

On the Implementation of Analgesia in the German Ambulance Service by Emergency Paramedics and Emergency Physicians - A Retrospective Study Based on the Protocols of Use in the German Ambulance Service

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Abstract

Background and Aim: According to §2a NotSanG, German emergency paramedics are allowed to carry out curative measures on their own responsibility until the arrival of an emergency physician or the start of further medical treatment. Analgesia, as a curative measure, is an important component in the treatment of emergency patients. The aim of this study is to investigate the frequency of analgesia performed by emergency service personnel.

Methodology: Between 01/05/2021 and 31/07/2021, 2,247 call-outs were retrospectively examined for the performance of analgesia by non-physician and physician paramedic staff in an ambulance service area. Data were analysed descriptively using IBM SPSS Statistics version 25.

Results: Of the 2,247 emergency calls, analgesia was provided by emergency paramedics staff in n = 21 (1.4%). In n = 293 (38.3%), analgesia was provided by an emergency physician.

Discussion: The study comes to the conclusion that only in a few cases, despite an existing indication, a painkiller was applied for analgesia. This is in line with the current state of research, which cites concerns about difficult diagnosis or lack of communication skills in different patient groups as reasons for this. Future studies should extend the methodological approach with regard to a nationwide survey.

Keywords: *Emergency Paramedic; Emergency Physician; Analgesia; Thuringian Procedural Instructions*

Background

The dynamic changes in the German health care system also have an impact on pre-hospital emergency care. For years, the number of emergency service calls has been increasing. Causes for this are, for example, demographic change, which is accompanied by an increase in the number of older citizens, and the increase in missions due to acute and chronic illnesses [1]. At the same time, the limited availability of emergency physicians depending on the location and the long journey times of the emergency vehicles (NEF) lead to a greater burden on the non-medical rescue service personnel.

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“At the latest with the introduction of the job description of emergency paramedic, a comprehensive professionalisation of the rescue service from a medical transport service to a comprehensive health service has begun” [2]. For this purpose, §2a of the Emergency Paramedic Act formulates the autonomous performance of curative measures by the emergency paramedic. The concrete implementation of the performance of curative medicine by non-medical staff in the emergency medical services must be regulated by the federal states themselves. In Thuringia, invasive curative measures were anchored in the Thuringian Rescue Services Act (ThürRettG) in 2018.

Severe pain continues to be one of the main reasons for alerting the emergency medical services [3]. Pain therapy, which from the patient’s point of view is one of the most essential measures after a trauma, but also pain therapy for non-traumatic pain, is thus a fundamental component of adequate and professional care [4].

Before the introduction of professional training as an emergency paramedic, the possibilities for emergency paramedic service personnel to perform pain therapy were limited. Due to the regulations in §2a NotSanG, the administration of medication in the context of pain therapy now represents a therapy option for emergency paramedics. “Nevertheless, a large proportion of patients in emergency situations receive no or at least insufficient pain therapy, despite high pain intensity” [5]. Hence, the aim of this paper is to investigate the implementation of pain therapy by medical and non-medical staff in emergency services.

Physiology of pain

“Pain is a complex sensory perception of varying quality that is usually significant as a vital symptom by disturbing well-being” [5, p. 428]. The occurrence of pain is intended to signal imminent damage to the body or to draw attention to damage that already exists. Pain is one of the most common symptoms and is defined by the International Association for the Study of Pain (IASP) as “an unpleasant sensory or emotional experience that is associated with or resembles actual or potential tissue damage” [6].

The ambulance service is not only called to acute pain in cases of life-threatening illness or serious injury; chronic pain conditions are also a reason for alert. Acute pain is characterised by a sudden onset and ends after the cause of the pain has been eliminated. In contrast, chronic pain is characterised by a long-lasting character and may recur. Chronic pain has thus lost its function as a warning signal and can be very stressful for the patient [7].

