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Self-evaluated competence in trauma reception

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ABSTRACT

INTRODUCTION: No formal training requirements exist for trauma teams in Denmark. The aim of this study was to investigate the point prevalence level of training and the self-evaluated competence of doctors involved in trauma care.

METHODS: On two nights, all doctors on call at departments involved in trauma care were interviewed and answered a structured questionnaire pertaining to their level of training and self-evaluated level of competence in relevant skills.

These skills included the ability to perform diagnostics and interventions as mandated by the Advanced Trauma Life Support and Definitive Surgical Trauma Care curriculums.

RESULTS: All contacted doctors replied to the questionnaire. 58% of doctors were specialists; most often anaesthesiologists (AN) (86%) and doctors working at hospitals with a dedicated trauma centre designation (100%). In total, 45% of orthopaedic (OS) and gastrointestinal surgeons (GS) were specialists. In terms of self-evaluated competence, 95% of AN felt competent performing damage control resuscitation, 82% of OS felt competent performing damage control surgery on extremities, whereas 55% of GS felt competent performing damage control surgery in the abdomen. A total of 20% of the respondents had not attended any relevant trauma course, the majority of these were GS.

CONCLUSIONS: The results indicate that, at the point of sampling, trauma reception in Denmark was handled by AN specialists in the majority of cases, but by surgical trainees. Self-perceived competencies evaluation revealed preparedness to perform damage control resuscitation, but discrepancies in the ability to perform surgical damage control procedures.

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Despite treatment advances, trauma remains a leading cause of lives lost for patients younger than 35 years of age in Denmark, and it is the direct cause of more than 700,000 hospital contacts annually (major and minor trauma) [1]. Affecting primarily the younger population, trauma is the overall second leading cause of potential life-years lost in Denmark, comparable to the life-years lost to stroke and cardiovascular disease combined. Furthermore, studies have indicated that 4.5% of the general population suffer from long-term effects of injuries [2] and that the socioeconomic costs of traffic- and workplace-related injuries alone exceed 2.9% of the

annual Gross National Product [3, 4]. With such a staggering health and socioeconomic cost of trauma, it is clear that treatment of the injured patient is of great importance. Even so, no formal requirements for trauma team competencies and education levels exist in Denmark.

In 2007, the Danish Health Authority stated a planning basis for emergency and acute care on a national level, specifying a required minimum of specialties and facilities available [5]. They also recommend the presence of specialists with a broad experience to ensure sufficient competencies due to a tendency towards sub-specialisation [5].

Regarding competence, the paper stated that the five administrative regions in Denmark should formulate requirements and ensure the relevant education of personnel involved in trauma care. As for doctors working in trauma centres, it was suggested that educational requirements could be met by courses such as the Advanced Trauma Life Support (ATLS) course, but without further specifications or definition of any specific competencies. It was stated, however, that the acute care capabilities in Denmark should be of a high and consistent quality [5].

Due to the relatively low volume combined with the inherent unpredictability of trauma, Danish trauma teams are often formed ad-hoc and composed by rotating on-call physicians from relevant specialties. There is thus a risk that the competencies available at the time of a trauma alert will be inadequate. To examine the level of these competencies, we set out to investigate the organisation of trauma reception in Denmark, including the level of education, expertise and self-evaluated competence of the doctors on call who are involved in trauma. We hypothesised that trauma team self-evaluated competencies and specialist education levels would be heterogeneous across the country.

METHODS

A cross-sectional survey with a structured questionnaire was sent to the administration of all Danish departments involved in trauma reception in May 2015. The questions in the survey pertained to the facilities and infrastructure available as well as to minimally acceptable time delays for imaging, operating room availability, etc. (data not shown).

ORIGINAL ARTICLE

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TABLE 1

The structured questionnaire.

No.	Question
1	In which hospital do you work?
2	In which department do you work?
3	In which specialty do you work?
4	Are you part of the trauma team?
5	How many years of experience in the specialty do you have? 0-4 yrs 5-9 yrs ≥ 10 yrs
6	Are you a specialist?
7	Which of the following courses have you attended? ATLS DS(A)TC European Trauma Course FAST FATE Other None
8	Do you participate in trauma team training on a yearly basis?
9	Do you feel competent handling ... damage control resuscitation? airway management, in critically ill patients? needle thoracostomy? tube thoracostomy? FAST scan? deciding indication for surgery based on FAST scan? damage control surgery, thoracic? damage control surgery, abdominal? damage control surgery, head/neck? damage control surgery, extremities?

