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Realistic assessment of the physician-staffed emergency services in Germany

Introduction

In Germany, the emergency medical services (EMS) are considered to be among the best in the world. An essential feature is that specially qualified EMS physicians treat patients at the scene and can also perform further emergency interventions if necessary [8]. As a consequence, formal qualifications for EMS physicians have been established. In addition to participating in theory courses, a minimum requirement has been established for previous clinical and intensive care experience and the number of supervised scene calls. When these criteria have been fulfilled and, also as of recently, after passing an oral examination conducted by the appropriate state medical board, an EMS physician is certified for both air and ground scene calls [24].

Ideally, EMS physicians should be dispatched depending on the patient's condition, the kind of emergency and according to criteria established in an indication catalogue. This enables the dispatch center to take the time element into account as well when calculating the distance between the location of the EMS unit and the emergency site for dispatching the EMS team [12]. The EMS dispatch center assumes that the quality provided by all available EMS units is identical. In addition to the theoretical qualifications, the quality of an EMS system depends in par-

ticular on clinical routine and experience of staff in managing demanding or complex emergency situations [22]. Especially because a high proportion of scene calls are not considered to be life-threatening, it seems all the more important to consider how often an EMS team encounters situations that are classified as demanding rather than the absolute numbers of scene calls [1].

Since no data for Germany are currently available to document the occurrence of very difficult scene calls, the present study was carried out to address the question how often EMS physicians encounter defined difficult situations and carry out certain emergency interventions in both ground and helicopter EMS scene calls. Particular emphasis was placed on acute coronary syndrome (ACS), stroke, multiple trauma, as well as head injury, which have been defined as tracer diagnoses in emergency situations [23].

Materials and methods

As part of the seminar "Invasive Emergency Techniques (INTECH)" that is offered annually to EMS staff by the Department of Anesthesiology and the Second Department of Anatomy of the University of Heidelberg since 2001, participants were asked to complete a questionnaire which was prospective and anonymous in design.

In addition to personal information provided by the seminar participants, we also analyzed data from the MIND ("minimaler Notarzt Datensatz") registry, which was compiled by the state medical association of Baden-Wuerttemberg, Germany, from 1st January 2002 to 30th June 2004, to determine how often certain kinds of ground EMS scene calls were carried out in the entire state [17]. Permission to include this data was granted by both the state medical association and the institute that conducted the MIND study (AQAI, Nierstein, Germany). We focused on information pertaining to the incidence of tracer diagnoses and emergencies such as ACS, stroke, head trauma, multiple trauma, pediatric emergencies and emergency procedures such as cardiopulmonary resuscitation, intubation, intubation not associated with cardiopulmonary resuscitation and inserting a chest tube.

To investigate possible differences among the various EMS systems, we also evaluated data from the "Luftrettungs-, Informations- und Kommunikationssystem" (LIKS) database of the German Automobile Association (ADAC) air rescue service for the time period 2002–2003. As of 31st December 2003, LIKS had included 25 ADAC air rescue centers and 3 units supported by the Germany Federal

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Department of the Interior. After excluding the 4 helicopter EMS centers designed as intensive care transport only, data for 47,184 primary scene calls from 24 air rescue centers could be further evaluated [23].

The definitions of scene calls or emergency procedures for the two EMS systems are outlined in **Tab. 1**. It is important to note that the severity of the illness or injury is only included in the definition of multiple trauma. We then calculated the individual frequency of encountering certain emergency situations and carrying out certain emergency procedures from the individual data as per the anonymous questionnaire given at the INTECH seminars and correlated them with the MIND data and the data from the helicopter EMS units using the following formulae:

$$\begin{aligned} & \text{no. of scene calls} \\ & \text{per month}_{(\text{emergency physician})} \\ & \times \text{frequency}_{(\text{scene call MIND/Air Rescue})} \\ & = \text{no. per month}_{(\text{scene call})} \end{aligned}$$

$$\begin{aligned} & 1/\text{no. per month}_{(\text{scene call})} \\ & = \text{Time in months} \\ & \text{to encountering}_{(\text{scene call})} \end{aligned}$$

Definitions of the variables used in these formulae are summarized in **Tab. 2**.