Acute and chronic pain trigger a stress situation in the body and thus lead to an increase in heart rate and blood pressure. This increases the oxygen consumption of the heart, which puts patients with coronary heart disease in particular at considerable risk. In addition to the impairment of well-being and the strain on the cardiovascular system, pain leads to the patient adopting a protective posture. In the case of trauma to the thorax, this can lead to a protective breathing posture and thus to a reduced oxygen supply to the organs [5].

Studies have shown that, from the patient’s point of view, pain relief through adequate analgesia is one of the essential measures taken by non-medical and medical emergency service personnel. Sufficient analgesia thus represents an elementary component of high-quality emergency medical care. Despite the importance of pain therapy, the proportion of patients not treated with analgesia is consistently high in studies [4].

Current state of research

The search for scientifically proven figures on how often analgesia is performed independently by emergency paramedics within the framework of curative measures is proving difficult. The reasons for this are, on the one hand, the different documentation possibilities of the emergency forces and, on the other hand, the state-specific regulations on the independent performance of curative measures by the emergency paramedic.

In a survey among all Bavarian ÄLRD, the medical district heads (ÄBRD) as well as the state commissioner (ÄLBRD), no consensus was found on the release for the administration of medicines. However, it is worth mentioning that “intravenous drug administration was narrowly missed with an approval rate of 70.3%” [9].

In order to investigate the general delegation of curative measures to emergency paramedics, a study from Berlin retrospectively evaluated 1,034 deployments. The use of esketamine in combination with midazolam was documented in 24.6% of the missions. In 12.2% of cases, butylscopolamine was administered on the basis of the SOP “Abdominal Pain”, mostly in combination with metamizole as a short infusion [8]. As a result, a comparatively high emergency physician involvement was found for pain therapy with esketamine and midazolam. In contrast, analgesia with butylscopolamine and metamizole involved an emergency physician significantly less often.

Initial experiences on the use of analgesics by emergency paramedics were exchanged in 2019 at a meeting of the ÄLRD North Rhine-Westphalia (NRW). In a total of five rescue service areas, the frequency of use of Ketanest and Midazolam by an emergency paramedic was between 0.2-1%. In another rescue service area in NRW, morphine i.v. was applied by the emergency paramedic on his own responsibility in 0.6% of the missions. Relevant complications or problems were reported in the context of analgesia performed by an emergency paramedic [10].

Scientific studies continue to show that a large proportion of patients receive no or at least inadequate pain therapy. The insufficient treatment of pain in the face of valid indications is referred to as oligoanalgesia [11]. In an article by Stork and Hofmann-Kiefer, the incidence of patients not receiving prehospital analgesia was reported to be 46 - 87% in various studies [5]. The authors cite as a reason for the prevalence of oligoanalgesia, for example, the lack of communication skills, especially in children, elderly or foreign-speaking patients. Similarly, it is still widespread for doctors to fear that analgesia per se could make diagnosis more difficult or mask symptoms. “This dogma dates back to 1921 and has been clearly refuted by recent studies” it continues [5].

Fear of possible side effects, especially when opioid analgesics are administered, can also be cited as a reason for inadequate analgesia. The most feared complication here is possible respiratory depression, which manifests itself in the form of clouding of consciousness and a drop in the respiratory rate of the emergency patient.

In a systematic literature analysis by Häske., *et al.* on analgesia in trauma patients in emergency medicine, reference is also made to various study results that show inadequate care with regard to pain therapy in patients [4].

Problem and Objective

The implementation of analgesia as an autonomous curative activity by the emergency paramedic is also provided for in the course of the pyramid process published catalogue of measures and medications. Although the right to treatment of pain is now considered a fundamental and human right, different studies still show an underuse of patients in pain therapy [12]. The prehospital treatment of pain is one of the most important measures in the context of high-quality and adequate care of emergency patients. Studies continue to show that 46 - 87% of patients do not receive adequate analgesia despite appropriate indication [5]. The aim of this study is to find out how often analgesia was administered by emergency medical personnel in the Erfurt rescue service area.

