can not reach the medicine bag, and I have felt that we are soon inside the hospital. (P3)

Stressful situations such as shorter driving distances to the hospital with less time to prepare and treat the patients, rapid decisions without time to reflect, or stressed patients, relatives and colleagues affected the

participants' use of guidelines negatively:

Well, there is a risk that you get stressed. And when stressed, you might not think as fast and clear; then there is an increased risk that you miss something. (P19)

## 4. Discussion

Amongst the findings, one of the most prominent was a sense of professional obligation to carry out their professional duties. Guidelines helped them to grasp what was expected of them and to understand ones' obligation, which in turn would lead to improved adherence to guidelines. Furthermore, to carry out ones' duties, a functional collaboration within the chain of care was crucial, without delays in decision or treatment. Previous research shows the importance of early treatment [5], as most death occurs two hours after the onset of symptoms [16]. A functional chain of care aims to provide efficient and timely care for patients [17]. In this respect, guidelines serve as an important tool because they facilitate decision-making by instructing the ambulance nurse how to provide evidence-based care [18]. Furthermore, our results also imply that receiving feedback on care provided and their use of guidelines affected their professional obligation to adhere to guidelines: a finding shared by other studies [19–21]. A place for discussion between health personnel within the chain of care was sought as a means for mutual learning and an understanding of each other's work. However, informal feedback itself seems not to be the sole solution. Rather, formal feedback is required at a regular basis using inter-disciplinary communication. Inter-disciplinary feedback has been used to increase the understanding of organizational processes, which further improved paramedics diagnostic and decision-making skills [21]. For instance, implementing feedback in prehospital settings has shown not only to improve medication administration and reduce system delays [22,23] but also to strengthen the paramedics' professional role [21]. Strikingly, adherence to guideline for acute chest pain is low [9], which may jeopardize health outcome for patients with acute chest pain. Therefore, enhancing ambulance nurses' adherence is urgently needed. Initiating treatment according to guidelines is encouraged by the current findings. Thus, post-registration education to update knowledge and skills about guidelines for acute chest pain is needed. Another suggestion based on the current results is that routines for feedback to ambulance nurses on provided care are implemented.

Our results show that using guidelines was linked to clinical difficulties that made the participants insecure. Handling nonspecific chest pain was one encountered difficulty, as the participants did not find sufficient support in the guidelines to treat these patients. To ascertain whether pain was of cardiac origin, some participants used the pharmacological effects of nitroglycerine. However, this is not recommended due to low diagnostic accuracy [24]. Others felt the guidelines were used in a widespread variation among colleagues: some only treating patients when monitoring changes of ST-elevation, with others wanting clarification in the guidelines that the ECG itself is not sufficient to exclude MI, despite research showing that the majority of patients with MI do not demonstrate typical signs [25] or symptoms [1] at early phases. Some also felt uncertain when administering medication: fear of exacerbating the condition of the patient through causing allergies, low blood pressure, or aggravating stomach ulcers – a finding similar to another study [26]. However, the results also indicate that some ambulance nurses relied on their clinical experience when feeling insecure about the use of guidelines, a finding which is in line with other studies [12,27]. These findings suggest uncertainty in assessing patients with acute chest pain, knowledge needs about drug effects and guidelines. This may explain previously reported low adherence to guidelines regarding the use of aspirin [9], despite its beneficial effects [5] and seldom causing adverse effects in patients with MI [28]. Thus, educational intervention and post-registration update focusing on assessments of patients with acute chest pain, medication effects and use of guidelines is warranted.



## 5. Methodological strengths and limitations

A strength is that there was a variation in the background characteristics of the participants and that they were recruited from different ambulance stations covering both urban and rural areas. On one hand, a limitation that may have implication for transferability of the results may be that the participants were recruited from one geographical area. On the other hand, this area is one of the most densely populated counties implying that ambulance calls for residents suffering from acute chest pain are common work tasks for ambulance nurses, which is to be considered as a strength. Another strength of relevance for the transferability is that the data were collected from several different ambulance stations. In addition, there is a clear description of the study's context, data collection, data analysis, processed through dialogue within the research-group, which ensures the overall trustworthiness of the study [14,15]. The sample size was guided by information power as described by Malterud [29], meaning that the more relevant information the participants have in relation to the aim and the broadness of the aim guided the number of participants. Because the aim was rather broad, the current sample size was deemed as the least number sufficient to answer the aim. A potential limitation may be that the participants were asked to recall information on their experiences of using guidelines, e.g. recall bias. However, the use of guidelines for patients with acute chest pain is one of the most common prehospital emergencies, which ambulance nurses encounter on a daily basis. The participants did not express any difficulties in remembering during the interviews, which indicates that there was a low risk for recall bias.

## 6. Conclusion

The ambulance nurses' experiences of using guidelines for patients with acute chest pain can be described as a mixture of both being confident and uncertain. Having an efficient working collaboration within the chain of care facilitated the use of guidelines and was best perceived when encountering patients with typical signs and symptoms of MI. However, having insufficient support from the guidelines and lack of feedback on provided care given to patients with nonspecific chest pain made ambulance nurses feel uncertain. Educational interventions and post-registration updating of knowledge and skills are thereby prompted regarding the important role ambulance nurses possess in the chain of care with early treatment. This also impacts meeting patients with nonspecific chest pain, and it contributes to familiarity with guidelines. This study enhances valuable insight that can be important components in efforts to support use of and improve adherence to guidelines. One recommendation for practice is that ambulance nurses experienced a professional obligation to provide evidence-based care for patients with acute chest pain, which is made possible through the guidelines. Because adherence to guidelines sometimes is compromised, another recommendation is that unclarity and practical obstacles are prevented. Further, providing formal inter-disciplinary feedback on care provided could also improve their awareness and professional obligation towards guidelines and prevent future uncertainties.

### Credit Author Statement

All four authors contributed equally to the study design. The first author, MUH, performed all interviews and data transcriptions. MUH, VV, SZ, MA, contributed equally to interpretation of the data analysis. MUH drafted the manuscript and VV, SZ and MA revised the manuscript for important intellectual content and supervision. All authors read and approved the final manuscript.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

the work reported in this paper.

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