The absolute numbers are given either as mean ± standard deviation or frequency with respect to the total number of missions in percent. Differences between the emergency missions carried out by ground EMS systems (MIND study) and the ADAC air rescue services were computer analyzed using the χ^2 -test. A value of $p < 0.05$ was considered statistically significant. Since all other calculations were based on the frequency we did not carry out any further statistical analysis of the data.

Results

A total of 154 fully completed questionnaires from EMS physicians working in southwestern Germany (male/female: 91/63) could be evaluated. At the time of the questionnaire, the average age of the EMS physicians was 38 ± 7 years (range 27–58 years, median 36 years) and the average

Tab. 1 Definition (as indicated in the EMS physician's report) of the tracer diagnoses and procedure according to the MIND registry of the state medical association of Baden-Wuerttemberg and the LIKS database of the ADAC air rescue services

Diagnosis/procedure	Definition
Acute coronary syndrome	Angina pectoris and/or myocardial infarction
Stroke	TIA/insult/hemorrhage
Head trauma	Head and brain trauma
Multiple trauma	MIND registry: NACA V or VI and at least two of the following boxes marked: head-brain injury, spinal injury, thoracic injury, abdominal injury, pelvic injury, or injury to the extremities LIKS database: additional box multiple injury marked and NACA V or VI
Pediatric emergency	Patient age ≤ 7 years
Cardiopulmonary resuscitation	Resuscitation
Intubation	Intubation
Intubation not associated with cardiopulmonary resuscitation	Intubation but not resuscitation
Insertion of chest tube	Chest tube

ADAC "Allgemeiner Deutscher Automobil-Club", EMS emergency medical service, LIKS "Luftrettungs-, Informations- und Kommunikationssystem", MIND "minimaler Notarzt Datensatz", NACA National Advisory Committee of Aeronautics, TIA transient ischemic attack.

Tab. 2 Definitions of variables used in calculating the individual frequency of certain kinds of scene calls and emergency interventions

Variable	Definition
Number of scene calls per month _(emergency physician)	Average number of missions carried out as emergency physician
Frequency _(scene calls MIND/air rescue)	Frequency of certain kinds of scene calls and emergency interventions from the MIND registry of the state medical association of Baden-Wuerttemberg and the LIKS database of the ADAC air rescue for primary missions at 24 sites
Number per month _(scene calls)	Number of missions per month in which the EMS physician encountered defined situations and interventions
Time in months to encountering _(scene calls)	Average time (in months) between encountering defined situations while on a scene call

ADAC "Allgemeiner Deutscher Automobil-Club", LIKS Luftrettungs-, Informations- und Kommunikationssystem, MIND minimaler Notarzt Datensatz.

professional experience was 9 ± 6 years (range 1–28 years, median 6 years). Of the participants, 86 (56%) said they worked in the field of anesthesiology, 27% in internal medicine, 14% in surgery and 3% in general medicine or gynecology. The rate of board certification was 43%. At the time of the questionnaire, the participants had been working as EMS physicians on average for 6 ± 6 years (range 0.5–26 years, median 4 years). The average scene call frequency was given as 16 ± 11 per month (range 3–60, median 14; **Tab. 3**).

According to the MIND data, 82,002 scene calls were registered for the time period from 1st January 2002 to 30th Ju-

ne 30 2004 and could be evaluated. Likewise, for the time period 1st January 2002 to 31st December 2003, the LIKS database included 47,184 primary ADAC air rescue scene calls that could be studied. To calculate the incidence of scene calls, we did not just evaluate missions that involved treating patients but rather the total number of scene calls, as indicated in the questionnaire.

With respect to our definitions, the frequency of the individual scene calls in the study period and the frequency of certain emergency medical procedures for MIND vs. LIKS, respectively, are summarized in **Tab. 4**.

