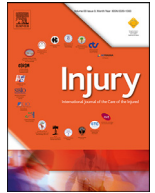




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## Decision making in prehospital traumatic cardiac arrest; A qualitative study

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### ABSTRACT

**Background:** Despite improving survival of patients in prehospital traumatic cardiac arrest (TCA), initiation and/or discontinuation of resuscitation of TCA patients remains a subject of debate among pre-hospital emergency medical service providers. The aim of this study was to identify factors that influence decision making by prehospital emergency medical service providers during resuscitation of patients with TCA.

**Methods:** Twenty-five semi-structured interviews were conducted with experienced ambulance nurses, HEMS nurses and HEMS physicians individually, followed by a focus group discussion. Participants had to be currently active in prehospital medicine in the Netherlands. Interviews were encoded for analysis using ATLAS.ti. Using qualitative analysis, different themes around decision making in TCA were identified.

**Results:** Eight themes were identified as being important factors for decision making during prehospital TCA. These themes were: (1) factual information (e.g., electrocardiography rhythm or trauma mechanism); (2) fear of providing futile care or major impairment if return of spontaneous circulation was obtained; (3) potential organ donation; (4) patient age; (5) suspicion of attempted suicide; (6) presence of bystanders or family; (7) opinions of other team members; and (8) training and education. Several ambulance nurses reported they do not feel adequately supported by the current official national ambulance guidelines on TCA, nor did they feel sufficiently trained to perform pre-hospital interventions such as endotracheal intubation or needle thoracocentesis on these patients.

**Conclusion:** Eight themes were identified as being important for decision making during prehospital TCA. While guidelines based on prognostic factors are important, it should be recognized that decision making in TCA is impacted by more than factual information alone. This should be reflected in educational programs and future guidelines.

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### Introduction

Prehospital resuscitation of adult patients in traumatic cardiac arrest after blunt or penetrating trauma has long been associated with poor survival rates, even as low as 0% in some reports [1]. Several more recent cohort studies and registry studies have reported better outcomes. A registry study from 2016 including 2300 patients with prehospital TCA resulting from blunt or penetrating injury reported a 6.3% survival to hospital discharge [2]. A 2017 study from England and Wales including 705 patients reported a 7.5% survival rate [3].

These improving outcomes are most likely the result of an increased awareness for the identification and treatment of specific reversible causes resulting in cardiac arrest in trauma patients such as hypoxia, tension pneumothorax, exsanguination, and cardiac tamponade, as reflected by the most recent guidelines of the European Resuscitation Counsel (ERC) [4]. The implementation of physician staffed prehospital medical teams equipped to address these reversible causes by advanced airway management, finger thoracostomy, prehospital blood transfusion, or even on-scene thoracotomy has made it possible to implement these potentially life-saving procedures into prehospital trauma care [5–7].

While Dutch ambulance nurses have to adhere to strict guidelines with regard to initiating or withholding resuscitation in patients in TCA (the National Ambulance Protocol, LPA 8,

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Appendix 2), these guidelines are not always followed or are subject to individual interpretation. This creates a risk of inadequate decision making with regard to whether or not resuscitation should be initiated and which procedures should or should not be performed.

In addition, we hypothesize that factors such as limited previous exposure to patients in TCA, lack of proper education and training and therefore poor knowledge of actual outcomes as well as human factors such as emotions resulting from previous experiences, hierarchic issues or skeptic remarks from non-medical bystanders may further compromise adequate decision making.

In order to further improve prehospital care for patients in TCA, it is important to understand what drives prehospital personnel to make certain decisions. This knowledge may then be used to specifically guide educational programs and formulate new national prehospital guidelines and ultimately, to increase the likelihood of survival.

Thus, the aim of this study was to identify factors that influence decision making by prehospital emergency medical service providers during resuscitation of patients with TCA.

## Methods

This was a qualitative study involving semi-structured interviews with providers of prehospital trauma care and a focus group with three of the healthcare providers who participated in the interviews. A total of 19 ambulance nurses were randomly picked from around 250 ambulance nurses belonging to two Dutch ambulance districts and were approached to participate in the study. Randomization occurred based on the monthly work schedule (all nurses were first asked on working on Monday, then all nurses working on Tuesday, etc.). In addition, five HEMS physicians and five HEMS nurses were picked in a similar way from the Rotterdam area HEMS. In order to be eligible for participation, the participant had to be currently employed in prehospital medicine with at least two years of experience and/or at least five dispatches for patients in TCA. After completion of the interviews a focus group discussion including three study participants (one HEMS nurse and two ambulance nurses, non-probability sample from previous study group) was held to further discuss factors that contributed to prehospital decision making in TCA scenarios. It was estimated that 25 interviews would lead to sufficient data saturation based on previous qualitative studies on out of hospital cardiac arrest [8]. The study was exempted by the local Medical Research Ethics Committee.