Method

A retrospective cross-sectional study was chosen as the research design. The study data were extracted from the deployment protocols of the rescue service of the German Red Cross District Association Erfurt e.V. and the Workers’ Samaritan Federation District Association Erfurt e.V.

Approval of the study

Approval to conduct the study was granted by the two chairmen of the board of directors of the German Red Cross District Association Erfurt e.V. and the Workers' Samaritan Federation District Association Erfurt e.V. as well as the head of the rescue service department in March 2021. In addition, the medical directors of the city of Erfurt were asked for their approval, which was granted in April 2021.

Description of the rescue service

The rescue service in Erfurt is provided by various aid organisations that are stationed at three different bases in Erfurt. At the time of this study, 29 employees with various qualifications were employed in the rescue service of the German Red Cross District Association Erfurt e.V. There are n = 9 (41.9%) paramedics and n = 20 (69%) emergency paramedics. At the time of the study, the rescue service of the Workers' Samaritan Federation District Association Erfurt e.V. employed 55 staff members with different qualifications. There are n = 16 (29.1%) paramedics and n = 39 (70.1%) emergency paramedics.

Conducting the study

Every emergency operation is documented by the emergency personnel in the form of an operation log. These protocols are collected and checked by the head of the rescue service department. This is followed by a further check by the ÄLRD and the deployment accounting by the city of Erfurt.

The study included all missions in which potential analgesia was administered by medical and non-medical ambulance personnel. Accordingly, all missions classified as ambulance transport were excluded. Furthermore, all missions that were performed on the order of a general practitioner were excluded.

The data collection was carried out in the period from 01 May 2021 to 31 July 2021. After submitting the mission documentation to the head of the rescue service department, the protocols could be evaluated for the study.

In order to evaluate the study descriptively, a coding table was created. A distinction was made as to whether the operation was carried out by an RTW or within the framework of the rendezvous system with an NEF. Subsequently, the first-mentioned suspected diagnosis, which according to the Thuringian procedural instructions may require analgesia, was coded on the basis of its medical specialty. In doing so, the individual suspected diagnoses were assigned to the pain conditions according to the VFA Thuringia. The suspected diagnoses acute coronary syndrome, acute abdomen, bradycardia, fracture/joint injury, polytrauma, unclear abdomen, burn and other suspected diagnoses were included in the study.

In the following, it was ascertained whether an invasive curative measure was performed. If this was the case, a differentiation was made as to which medication was used for analgesia and whether another medication was applied. Finally, any transport was documented. The collected data were recorded in a table before being entered into the statistics programme.

Evaluation

The data evaluation was carried out with the statistics programme IBM SPSS Statistics Version 25. After the complete entry of the results, 10% of the questionnaires were randomly checked. No errors occurred, so that a complete check of the data was dispensed with. The evaluation was exclusively descriptive. Statistical tests were not carried out due to the exploratory nature of the study.

Ethics

The study protocol was submitted to the Ethics Committee of the Medical Faculty of the Martin Luther University Halle/Wittenberg and positively reviewed (Edit. No. 2022-102).

Results

During the study period, N = 2,247 emergency calls were evaluated which, according to the VFA Thuringia, represented an indication for analgesia.

Of these, n = 1,481 (64.9%) missions were logged by emergency paramedics. In n = 766 (35.1%) missions, the protocol was prepared by an emergency physician (Table 1).

	Frequency	Percent	Valid Percent	Cumulated Percent
RTW	1.481	65.9	65.9	65.9
NEF	766	34.1	34.1	100.0
Total	2.247	100.0	100.0	

Table 1: Deployment figures sorted by means of rescue.

General operational data

Of N = 1,481 emergency interventions logged by an emergency paramedic and representing an indication for analgesia according to the VFA Thuringia, the suspected diagnosis of ACS was made in n = 18 (1.2%). In n = 174 (11.8%), a fracture/joint injury was diagnosed. In n = 110 (11.8%), a suspected diagnosis of unclear abdomen was made. The further distribution can be seen in table 2.