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Realistische Bewertung des Notarztdienstes in Deutschland

Zusammenfassung

Obwohl das bundesdeutsche Rettungssystem mit dem Einsatz von Notärzten an der Notfallstelle als eines der leistungsstärksten der Welt gilt, wird von aufnehmenden Kliniken immer wieder über Mängel in der prähospitalen Versorgung berichtet. Da neben der formalen Qualifikation die Leistungsfähigkeit eines Notarztsystems von der Routine des eingesetzten Personals im Management entsprechender Notfallsituationen abhängt, wurde unter Berücksichtigung von über 82.000 durch die Minimaler-Notarztdatensatz- (MIND-)Auswertung in Baden-Württemberg erfassten bodengebundenen und über 47.000 durch die Luftrettungs-, Informations- und Kommunikationssystem- (LIKS-)Datenbank der Allgemeiner-Deutscher-Automobil-Club- (ADAC-)Luftrettung dokumentierten luftgestützten Notarzteinsätzen untersucht, wie häufig Notärzte in Deutschland tatsächlich komplexen und anspruchs-

vollen Notfallsituationen prähospital begegnen bzw. bestimmte Maßnahmen durchführen müssen. Die in ihrer Ausprägung unerwarteten Ergebnisse zeigen eindrucksvoll, dass bundesdeutsche Notarztsysteme entsprechenden Notfallsituationen z. T. nur sehr selten begegnen: Insbesondere vitalbedrohte Patienten mit den Tracerdiagnosen akutes Koronarsyndrom, Apoplex, Schädel-Hirn-Trauma und Polytrauma werden nur alle 0,4–14,5 Monate behandelt. Eine kardiopulmonale Reanimation und eine Intubation werden alle 0,5–1,5 Monate durchgeführt; bis zur Anlage einer Thoraxdrainage vergeht ein Zeitraum von 6 Monaten bis zu über 6 Jahren. Dabei sind allerdings z. T. erhebliche Unterschiede zwischen bodengebundenen und luftgestützten Systemen evident. Gerade an Standorten mit einer geringen Einsatzfrequenz kann durch die ausschließliche Teilnahme am Notarztdienst eine entsprechende

zum Management anspruchsvoller Notfallsituationen erforderliche Routine nicht erworben bzw. aufrechterhalten werden. Unter dem allgemeinen Druck, finanzielle Mittel einsparen zu müssen und einer sich ändernden Krankenhauslandschaft wird in Deutschland längerfristig allerdings nur ein hochqualifizierter und routinierter Notarztdienst Bestand haben können. Neben einer formalen Qualifikation und begleitenden praxisrelevanten Kursen sollte zukünftig Personal für den Notarztdienst daher aus klinischen Bereichen, in denen regelhaft schwer erkrankte und schwer verletzte Patienten behandelt werden, gewonnen werden.

Schlüsselwörter

Notarztdienst · Qualifikation · Einsatzerfahrung · Tracerdiagnosen

Realistic assessment of the physician-staffed emergency services in Germany

Abstract

In Germany the emergency medical services, which include dispatching emergency physicians to the scene, are considered to be among the best in the world. However, the hospitals admitting these patients still report shortcomings in prehospital care. The quality of an emergency medical service depends on both formal qualification and experience in managing such emergencies. Therefore, we determined how frequently emergency medical service physicians in Germany actually encountered complex and demanding emergency situations outside the hospital and how often they had to carry out emergency interventions. We therefore evaluated data from more than 82,000 ground emergency medical service scene calls registered in the MIND ("minimaler Notarztdatensatz") data base of the state of Baden-Wuerttemberg, Germany and more than 47,000 helicopter emergency medical service scene calls

from the "Luftrettungs-, Informations- und Kommunikationssystem" (LIKS) data base of the German ADAC air rescue service. The results, which were unexpectedly distinct, impressively demonstrate that in part emergency medical service staff only encountered some emergencies very rarely. In particular, patients with life-threatening conditions such as acute coronary syndrome, stroke, head trauma, as well as multiple trauma were only treated once every 0.4–14.5 months and cardiopulmonary resuscitation and intubation were only carried out once every 0.5–1.5 months. Furthermore, a time period of 6 months to more than 6 years may pass before a chest tube has to be placed. There are, of course, considerable differences between ground and helicopter emergency medical services. Particularly in areas where the frequency of such emergency cases is low, the clinical experience required to competent-

ly manage a demanding emergency situation cannot be gained or maintained just by working in the emergency medical system. As a result of the general pressure to cut costs and also of changes in hospital politics, however, only highly qualified and experienced emergency medical services may survive in Germany in the long term. In addition to formal qualifications and accompanying practice-related courses, future emergency medical service personnel should be drafted from clinical department staff that are experienced in treating severely ill and severely injured patients.