### *The Dutch emergency medical services*

Prehospital emergency medical service in The Netherlands is primarily provided by ground ambulance crews staffed with a driver and a certified nurse. There are no ambulance paramedics in the Netherlands. All Dutch ambulance nurses are ICU, ER or anesthesiology certified nurses who have undergone an additional seven month training program at the Dutch Ambulance Academy and have successfully completed a prehospital trauma life support (PHTLS) course. In addition to ground emergency medical services (EMS), four physician-staffed HEMS operations operate across the country. A HEMS team consists of a helicopter pilot, a board-certified physician (either trauma-surgeon or anesthesiologist), and a specialized ambulance or ER nurse. In all TCA cases, a HEMS team is dispatched by helicopter or by car. While HEMS physician have the ultimate decisive authority from the moment HEMS are dispatched, many of the decisions around TCA (e.g., initiating resuscitation or not, thoracic decompression, etc.) will have to be made by ground EMS in the absence of a HEMS team.

### *Data collection*

An interview guide with 12 questions was developed (Appendix 1). Interviews were taken face-to-face or through videoconference and every interview was conducted by two researchers (MGVV and MB). Characteristics of providers such as age, years of experience, current profession, and number of patients with TCA involved in their career were collected. TCA was defined as the absence of cardiac mechanical activity as confirmed by the absence of signs of circulation following any trauma. Familiarity with guidelines and their interpretation of these guidelines was elaborated on. Next, the participant's past experiences with resuscitation of patients in TCA were discussed, where special attention was paid to factors that had influenced their treatment decisions in specific cases. Finally, respondents were asked for their opinion on other healthcare worker's points of view. Respondents were stimulated to support their answers with illustrative examples of their experience with TCA decision making.

All interviews were digitally recorded and transcribed by one researcher (MB). For quality control, for a random subset of interviews, the transcript was compared with the audio file by a second researcher (MGVV). After a first read of all interviews by two investigators (MGVV and MB) to get a general sense of their content, phrases and words related to decision making were encoded by assigning specific codes to words or phrases in the interview texts using ATLAS.ti v8 (Scientific Software Development GmbH, Berlin, Germany). By grouping the encoded words and phrases, different themes around decision making in TCA patients were identified. These specific themes were discussed with other study group members in order to assess their validity and to meet consensus.

Demographic data of the study participants were analyzed descriptively using IBM SPSS Statistics for Macintosh, Version 24.0. Continuous data, which were all non-parametric according to the Shapiro-Wilk test, are shown as median and quartiles. Categorical data are shown as number and percentage.

## Results

### *Study participants*

Between October 11, 2018 and January 21, 2019, a total of 25 prehospital caregivers agreed to participate in the study: 15 ambulance nurses, five HEMS physicians, and five HEMS nurses. Four nurses declined because of scheduling matters. Characteristics of the participants are listed in Table 1. Their median age was 43 years ( $P_{25}$ - $P_{75}$  39–48). Eighteen (72%) participants were male. Ten (73%) ambulance nurses and three (60%) HEMS nurses had a background in the ICU. Other professional backgrounds of these participants were the Cardiac Care Unit or Emergency Department. Three HEMS nurses had previous experience as ambulance nurse. One HEMS physician had a background in trauma surgery and four in anesthesiology. The median years of experience in pre-hospital emergency medical service was 12 ( $P_{25}$ - $P_{75}$  9–20) years. Nine out of 10 HEMS caregivers had been involved in over 50 patients with TCA, of which seven were involved in more than 100 patients in TCA. Ten (68%) ambulance nurses were only involved in 10 or less TCA cases. In general, participants estimated the average survival rate of patients to be  $\leq 5\%$ . Only few participants said to have encountered a case with a positive outcome.

After categorizing and discussing the content of the interviews, eight themes were identified to be of importance prior to and during resuscitation of patients in TCA. These themes are listed in Table 2.