ATLS = Advanced Trauma Life Support; DS(A)TC = Definitive Surgical (and Anesthesia) Trauma Care; FAST = Focused Assessment with Sonography; FATE = Focus Assessed Transthoracic Echo.

TABLE 2

Years of experience in different specialties for doctors involved in trauma care in Denmark.

	n	Experience, %			Specialists, %
		0-4 yrs	5-9 yrs	> 9 yrs	
<i>All doctors</i>					
Anaesthesiology	21	9	24	67	86
Orthopaedic surgery	22	46	36	18	45
Gastrointestinal surgery	22	36	23	41	45
Total	65	31	28	41	58
<i>Trauma centre</i>					
Anaesthesiology	3	0	0	100	100
Orthopaedic surgery	4	0	75	25	100
Gastrointestinal surgery	4	0	0	100	100
Total	11	0	27	73	100
<i>Non-trauma centre</i>					
Anaesthesiology	18	11	28	61	83
Orthopaedic surgery	18	55	28	17	33
Gastrointestinal surgery	18	44	28	28	33
Total	54	37	28	35	50

On two nights (15th and 22nd June 2015), all doctors on call at the departments involved in trauma care in Denmark were interviewed anonymously by phone and answered a second structured questionnaire pertaining to their level of training as well as their self-perceived level of competence in specific skills relevant to trauma patient care. **Table 1** shows details of questions included in this survey.

Trial registration: not relevant.

RESULTS

A total of 59 out of 66 department heads (89%) answered the questionnaire concerning facilities and infrastructure.

All interviewed doctors on call answered the questionnaire concerning level of training and self-perceived level of competencies (n = 66). The distribution of specialties among respondents was orthopaedic surgery (n = 22, 33%), gastrointestinal (GI) surgery (n = 22, 33%) and anaesthesiology (n = 21, 32%). One anaesthesiologist and one GI surgeon worked as emergency physicians, but their answers were recorded with their respective specialties. One emergency physician was a cardiologist (n = 1, 1.5%), the results from this questionnaire were not included in this analysis.

Trauma team leaders were either orthopaedic surgeons (56%) or anaesthesiologists (44%).

Experience

Table 2 shows years in the relevant specialty for doctors on call at the time the survey was performed. In total, 58% of doctors were specialists. The highest frequency of specialists was observed in anaesthesia (86%), whereas the same share of orthopaedic surgeons and GI surgeons were specialists (45%).

The number of years of postgraduate experience varied: 0-4 years (31%), 5-9 years (28%), more than nine years (41%). Doctors in hospitals with level 1 or 2 trauma centres (Rigshospitalet, Odense, Aarhus, Aalborg) had more years of experience (> 9 years, 73%) and they were all specialists (Table 2).

Trauma-relevant education

A total of 48% (n = 31) of the doctors reported participation in trauma team training at least once a year. When asked about trauma-related or -relevant courses, 80% reported participation in at least one such course (**Table 3**).

ATLS was the most frequently attended course, with 66% of all doctors participating.

A total of 20% of doctors had not attended any trauma-related course. Of these, 77% were GI surgeons, 15% orthopaedic surgeons and 8% anaesthesiologists (Table 3).

The years of experience of doctors without any courses varied: 0-4 years (53%), 5-9 years (7%) and more than nine years (40%) (data not shown).

Self-evaluated competencies

Table 4 lists self-evaluated levels of competencies by specialty. In general, anaesthesiologists felt prepared performing relevant procedures on trauma patients: (95%) felt competent performing damage control resuscitation, airway management and needle thoracostomy, and unsurprisingly less competent with respect to other (surgical) procedures, namely tube thoracostomy (76%) and focused assessment with sonography (FAST) (48%). Orthopaedic surgeons felt competent performing damage control surgery of the extremities (82%) while fewer GI surgeons felt competent performing damage control surgery in the abdomen (59%). GI surgeons felt competent deciding on indication for surgery based on FAST findings (81%); however, only 57% felt competent performing the FAST themselves. As might be expected, self-evaluated competence performing thoracic (11%) or head/neck (8%) damage control surgery was low among both orthopaedic and GI surgeons, and was actually higher among anaesthesiologists, although the numbers were low ($n = 2$, 10%).

Infrastructure

All hospitals reported availability of thoracic and pelvic X-rays and trauma-CT within 15 minutes as well as the possibility of transfer to the operating theatre within 15 minutes. All hospitals except one had massive transfusion packs available.

DISCUSSION

In this study, we found variations in the levels of training and the self-perceived skills among Danish doctors participating in initial trauma management, despite infrastructural facilities meeting required standards.