Keywords

Prehospital emergency system · Emergency physician · Treatment quality · Experience · Air rescue system · Ground rescue system

Tab. 3 Characteristics of the EMS physicians participating in the Heidelberg INTECH seminars 2001–2004 according to the questionnaire (n=154)

Gender (male/female)	91/63
Age (years)	37.5±7.2 (27–58, median 36)
Years of professional experience	8.6±6.3 (1–28, median 6)
Specialty area (%)	
Anesthesiology	56
Internal medicine	27
Surgery	14
Other	3
Percentage of board certification (%)	43
Previous experience in the EMS (years)	6.3±6.2 (0.5–26, median 4)
Scene calls (per month)	16±11 (3–60, median 14)

EMS emergency medical service, INTECH invasive emergency techniques.

The diagnosis of acute coronary syndrome was made significantly more often in ground rescue than in air rescue missions (ratio 1.4, $p<0.01$). In contrast, the diagnosis or emergency treatment of apoplexy (ratio 1.3, $p<0.05$), head and brain trauma (ratio 1.5, $p<0.05$), multiple trauma (ratio 11.4, $p<0.001$), pediatric emergency (ratio 1.2, $p<0.05$), resuscitation (ratio 1.2, $p<0.05$), intubation (ratio 3.1, $p<0.01$), intubation not associated with resuscitation (ratio 5.6, $p<0.001$) and placing a chest tube (ratio 13.8, $p<0.001$) were identified significantly more frequently in air rescue missions.

According to the subjective data of the INTECH participants at 16 emergency missions per month and with respect to the data from the MIND and LIKS evaluations, formula 1 shows that on average, on ground rescue missions emergency physicians treated 2–3 patients with ACS per month (2.6) and 1 patient with apoplexy (1.2). On air rescue missions emergency physicians encountered ACS at 1.9 patients per month less often and apoplexy at 1.6 patients per month somewhat more frequently.

Emergency physicians encountered all other emergency situations less frequently. The averages per month for ground rescue and air rescue missions, respectively, were as follows: head and brain trauma 0.56 and 0.86 patients, multiple trauma

Tab. 4 Number of certain kinds of scene calls and interventions carried out and time period (in months) before encountering such an emergency again in ground and helicopter EMS scene calls with 16 scene calls per month as per INTECH (n=154), MIND (n=82,002) and ADAC (n=47,184) data

Scene call	System	Frequency (%)	Number per month (n)	Time period before encountering (months)
ACS	Ground	16.27	2.60	0.4
	Helicopter	11.63**	1.86	0.5
Stroke	Ground	7.74	1.24	0.8
	Helicopter	9.66*	1.55	0.6
Head trauma	Ground	3.51	0.56	1.8
	Helicopter	5.35*	0.86	1.2
Multiple trauma	Ground	0.43	0.07	14.5
	Helicopter	4.88***	0.78	1.3
Pediatric emergency	Ground	4.85	0.78	1.3
	Helicopter	5.94*	0.95	1.1
CPR	Ground	4.01	0.64	1.6
	Helicopter	4.72*	0.75	1.3
Intubation	Ground	4.43	0.71	1.4
	Helicopter	13.54**	2.17	0.5
Intubation without CPR	Ground	1.70	0.27	3.7
	Helicopter	9.48***	1.52	0.7
Insertion of chest tube	Ground	0.08	0.01	76.5
	Helicopter	1.10***	0.18	5.7

* $p<0.05$, ** $p<0.01$, *** $p<0.001$; see text.

ACS acute coronary syndrome, ADAC "Allgemeiner Deutscher Automobil-Club", CPR cardiopulmonary resuscitation, EMS emergency medical service, INTECH invasive emergency techniques.