**Table 1**

Characteristics and demographics of study participants.

	Total	Ambulance nurses	HEMS <sup>1</sup> physicians	HEMS <sup>1</sup> nurses
Number	25 (100%)	15 (60%)	5 (20%)	5 (20%)
Age (years)	43 (39–48)	40 (37–48)	44 (40–50)	44 (41–51)
Male gender	18 (72%)	11 (73%)	5 (100%)	2 (40%)
Experience in prehospital care giving (years)	12 (9–20)	11 (6–18)	15 (8–28)	20 (10–25)
Professional training <sup>#</sup>				
Anesthesiologist	4 (16%)	0 (0%)	4 (80%)	0 (0%)
Trauma surgeon	1 (4%)	0 (0%)	1 (20%)	0 (0%)
ICU <sup>2</sup> nurse	14 (64%)	11 (73%)	0 (0%)	3 (60%)
CCU <sup>3</sup> nurse	6 (24%)	5 (33%)	0 (0%)	1 (20%)
A&E <sup>4</sup> nurse	7 (28%)	5 (33%)	0 (0%)	2 (40%)
Marine	1 (4%)	1 (7%)	0 (0%)	0 (0%)
Number of TCA cases involved in				
≤10	10 (40%)	10 (68%)	0 (0%)	0 (0%)
11–20	5 (20%)	4 (27%)	0 (0%)	1 (20%)
21–50	1 (4%)	1 (7%)	0 (0%)	0 (0%)
51–100	2 (8%)	0 (0%)	2 (40%)	0 (0%)
>100	7 (28%)	0 (0%)	3 (60%)	4 (80%)

Data are shown as N (%) or as median (P<sub>25</sub>–P<sub>75</sub>).<sup>#</sup> Proportions may exceed 100 as some participants had experience in more than one specialty.<sup>1</sup> HEMS: Helicopter Emergency Medical Services.<sup>2</sup> ICU: Intensive Care Unit.<sup>3</sup> CCU: Cardio Care Unit.<sup>4</sup> A&E: Accident and Emergency.**Table 2**

Eight themes that were identified as being important for decision making during pre-hospital traumatic cardiac arrest.

1	Factual information
2	Fear of futile care or major impairment of the patient if ROSC was obtained
3	Age of the patient
4	Potential organ donation
5	Suicide
6	Presence of bystanders or family
7	Interaction between ground EMS and HEMS
8	Experience and training

### Theme 1: Factual information

Relevant quotations from the interview are listed in Table 3. Factual information available at the start of resuscitation, such as injuries incompatible with life, delay to BLS, signs of life, trauma mechanism, and initial electrocardiogram (ECG) rhythm were frequently mentioned factors to support the decision whether or not to start resuscitation (Quote 1.1).

There was some debate about the definition of injuries incompatible with life; while it was pointed out that the only injuries incompatible with life were those where disintegration of the body was obvious. Some interviewees mentioned they would deem resuscitation futile based upon the trauma mechanism combined with characteristics such as visible blood loss or visible deformities (Quote 1.2).

Similarly, the absence of a positive reaction to treatment was the most mentioned reason to discontinue resuscitation, most often defined as persistent or developing asystole on ECG monitoring combined with absent signs of life (Quote 1.3). In addition, the discovery of non-survivable injuries or injuries with a high likelihood of major neurological impairment also influenced decision making for many of the interviewees. All HEMS personnel emphasized failure to gain return of spontaneous circulation (ROSC) after addressing all reversible causes as their most important factor to warrant discontinuation of resuscitation. Several ambulance nurses also mentioned total time of chest compressions to be an important factor.

When interpreting this factual information, HEMS personnel mentioned to be most likely to act according to the most recent ERC guidelines on TCA and felt these were sufficient to act upon in the majority of patients in TCA. The mnemonic to ad-

dress reversible causes - Hypovolemia, Hypoxia, Tension pneumothorax, cardiac Tamponade - also known as HOTT-criteria, was well known by HEMS personnel and some ambulance nurses. Ambulance nurses noted to be well aware of the existence of the current ERC-guidelines, but were more inclined to use the national ambulance protocol (in Dutch: Landelijk Protocol Ambulancezorg, LPA) when confronted with a patient in TCA. However, some participants stated that this protocol does not adequately address the differences between cardiac arrest from a medical cause and TCA and leaves too much room for discussion about the initiation of resuscitation in these patients (Quote 1.4).