	Frequency	Percent	Valid Percent	Cumulated Percent
Other	1.124	75.9	75.9	75.9
Fracture/joint injury	174	11.8	11.8	87.7
Unclear abdomen	110	7.4	7.4	95.1
Acute abdomen	46	3.1	3.1	98.2
ACS	18	1.2	1.2	99.4
Polytrauma	5	0.3	0.3	99.7
Bradycardia	3	0.2	0.2	99.9
Burns	1	0.1	0.1	100.0
Total	1.481	100.0	100.0	

Table 2: How often were the individual suspected diagnoses, which are an indication for analgesia, logged by an emergency paramedic

Of N = 766 of the emergency interventions that were logged by an emergency physician and may require analgesia according to the VFA Thuringia, the suspected diagnosis of ACS was made in n = 159 (20.7%). A fracture/joint injury was diagnosed in n = 90 (11.7%). An unclear abdomen was diagnosed in n = 24 (3.1%). The other frequencies according to the suspected diagnoses can be seen in table 3.

Analgesia by emergency paramedics

Of the N = 1,481 calls that were logged by an emergency paramedic, analgesia was provided in n = 21 (1.4%) analgesia was administered

	Frequency	Percent	Valid Percent	Cumulated Percent
Other	413	53.9	53.9	53.9
ACS	159	20.7	20.7	74.6
Fracture/joint injury	90	11.7	11.7	86.3
Polytrauma	38	5.0	5.0	91.3
Acute abdomen	28	3.7	3.7	95.0
Unclear abdomen	24	3.1	3.1	98.1
Bradycardia	12	1.6	1.6	99.7
Burns	2	0.3	0.3	100.0
Total	766	100.0	100.0	

Table 3: How often were the individual suspected diagnoses for which analgesia was indicated recorded by an emergency physician?

	Frequency	Percent	Valid	Frequency
Yes	21	1.4	1.4	1.4
No	1.460	98.6	98.6	100.0
Total	1.481	100.0	100.0	

Table 4: How often was analgesia administered by emergency paramedics?

(Table 4).

	Frequency	Percent	Valid	Frequency
Yes	293	38.3	38.3	38.3
No	473	61.7	61.7	100.0
Total	766	100.0	100.0	

Table 5: How often was analgesia administered by emergency physicians?

Analgesia by emergency physicians

Of N = 766 calls logged by an emergency physician, analgesia was administered in n = 293 (38.3%) (Table 5).

Discussion

The deployment figures reflect a higher deployment rate of the non-medical ambulance staff. During the study period, n = 1,481 (65.9%) emergency calls were documented by the ambulances. This is almost twice the number of missions that were logged by the NEF in the same period. This development is also reflected in a study by the Federal Highway Research Institute. There, 60% of the nationwide emergency travel volume was carried out by ambulances in the study period 2016/17 [13]. An emergency physician was involved in 34.8% of emergency calls, which puts the rescue service of the German Red Cross District Association Erfurt e.V. and Workers' Samaritan Federation District Association Erfurt e.V. below the national average of approximately 48.4% [14].

In relation to the various suspected diagnoses, the participation of emergency physicians is very heterogeneous. The basis for the deployment of the emergency physician is the specifications of the emergency physician indication catalogue according to the Thuringian state rescue service plan. The emergency physician indication catalogue published by the Federal Association of Emergency Physicians (BAND e.V.) [15] also applies. This explains, among other things, the different distributions of suspected diagnoses among the emergency medical services.

For example $n = 159$ (89.8%) of the missions with the suspected diagnosis of ACS were logged by an emergency physician. This corresponds to a comparable value from the Berlin ambulance service area. There, emergency physician involvement in suspected ACS was 83% of cases. Furthermore, for patients with diseases of the abdomen, the emergency physician involvement was $n = 52$ (25.0%). In the context of traumatic injury, the involvement of an emergency physician was $n = 130$ (41.9%), and in interventions with a suspected diagnosis of bradycardia, the emergency physician was involved in care in $n = 12$ (80%) [8].