0.07 and 0.78, pediatric emergency 0.78 and 0.95, emergency resuscitation 0.64 and 0.75, intubation 0.71 and 2.17 (intubation not associated with resuscitation 0.27 and 1.5 patients) and placing a chest tube 0.01 and 0.18. These findings are summarized in **Tab. 4** and **Fig. 1**.

According to formula 2, the time intervals (in months) between the same emergency situation, i.e., the time that passed until an emergency physician encountered a certain situation again as a ground rescue mission (or air rescue mission), were 0.4 (0.5) months for acute coronary syndrome, 0.8 (0.6) for apoplexy, 1.8 (1.2) for head and brain trauma, 14.5 (1.3) for multiple trauma and 1.3 (1.1) for pediatric emergencies.

Every 1.6 (1.3) months an emergency physician encountered a resuscitation situation, intubated a patient every 1.4 (0.5) months before reaching the clinic, not associated with resuscitation every 3.7 (0.7) months and placed a chest tube every 76.5 (5.7) months. A summary of these results is presented in **Fig. 2**.

Without distinguishing between the individual kinds of emergencies, the pro-

portion of the missions classified as NACA (National Advisory Committee of Aeronautics) IV (life-threatening situation cannot be excluded), V (acutely life-threatening) and VI (successful resuscitation) in the MIND registry for ground missions was 37.6% and for air rescue 35.1% (ratio ground to air 1:1, not statistically significant).

Discussion

This study shows that some EMS physicians only encountered demanding emergency situations very rarely. While both ground and helicopter EMS crews treated about two ACS or strokes every month, the likelihood of helicopter EMS staff managing head and multiple trauma, pediatric emergencies, intubating or inserting chest tubes was significantly higher than in ground EMS units. The significantly higher incidence of these emergency procedures can be explained at least in part by the fact that patients with head trauma were treated during helicopter vs. ground EMS scene calls 1.5 times more often and patients with multiple trauma 11.4 times

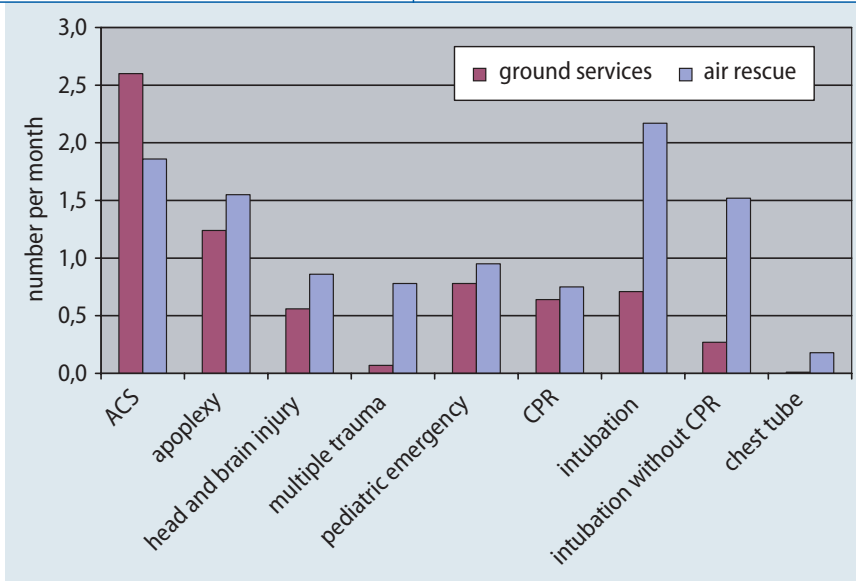


Fig. 1 ▲ Number of certain kinds of scene calls and interventions carried out in ground and helicopter EMS scene calls for 16 scene calls per month as per the INTECH (n=154), MIND (n=82.002) und ADAC data (n=47.184)