Interestingly, the timing and indication for needle thoracocentesis led to some debate among ambulance nurses (Quote 1.5). Regardless, all participants felt confident that they were able to successfully perform a needle thoracostomy when indicated, despite low exposure rates.

### Theme 2: Fear of futile care or major impairment of the patient if ROSC was obtained

Several interviewed prehospital caregivers mentioned concerns with regard to futility of resuscitation and the risk of survival with major impairment for the patient if ROSC was achieved (Quote 2.1).

Almost all study participants had experienced situations where resuscitation was initiated despite their feeling of providing futile care. However, all agreed that they would start resuscitation regardless of this in almost all situations and rather collect additional information during resuscitation to support further decision making about continuation or discontinuation of resuscitative efforts (Quote 2.2).

**Table 3**

Quotes from Ambulance Nurses, HEMS Nurses, and HEMS Physicians, organized by theme.

Quote
1.1 "If someone is 80 years old and has had a high energy trauma and maybe jumped from a high building and has asystole on ECG. Yes, in those situations I do seriously question whether we should start" (Ambulance nurse)
1.2 "Recently we had a patient with 12 gun-shot wounds in his thorax. In a case like that I don't even start, I actually told the police to stop" (Ambulance nurse)
1.3 "If I really persevere, so if I judged there are no injuries incompatible with life, I have treated hypovolemia, there is no tension pneumothorax, there is no tamponade, if I have addressed all reversible causes and the patient does not respond. Than that's the moment to stop." (HEMS nurse)
"If someone does not respond to the therapy you are giving, well, I do try to continue for at least 20 min, like in a normal resuscitation" (Ambulance nurse).
1.4 "Interpretation (of the guideline, red) and when you start and when you don't start and when you stop, that's hard" (Ambulance nurse)
1.5 "And then those thoracic needles. Where in the (ALS) protocol are you going to insert them?" (Ambulance nurse)
2.1 "It needs to be expedient. Or at least a meaningful chance. And he should have a reasonable quality of life afterwards. But then, who decides that. One may be happy in a wheelchair, another may not. I realize that's not up to us. But in TCA cases, this can be very intense." (Ambulance nurse)
"I did not feel we were doing something meaningful. But the HEMS doctor decided "to go for it regardless and it did not work out. And then I thought; 'This is pointless'" (Ambulance nurse)
2.2 "There is only one way to tell if it (resuscitation, red.) is really futile, and that is to start. And then see where you get. I have a very low threshold for starting" (HEMS nurse)
"You can always start, but you can only stop once" (Ambulance nurse)
3.1 "In hindsight, we should not have started based on the trauma mechanism, but because it was a 12 year old child, we started regardless. For our own peace of mind, so to say" (Ambulance nurse)
"..., but if someone is a severely injured ninety year-old, and if resuscitation is started, I would sooner decide to stop than when it was a young patient" (HEMS nurse)
4.1 "And then I sometimes get the idea that the interests of HEMS are different than ours, and then we start harvesting and collecting donors. Yes, this is actually never said aloud. But I suspect this is something that adds up to the decision" (Ambulance nurse)
"This is sometimes overlooked. That someone could be a good organ donor." (Ambulance nurse)
5.1 "Who are we to decide; 'he jumped in front of a train, this is what he wanted'. That's not what we are for" (Ambulance nurse)
"Yes, in those cases you stop sooner" (Ambulance nurse)
6.1 "Sometimes the social situation is so explosive, that not starting resuscitation might put myself and the team in danger" (HEMS nurse)
6.2 "Sometimes there is a lag between the decision to stop resuscitation and actually stopping resuscitation, because I want to speak to family of the patient first, or give them a chance to be present when we stop" (HEMS nurse)
7.1 "People are sometimes afraid not to start, because they fear the reaction of the (HEMS, red) physician if they did not start" (Ambulance nurse)
7.2 "I think that's often the case with doctors. They just see a body, while I think it is about the whole picture" (Ambulance nurse)
"I think they are more inclined to do more. We are sooner tempted to think: 'this is not going to work', while HEMS may say: 'let's go for it!' in the same patient" (Ambulance nurse)
"They have more expertise and more options" (Ambulance nurse)
7.3 "There are certain ambulance nurses that think they can see whether a patient has a chance or not just by eyeballing the patient" (HEMS nurse)
7.4 "I will not stop resuscitation without consulting all colleagues on scene, including other ambulance nurses, ambulance drivers, and doctors on scene." (Ambulance nurse)
8.1 "We do fewer and fewer intubations, especially since we have with laryngeal mask airways. (...) I am glad when HEMS arrive" (Ambulance nurse)
"I am quite happy we have laryngeal mask airways at our disposal. (...) we just don't do it (intubation, red) often enough" (Ambulance nurse)