In a statement by the BAND e.V., the authors comment with regard to the emergency physician indication catalogue that both its first version from 2001 and the revised version from 2013 no longer do justice to the many changes in prehospital emergency medicine [16]. With the establishment of the occupational profile of emergency paramedic, a non-medical training occupation was defined with the aim of independently conducting invasive and non-invasive curative measures. Thus, with the increasing implementation of the emergency paramedic, a focussing of the medical intervention is to be undertaken. The medical treatment of acute pain in the ambulance service, in the context of non-vital threatening clinical pictures, should no longer be exclusively an emergency physician indication [16].

Analgesia for pain control was administered by non-medical personnel in $N = 21$ of the emergency calls. Of these $n = 12$ (57.1%), analgesia was administered with esketamine i.v. In $n = 9$ (42.9%), metamizole was administered i.v. for pain control. When analgesia with esketamine and midazolam i.v. was administered, an emergency physician was still involved in the treatment in 80%. A roughly identical result was obtained by the city of Berlin in a comparative study. There, emergency physician involvement in the context of analgesia with esketamine and midazolam i.v. was 77% of the cases [8].

Pain is one of the most common symptoms of rescue operations. Even in an international comparison, it is reported in over 20 - 54% of missions. Nevertheless, the provision of analgesia by non-medical staff is a rarity [17]. The BV ÄLRD provides a roughly identical percentage figure in a comparative study from NRW. There, the use of analgesics by emergency paramedics was 0.2 - 3% in 2018 [10]. The approval for the implementation of invasive curative measures is in the hands of the federal states and is approved by and the responsibility of the individual ÄLRDs of the rescue service areas. Furthermore, it must be ensured that the measures taken have been learned by the emergency paramedic in the course of training and that he has mastered them (NotSanG). Existing uncertainties of non-medical rescue service personnel in the use of analgesics, as well as the partly existing short transport routes due to the infrastructure of the Erfurt rescue service area, can be a reason for dispensing with pain therapy.

Limitation of the Study

One point of criticism is the scope of the work so far. The work was only conducted in one ambulance service area and a short period of three months.

Furthermore, only a limited proportion of the information recorded in the ambulance log was examined with regard to the patient and the care of the suspected diagnoses. For example, the complete anamnesis field, in which the transport driver of the ambulance or the emergency physician must write a free text on anamnesis results, previous illnesses and exact descriptions of the current complaints, was not evaluated. The evaluation of the fields could have provided information as to why analgesia was not administered within the scope of the investigated suspected diagnoses or why a pain medication was given outside the guidelines of the VFA Thuringia.

In this context, it must also be critically considered that no evaluation of the registered vital parameters and the information on the pain scale took place.

Outlook

The present study reflects for the first time the number of analgesia procedures performed by emergency paramedics and emergency physicians in the rescue service of the German Red Cross District Association Erfurt e.V. and, to a certain extent, the Arbeiter-Samariter-Bund Regionalverband-Mittelthüringen e.V. Future research should achieve greater coverage with regard to the relief organisations and rescue service areas involved.

The data show that the algorithms for analgesia released for emergency paramedics are hardly used. It can be assumed that 85.8% of patients were transported to hospital with pain and were thus underserved in terms of pain therapy. In this context, a more comprehensive evaluation of the entries on the ambulance logs should be carried out. It has been shown that the sole consideration of the suspected diagnoses leads to gaps in knowledge with regard to the results of the anamnesis, vital parameters and pain conditions. An evaluation of the pain scale should be implemented in the survey to explain apparent oligoanalgesia.

Furthermore, the implementation of non-invasive measures for pain relief should be investigated, since, for example, the repositioning and splinting of extremities in the context of a trauma has a significant influence on pain relief [4].

Conclusion for the Practice

- Establishment and adaptation of nationwide uniform recommendations for action for emergency paramedics according to the current state of science and technology
- Adaptation of nationwide uniform emergency physician indication catalogues according to current care structures
- Establishment of nationwide digital documentation of ambulance operations
- Regular review of the use of invasive curative measures by emergency paramedics in accordance with the current state of science and technology.

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