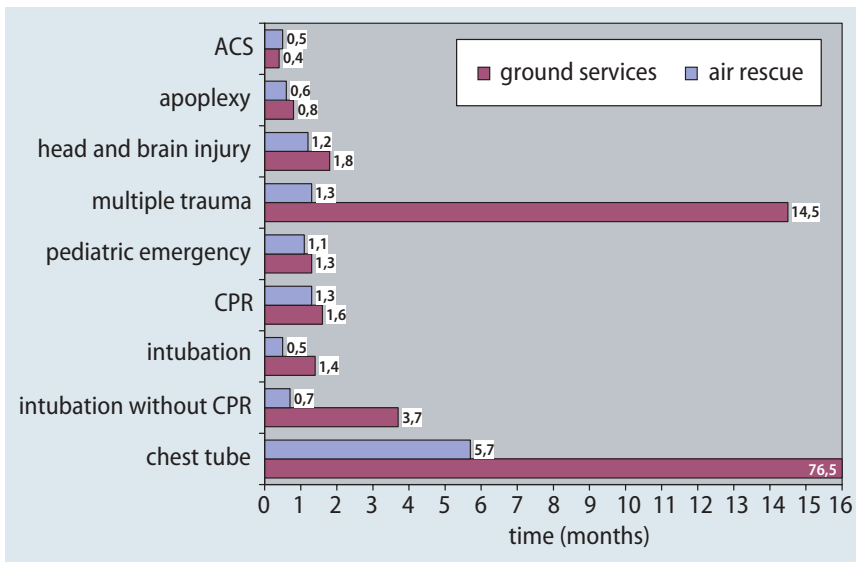


Fig. 2 ▲ Frequency (time between the same kind of scene call in months) of encountering certain scene calls in ground and helicopter EMS scene calls at 16 scene calls per month as per the INTECH (n=154), MIND (n=82.002) und ADAC data (n=47.184)

more often. When interpreting our data, the severity of the illness or injury was only taken into account for multiple trauma cases, for which the NACA score had to be either V or VI. For the other emergency situations, diagnoses and procedures, however, the level of danger to lose life or limb remained speculative. The question is whether patients encountered in ground EMS scene calls were less severely ill or injured than those encountered in helicopter EMS scene calls. Without distinguishing between the individual dia-

gnoses, however, the NACA scores IV–VI in 37.6% of ground EMS vs. 35.1% in helicopter EMS scene calls did not confirm this assumption.

A recent validation study of prehospital NACA scores to assess the severity of illness or injury showed that strong subjective influence and expectations of the EMS physicians played a role and that the score was often incorrect or too low. With respect to objective parameters, the rate of patients with a NACA IV–VI score in helicopter EMS scene calls was found to

be 70% in this study [25]. The lack of optimal coordination of scene calls by dispatch centers, which has resulted in a high percentage of aborted scene calls, is another issue and cannot be addressed in this study [1]. A limitation of our study is that further calculations in a large number of scene calls were based on the results of a questionnaire and not on directly obtained data. Although the questionnaire was anonymous, it may be prone to subjective influence.

Although workshop participants might be more motivated than average, they may also be less qualified thus representing a selective and possibly non-representative cohort. In the future, it would certainly be desirable to register the actual total and individual number of scene calls per month in a given location in a large cohort of EMS physicians. Furthermore, it would be interesting to assess to what extent EMS physicians work in more than one EMS service simultaneously.

In our opinion, self-characterization of the interviewed EMS physicians and the calculated number of an average 16 scene calls per month is realistic. Although an EMS system with ~1,500 scene calls per year may be relatively low-volume in a metropolitan area, it would be high-volume for rural locations. This would indicate that our interviewed EMS physicians worked 3 shifts monthly with 4–5 scene calls each. The difference between 2–60 scene calls per month indicates for certain individuals not only a much higher but also a considerably lower individual incidence for certain kinds of scene calls than calculated. However, the performance survey from the EMS services in Germany 2000 and 2001 reporting 110 annual scene calls per EMS physician, indicates that the subjective assessment of the monthly number of missions is too high and therefore the intervals between certain kinds of emergencies are even greater [4]. Although the seminar participants indicated that they had an average of 6 years EMS experience, the rate of board certification was only 43%, while it was 53% for MIND data and 66% for the LIKS database. While subspecialties from the INTECH participants vs. MIND data were comparable (anesthesiology 56% vs. 58%, surgery 14% vs. 13%, internal medicine 27% vs.