**Theme 3: Age of the patient**

While not all participants mentioned age as a factor that may have influenced decision making in cases they had been involved in, a couple of ambulance nurses declared to have been influenced by the age of the patient they had been confronted with previously (Quote 3.1).

**Theme 4: Potential organ donation**

The potential for organ donation, especially in patients with isolated traumatic brain injury, was a factor that made participants more likely to continue resuscitation. However, some ambulance nurses stated they did not always feel comfortable about this and that they felt HEMS physicians should be more clear about this (Quote 4.1).

**Theme 5: Suicide**

While most participants agreed that a suspicion of suicide resulting in TCA did complicate the emotional aspect of resuscitation, few admitted this would impact treatment related decisions (Quote 5.1).

**Theme 6: Presence of bystanders or family**

One participant stated that he had once continued resuscitating a patient because BLS was already initiated by bystanders, even though he felt the patient had zero chance of survival. However, immediate termination of resuscitative efforts would have felt inappropriate, as stated by this ambulance nurse (Quote 6.1). Moreover, resuscitation was sometimes prolonged to give family an opportunity to say goodbye to a patient (Quote 6.2).

**Theme 7: Interaction between ground EMS and HEMS**

One participant admitted to be more inclined to start resuscitation with HEMS on their way to the scene because they offer a greater variety of treatment options. Alternatively, when HEMS needed a long time to arrive, most ambulance nurses were confident enough to make the decision themselves. Although fear for negative response of HEMS crews for not starting resuscitation was also mentioned as a reason to start resuscitation, none of the ambulance nurses had experienced this themselves (Quote 7.1).

A couple of ambulance nurses stated they had continued resuscitation longer than they felt was medically expedient because a HEMS physician did not yet want to stop. Also, some ambulance nurses stated that they would not stop until a physician was present and rather make the decision to stop together.

Some ambulance nurses felt HEMS teams were sometimes much more aggressive in their approach to TCA patients than they felt was appropriate. When asked to elaborate on this discrepancy, ambulance nurses mentioned several factors. Some speculated that HEMS personnel may be more up-to-date on the guidelines and have had previous experiences with unlikely survivors as a reason for their more aggressive approach (Quote 7.2).

On the other hand, HEMS personnel was sometimes frustrated about ambulance nurses not initiating resuscitation in patients where they felt this would have been appropriate. Inadequate knowledge of available protocols and literature and limited experience were mentioned as most important factors contributing to this difference in insight (Quote 7.3).

Finally, participants declared to often prolong resuscitation when other team members or seemed not yet emotionally ready to stop (Quote 7.4).



### Theme 8: Experience and training

At last, not all ambulance nurses felt adequately trained to use pelvic binders and tourniquets for basic bleeding control or to perform needle thoracocentesis in case of suspected tension pneumothorax. In addition, some mentioned to have little experience with these interventions outside the training environment. Also, preparedness for advanced airway control by endotracheal intubation in TCA patients differed among ambulance nurses. While some felt they had adequate skill and experience to perform (non-drug assisted) endotracheal intubation in TCA patients, others felt less confident about their capabilities and mentioned they would be more inclined to temporarily secure the airway using a supraglottic device or use bag-mask ventilation and wait for HEMS to arrive for advanced airway management (Quote 8.1).