The doctors involved in trauma reception in Denmark were mainly anaesthesiologists, orthopaedic surgeons and GI surgeons, with the two first mentioned specialties functioning as trauma team leaders. Approximately one third of the doctors had limited experience (0-4 years of practice), with the majority of junior doctors being either GI surgeons or orthopaedic surgeons. Overall, more than half of the doctors involved in trauma teams were specialists in their respective fields, but in the surgical specialties less than half were specialists. Doctors employed in hospitals with dedicated trauma centres had more years of experience and all were specialists. As could be expected, the overall level of competencies does seem to differ between trauma centres and other hospitals. It is, however, interesting to note that anaesthesia seemed to have a higher nation-

TABLE 3

Courses attended in different specialties. The values are n/N (%).

Course attended/specialty	Anaesthesiology	Gastrointestinal surgery	Orthopaedic surgery
<i>Advanced Trauma Life Support</i>			
TC	3/3 (100)	1/4 (25)	4/4 (100)
NTC	16/18 (89)	5/18 (28)	14/18 (78)
Total	19/21 (90)	6/22 (27)	18/22 (82)
<i>Definitive Surgical Trauma Course/ Definitive Surgical and Anesthesia Trauma Course</i>			
TC	1/3 (33)	2/4 (50)	2/4 (50)
NTC	1/18 (6)	1/18 (6)	1/18 (6)
Total	2/21 (10)	3/22 (14)	3/22 (14)
<i>European Trauma Course</i>			
TC	1/3 (33)	–	1/4 (25)
NTC	2/18 (11)	–	2/18 (11)
Total	3/21 (14)	0	3/22 (14)
<i>Focused Assessment in Trauma</i>			
TC	2/3 (66)	2/4 (50)	1/4 (25)
NTC	5/18 (28)	7/18 (39)	3/18 (17)
Total	7/21 (33)	9/22 (41)	4/22 (18)
<i>Focus Assessed Transthoracic Echo</i>			
TC	3/3 (100)	0	0
NTC	12/18 (67)	1/18 (6)	1/18 (6)
Total	15/21 (71)	1/22 (5)	1/22 (5)
<i>None</i>			
TC	0	2/4 (50)	0
NTC	1/18 (6)	8/18 (44)	2/18 (11)
Total	1/21 (5)	10/22 (45)	2/22 (9)
Other	9 ^a /21 (43)	0	4 ^b /22 (18)

NTC = non-trauma centre; TC = trauma centre.

a) Prehospital Trauma Life Support: $n = 5$; military trauma courses: $n = 4$.

b) AO Trauma Course: $n = 4$; regional trauma course: $n = 1$ (also AO Trauma Course).

wide representation of specialists taking in-house calls than the surgical specialties. While this setup may be sensible for most surgical case types, trauma represents a unique challenge as major haemorrhage may require quick and decisive surgical intervention that is not necessarily achievable at the surgical trainee level. Also, while trauma centres will receive the brunt of major trauma cases, all emergency hospitals can potentially receive major trauma necessitating immediate surgical haemorrhage control. Furthermore, there is no nationwide standardised protocol for trauma patient triage and referral, creating inter-regional differences.

The levels of education varied between specialties, and the overall levels were worrying. 20% of the doctors involved in trauma had no specific trauma-relevant education or courses, while 34% had not attended the ATLS course. Furthermore, a low number of surgeons had participated in formal surgical trauma care courses, such as the Definitive Surgical Trauma Care course.

This is concerning since both international and

TABLE 4

Self-evaluated competence: Doctors were asked whether they could perform the listed skills unsupervised. The values are n/N (%).