23% and other 3% vs. 6%), most (76.1%) of helicopter EMS physicians were anesthesiologists, with only some surgeons (14%), internists (8.4%) and others (1.2%).

Reported intervention frequencies were taken exclusively from EMS physician's reports and a blinded study design was not employed. Furthermore, whether the EMS physician's diagnosis, the NACA score and the procedures carried out were correctly documented or indicated is not known. In addition to possible subjective influences on the NACA score, prehospital diagnosis and estimation of illness or injury severity may not always correspond to hospital assessment [2, 25]. Furthermore, EMS physicians who determine that treating severely injured and pediatric emergency patients is extremely stressful, often deliberately do not carry out invasive emergency interventions, suggesting that the diagnosis, degree of trauma severity, or the degree of threat to life may not always be objectively documented [27]. Current data from hospitals admitting emergency patients showing sometimes serious clinical management deficiencies in pediatric emergency and multiple trauma patients, indicate that Germany has not yet developed the best and most qualified EMS service in the world [7]. Prehospital management fails especially for those patients who require manual technical skills, such as creating adequate intravascular access employing intraosseous access, intubation and inserting a chest tube [3, 6, 10, 14, 15, 19, 20]. Our experience is also in full agreement with this data that EMS physicians often do not carry out these interventions [27].

Only limited data is available on how many interventions need to be done over time in order to effectively perform a previously learned intervention [13]. For example, the number of required intubations before it can be performed safely, correctly and without help in 90% of patients is 57 and even after 80 intubations, 18% of study subjects would still require help from experienced colleagues [13]. Although management of complicated emergency situations is not restricted to the technical manual skill levels [22], these studies impressively demonstrate that the number of a given intervention required for board certification or additional EMS certification is not always suf-

ficient to ensure that these interventions can be confidently performed under emergency conditions and maintained for a longer period of time. In our opinion, EMS physicians should be required to work continuously in anesthesiology, emergency departments or intensive care units in order to maintain their skills. This is underlined by current simulator-supported studies showing that anesthesiology, emergency department or intensive care physicians managing emergency situations such as anaphylaxis, acute myocardial infarction, ventricular tachy-

cardia, intracranial bleeding and aspiration, do significantly better than physicians not working in these areas [18]. Seldomly required, possibly life-saving manual techniques should be learned and continuously practiced in strictly "hands-on" seminars using modern simulation techniques [9, 26, 27].

Limiting the number of EMS physicians practicing in a given location may contribute to maintaining the greatest possible individual experience. Furthermore, the present results could suggest that not only location but also the actu-

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al performance capability of an EMS system should be accounted for in dispatch strategies. Interestingly, investigations of chest trauma have shown that scene times were considerably longer for ground vs. helicopter EMS systems even though twice as many chest tubes were placed before initiation of transport [2]. Introduction of flat case rate reimbursement in Germany, closing of hospitals and the fear that smaller emergency facilities will be closed because of a lack of physicians and low number of scene calls, may indicate that certain areas will be covered by competent, but more distant EMS units; however, this does not necessarily represent a disadvantage for patients with life-threatening conditions [5, 11, 16, 21].