### Discussion

In summary, this study contains a qualitative analysis of 25 semi-structured interviews and a focus group discussion. The aim of this study was to identify factors that influence decision making by prehospital emergency medical service providers during resuscitation of patients with TCA. Eight themes relevant to decision making around cardiopulmonary resuscitation of trauma patients were identified

Several recent studies have reported increasing survival rates after TCA, sometimes as high as 7.5% [9]. The reason for these improving survival rates is most likely multifactorial. First, guidelines have increasingly focused on addressing reversible causes of TCA as soon as possible. This is certainly reflected by the most recent guidelines of the European Resuscitation Council [4]. Furthermore, propagation of the HOTT mnemonic as first proposed in 2013 has further aided the dissemination of this paradigm among those who work in emergency medicine [4,10]. In fact, some have even advocated the omission of chest compressions at all in these patients to facilitate early treatment of potentially reversible causes of TCA [11]. A second factor that may have contributed to the increase in survival after TCA is the improvement in prehospital emergency medical care that has taken place in many European countries over the last decade. The introduction of physician staffed HEMS services has led to the availability of specialized medical treatment on-scene, such that the previously mentioned reversible causes can be addressed often within minutes after cardiac arrest.

Especially in a high urgency situation like TCA, split-second decisions have to be made continuously by all rescue-workers involved. Proper education and training of all actors involved together with the availability clear-cut protocols are paramount to making the right choices at the right moment.

The fact that several ambulance nurses mentioned their concerns with regard to their current level of education on the subject and criticized the currently available ambulance guidelines on TCA should be taken very seriously. Clear guidelines and repeated proper training can significantly contribute to cognitive offloading during resuscitation, thus eventually resulting in better patient care [12].

The current study shows that besides factual information, multiple other factors contribute to the decision making process. While this study was the first to investigate these themes around the resuscitation of pulseless trauma patients, several studies have reported similar results for patients with non-traumatic out of hospital cardiac arrest [13–16]. In another qualitative study among 16 UK EMS providers, cultural, interpersonal, and personal factors were found to impact on decision making in out of hospital cardiac arrest as much as factual information about the current and underlying condition of patient [15]. A review on this subject, which included 14 both qualitative as well as quantitative studies on decision making in patients with out of hospital cardiac arrest con-

cluded that “while guidelines based on prognostic factors are important, it should be recognized that decision making in out of hospital cardiac arrest is dynamic and idiosyncratic and significantly influenced by the weight an individual provider gives to the different (non-factual) factors he or she is confronted with” [13].

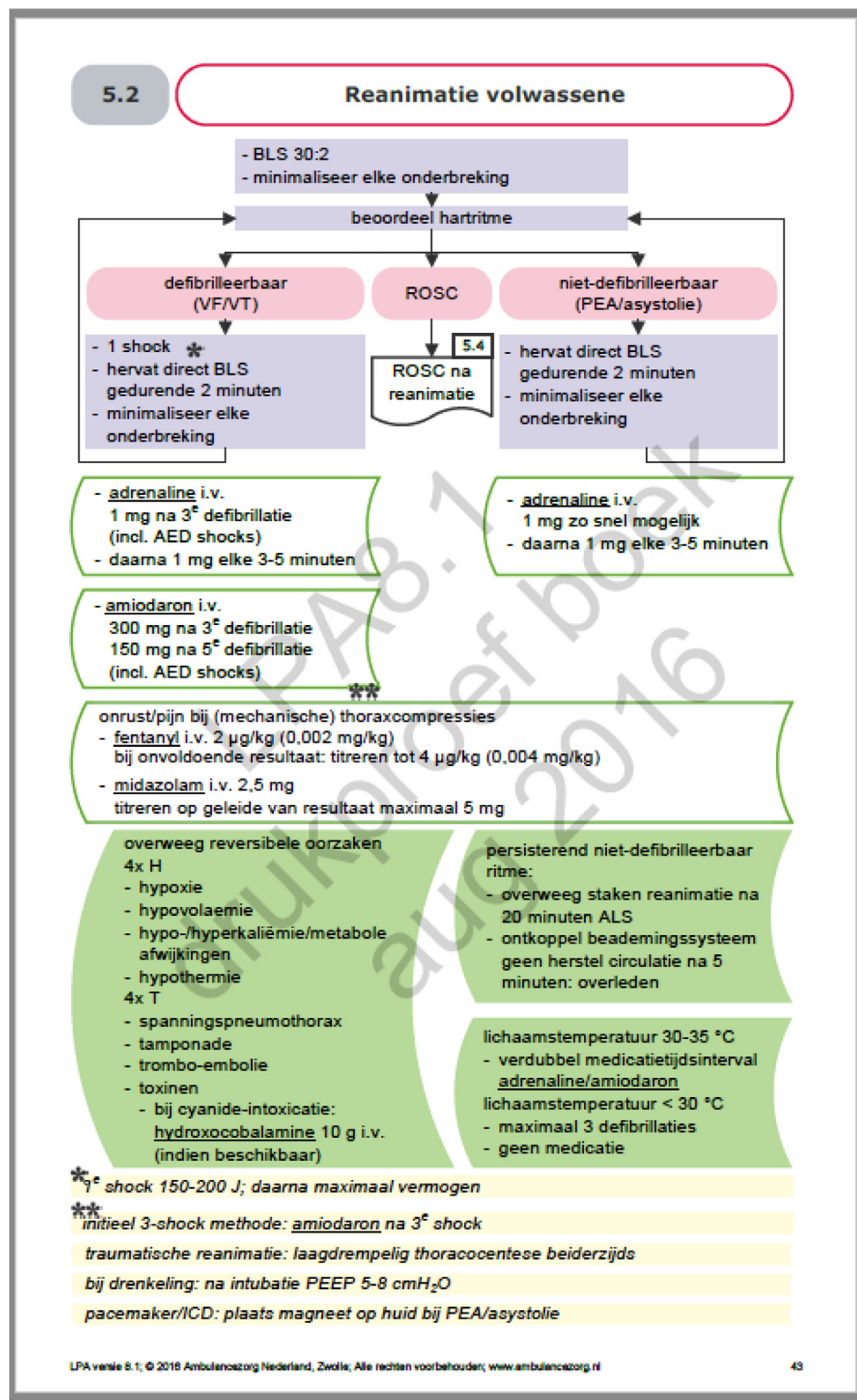
The current study has some limitations that may restrict the extrapolation of these results outside of the study population. First, the qualitative design of this study creates a certain degree of subjectivity. In addition, selection bias may have been introduced as highly motivated personnel may have been more inclined to participate in this study. While a quantitative study design may be more suitable to assess the exact frequency of certain opinions, we opted for a qualitative study to address the full spectrum opinions and themes regarding decision making in TCA. Furthermore, the participants of this study comprised only a small subset of prehospital personnel from only two districts in the Netherlands, which may limit extrapolation of these results. However, as training, schooling, and guidelines for prehospital personnel are exactly the same for each region in the Netherlands, we expect variations between regions to be small. However, differences between national EMS remain an important factor to keep in mind when interpreting these results.