Skill	Anaesthesiology	Gastrointestinal surgery	Orthopaedic surgery
<i>Damage control resuscitation</i>			
TC	3/3 (100)	3/4 (75)	2/4 (50)
NTC	17/18 (94)	12/18 (67)	13/18 (72)
Total	20/21 (95)	15/22 (68%)	15/22 (68%)
<i>Airway management, in critically ill patients</i>			
TC	3/3 (100)	2/4 (50)	1/4 (25)
NTC	17/18 (94)	2/18 (11)	1/18 (6)
Total	20/21 (95)	4/22 (18)	2/22 (9)
<i>Needle thoracostomy</i>			
TC	3/3 (100)	4/4 (100)	4/4 (100)
NTC	17/18 (94)	13/18 (72)	16/18 (89)
Total	20/21 (95)	17/22 (77)	20/22 (91)
<i>Tube thoracostomy</i>			
TC	2/4 (50)	4/4 (100)	4/4 (100)
NTC	14/18 (78)	12/18 (67)	14/18 (78)
Total	16/21 (76)	16/22 (73)	18/22 (82)
<i>FAST scan</i>			
TC	1/4 (25)	3/4 (75)	1/4 (25)
NTC	9/18 (50)	9/18 (50)	2/18 (11)
Total	10/21 (48)	12/22 (55)	3/22 (14)
<i>Indication for surgery based on FAST scan</i>			
TC	2/4 (50)	4/4 (100)	2/4 (50)
NTC	6/18 (33)	14/18 (78)	6/18 (33)
Total	8/21 (38)	18/22 (82)	8/22 (36)
<i>Damage control surgery</i>			
Thoracic:			
TC	0	3/4 (75)	0
NTC	1/18 (6)	2/18 (11)	1/18 (6)
Total	1/21 (5)	5/22 (23)	1/22 (5)
Abdominal:			
TC	0	4/4 (100)	
NTC	1/18 (6)	9/18 (50)	
Total	1/21 (5)	13/22 (59)	0
Head/neck:			
TC	0	2/4 (50)	1/4 (25)
NTC	2/18 (11)	0	0
Total	2/21 (10)	2/22 (9)	1/22 (5)
Extremities:			
TC	1/3 (33)	2/4 (50)	4/4 (100)
NTC	5/18 (28)	5/18 (28)	14/18 (78)
Total	6/21 (29)	3/22 (14)	18/22 (82)

FAST = Focused Assessment with Sonography; NTC = non-trauma centre; TC = trauma centre.

ZScandinavian guidelines on the management of injured patients state, that a course in initial trauma management, such as the ATLS course, is mandatory for doctors involved in trauma care [6, 7] as trauma surgical training courses may be the only hands-on experience surgeons get during training due to a relatively low exposure to major trauma during training.

There is evidence that ATLS significantly improves

knowledge on trauma care, as well as the participants' practical, organisational and prioritising skills [8, 9], whereas regular trauma team training may have a beneficial effect on critical decision making [10]. The lack of experience among surgical participants is especially concerning as surgical treatment of major trauma requires sound anatomical knowledge as well as rapid mobilisation of skills not readily available among junior trainees.

Furthermore, studies have indicated that increased physician exposure to trauma as well as hospital trauma volumes may be directly associated with beneficial outcomes [11]. It is therefore concerning to note that almost half of the doctors involved in trauma teams were non-specialists with limited clinical experience.

Responses regarding self-evaluated competence indicated that trauma-related procedures centring on airway and breathing seemed to be adequately addressed by the participating anaesthesiologists. In contrast, it was clear that the increased level of sub-specialisation observed within the surgical specialties drastically reduced the perceived ability of non-trauma centre hospitals to handle severe thoracic and head/neck trauma in Denmark. While the effect of this on mortality and morbidity remains unknown, it is interesting to note that studies have demonstrated superior outcomes in trauma centres meeting the American College of Surgeons level 1 criteria as opposed to centres with lower levels of certification (and thus without access to specialist thoracic, vascular and ear-nose-throat support) [12]. Furthermore, it should be noted that a relatively large percentage of surgeons handling trauma were in their early phases of training. As a recent study indicated that the average Danish senior resident and junior attending had performed only three trauma laparotomies and one splenectomy during training [13], there could potentially be a mismatch between the self-reported and actual skills in this area for GI surgeons. These results also indicated that surgical trauma care in Denmark outside of dedicated trauma centres remains within the auspices of residents and junior attendings even though attending level presence (specialists) may improve the outcome [14].

This study has several limitations. The collected observational data present a section of the doctors who were on call on the nights the survey was performed. The data might have been different if the survey had been performed on other dates. Furthermore, due to the point-prevalence nature of the study, the number of study participants is low. It does, however, reflect a realistic level of self-perceived competencies at a given point in time. Furthermore, no statistical comparisons were made. The objective of the study was, however, not to compare the level of competencies between centres, but rather to obtain a nationwide point-prevalence

view of competencies and education levels among trauma-receiving doctors.

The data were registered anonymously, and there is an inherent risk of under- or over reporting of skills and level of education. Furthermore, the reported level of skill cannot readily be validated objectively.

CONCLUSIONS

Despite these limitations that characterise many questionnaire-based studies, we conclude that the Danish trauma system is characterised by heterogeneity with respect to the level of training and competences of Danish doctors participating in the early care of critically injured patients, albeit with a higher level of specialisation and self-perceived skills at trauma centres and within certain specialties (i.e. anaesthesia). This is the first study to address the educational levels of doctors involved in trauma in Denmark. The results may serve to inform a debate about the postgraduate education offered. Further studies are needed in order to assess a potential impact on patient outcomes of these factors.

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