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References

- Ahnefeld FW, Dick W, Knuth P, Schuster HP (1998) Grundsatzpapier Rettungsdienst. Grundlagen und Grundsätze zur Weiterentwicklung der Rettungsdienste und der notfallmedizinischen Versorgung in der Bundesrepublik Deutschland. *Notfall Rettungsmed* 1: 68–74
- Aufmolk M, Ruchholtz S, Hering M et al.; AG Polytrauma der DGU (2003) The value of subjective estimation of the severity of thorax injuries by the emergency surgeon. *Unfallchirurg* 106: 746–753
- Bambrinck AM (1998) Notfälle im Kindesalter – Eine interdisziplinäre Herausforderung. *Notfall Rettungsmed* 1: 361–371
- Behrendt H, Schmiedel R (2004) Time comparison of current performance by emergency medical services in the Federal Republic of Germany (part II). *Notfall Rettungsmed* 7: 59–70
- Bernhard M, Helm M, Aul A, Gries A (2004) Preclinical management of multiple trauma. *Anaesthesist* 53: 887–904
- Biewener A, Holch M, Müller U et al. (2000) Impact of preclinical effort and logistics on lethality after severe trauma. *Unfallchirurg* 103: 137–143
- Dick WF (1996) Effectiveness of preclinical emergency management. Fiction or fact? *Anaesthesist* 45: 75–87
- Fischer M, Krep H, Wierich D et al. (2003) Comparison of the emergency medical services systems of Birmingham and Bonn: process efficacy and cost effectiveness. *Anesthesiol Intensivmed Notfallmed Schmerzther* 38: 630–642
- Gaba DM (2004) What makes a “good” anesthesiologist? (Editorial). *Anesthesiology* 101: 1061–1063
- Gries A, Wilhelm W (2004) Deficiencies in the practical management of certain emergency situations. Improvement in the emergency medical qualifications through practice oriented course concepts. *Anaesthesist* 53: 1043–1044
- Gries A, Helm M, Martin E (2003) The future of preclinical emergency medicine in Germany. *Anaesthesist* 52: 718–724
- Hennes HJ, Lang C (2000) Notarztindikationskatalog für Rheinland-Pfalz. *Notfall Rettungsmed* 3: 81–82
- Konrad C, Schupfer G, Wietlisbach M, Gerber H (1998) Learning manual skills in anesthesiology: is there a recommended number of cases for anesthetic procedures? *Anesth Analg* 86: 635–639
- Langhan M, Keshavarz R, Richardson LD (2004) How comfortable are emergency physicians with pediatric patients? *J Emerg Med* 26: 465–469
- Lemburg P (1998) Notfälle im Kindesalter (Editorial). *Notfall Rettungsmed* 1: 337
- Luiz T (2003) Emergency medicine tomorrow. *Anesthesiol Intensivmed Notfallmed Schmerzther* 38: 296–302
- Messelken M, Dirks B (2001) Central evaluation of emergency medical service calls. *Notfall Rettungsmed* 4: 408–415
- Murray DJ, Boulet JR, Kras JF et al. (2004) Acute care skills in anesthesia practice. A simulation-based resident performance assessment. *Anesthesiology* 101: 1084–1095
- Regel G, Seekamp A, Pohlemann T et al. (1998) Must the accident victim be protected from the emergency physician? *Unfallchirurg* 101: 160–175
- Ruchholtz S, Nast-Kolb D, Waydhas C et al. (1994) Early mortality in polytrauma – A critical analysis of preventable errors. *Unfallchirurg* 97: 285–291
- Ruppert M (2004) Wo kriegen wir unsere Notärzte her? (Vortrag, Deutscher Anästhesiekongress Nürnberg 19.–22.06.2004) <http://www.inm-online.de/pdf/aktuelles/veroeffentlichungen/notarztmangel.pdf>. Gesehen 06. Jun 2006
- Ruppert M, Paschen HR, Schmöller G, Schallhorn J (2001) Der Stellenwert des “Teams” in der Notfallrettung. *Notfall Rettungsmed* 4: 189–191
- Schlechtriemen T, Lackner C, Moecke HP et al. (2003) Medical quality management with the aid of selected target diagnoses (acute coronary syndrome, acute apoplexy, severe craniocerebral trauma, multiple trauma): recommendations for uniform documentation and data analysis. *Notfall Rettungsmed* 6: 175–188
- Schlechtriemen T, Lackner C, Moecke H, Stratmann D, Altemeyer KH (2004) Emergency care covering a wide area – How to ensure this specific structure? *Notarzt* 20: 20–29
- Schlechtriemen T, Burghofer K, Lackner CK, Altemeyer KH (2005) Validation of the NACA score based on objectifiable parameters: Analysis of 104,962 primary air rescue missions in 1999–2003. *Notfall Rettungsmed* 8: 96–108
- Wong DT, Prabhu AJ, Coloma M et al. (2003) What is the minimum training required for successful cricothyroidotomy? A study in mannequins. *Anesthesiology* 98: 349–353
- Zink W, Bernhard M, Keul W et al. (2004) Invasive techniques in emergency medicine. I. Practice-oriented training concept to ensure adequately qualified emergency physicians. *Anaesthesist* 53: 1086–92