In conclusion, eight themes were found to impact on decision making by Dutch emergency medical service providers in patients with TCA. These results may be used for future development of guidelines and educational programs.

### Appendix 1. Interview guide

- 1 What is your age?
- 2 How many years of experience do you have with working in prehospital medical care? What is your professional background?
- 3 How many cases of TCA have you encountered (1, 2–5, 5–10, >10)?
- 4 How do you feel about the resuscitation of trauma patients?
- 5 Are you familiar with the ERC resuscitation guidelines regarding to trauma patients? What is your opinion on these guidelines? Are you familiar with the HOTT criteria?
- 6 Do you feel comfortable performing the interventions that are described in these protocols, such as a thoracotomy, a thoracostomy, thoracocentesis, intubation, or applying a pelvic binder or a tourniquet? What is your opinion on performing a prehospital thoracotomy in patients with TCA due to penetrating trauma?
- 7 Which factors influence your decision to start/withhold and continue/discontinue resuscitation in trauma patients?
- 8 Have you ever been in a situation in which you had initiated resuscitation in a TCA case while you considered this might have been futile? If yes, why did you start? Have you ever been in a situation in which you had continued resuscitation in a TCA case while you considered this might have been futile? If yes, why did you continue?
- 9 Have you ever been in a situation in which you did not start, while you might have felt hopeful? If yes, why did you not start? Have you ever been in a situation in which you did not start, while you might have felt hopeful? If yes, why did you stop?
- 10 What do you think are indications of a scoop and run considering patients with TCA?
- 11 How do you think others think about TCA cases?
  - a HEMS physicians
  - b Ambulance paramedics
  - c Physicians in the hospital
  - d Bystanders

Do you have any additional comments?



## Appendix 2. The Netherlands' national resuscitation guidelines used by ambulance paramedics (In Dutch: Landelijk Protocol Ambulancezorg 8)

Source: Landelijk Protocol Ambulancezorg versie 8.1 <https://www.ambulancezorg.nl/nederlands/pagina/12351/lpa-8.1.html>

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