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Are Belgian military students in medical sciences better educated in disaster medicine than their civilian colleagues?

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ABSTRACT

Introduction Historically, medical students have been deployed to care for disaster victims but may not have been properly educated to do so. A previous evaluation of senior civilian medical students in Belgium revealed that they are woefully unprepared. Based on the nature of their military training, we hypothesised that military medical students were better educated and prepared than their civilian counterparts for disasters. We evaluated the impact of military training on disaster education in medical science students.

Methods Students completed an online survey on disaster medicine, training, and knowledge, tested using a mixed set of 10 theoretical and practical questions. The results were compared with those of a similar evaluation of senior civilian medical students.

Results The response rate was 77.5%, mean age 23 years and 59% were males. Overall, 95% of military medical students received some chemical, biological, radiological and nuclear training and 22% took part in other disaster management training; 44% perceived it is absolutely necessary that disaster management should be incorporated into the regular curriculum. Self-estimated knowledge ranged from 3.75 on biological incidents to 4.55 on influenza pandemics, based on a 10-point scale. Intention to respond in case of an incident ranged from 7 in biological incidents to 7.25 in chemical incidents. The mean test score was 5.52; scores improved with educational level attained. A comparison of survey data from civilian senior medical master students revealed that, except for influenza pandemic, military students scored higher on knowledge and capability, even though only 27% of them were senior master students. Data on willingness to work are comparable between the two groups. Results of the question/case set were significantly better for the military students.

Conclusions The military background and training of these students makes them better prepared for disaster situations than their civilian counterparts.

Key messages

- Disaster medicine education in medical curricula is scarce and frequently absent.
- The military has a tradition in mass casualty care and chemical, biological, radiological and nuclear incidents.
- Military background makes students in medical sciences better educated in, and prepared for, disaster situations.

INTRODUCTION

In the past, medical students have been involved in direct patient care in large-scale mass casualty incidents; from the Spanish flu pandemic in 1918,[1] flooding,[2] devastating earthquakes[3 4] to the 9/11 attacks,[5] medical students have been deployed for the purpose of victim care. The Belgian Royal Academy of Medicine even mentioned them as an important player in the National H5N1 Pandemic Plan in 2005[6] although they were not prepared for it.[7]

A survey on disaster education and knowledge in senior civilian Belgian medical students revealed some startling concerns:[8] disaster education is almost absent and knowledge on different disaster situations (except flu pandemics) as well on triage, decontamination and personal protective equipment use is extremely limited. On the other hand, we know that the military has a tradition in humanitarian aid in disaster situations[9] and possesses extensive knowledge in coping with chemical, biological, radiological and nuclear (CBRN) incidents;[10 11] many civilian models of medical disaster response follow the military model.[12] One could reasonably expect that military training enhances disaster management skills and knowledge. The Belgian Army offers selected personnel the opportunity to follow their university studies in several medical sciences (medicine, dentistry, pharmacology and veterinarian medicine) together with their civilian colleagues in all regular faculties, thus providing for its own medical staff needs.

The aim of this study is to evaluate the impact of basic military training on disaster management education and knowledge, compared with civilian senior medical student colleagues.[8] The study hypothesis is that military background makes military students better prepared/educated for disaster situations.

MATERIALS AND METHODS

To evaluate disaster medicine education among Belgian military students in medical sciences, a descriptive cross-sectional study was performed in 2014. The local ethical committee approved the study.

All military students in medical sciences were invited by email to complete an online survey (Survey Monkey, Palo Alto, California, USA) on disaster medicine, training and knowledge (Table 1). The survey queried demographics, prior educational level attained and self-estimated knowledge on, and capability to cope with, several disaster scenarios. Their willingness to work in these

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Table 1 Questions used in the survey. CBRN Chemical, Biological, Radiological, nuclear

1. **What's your native language?** Dutch or French
2. **What's your gender?** Male or female
3. **Age in years?**
4. **What is your educational study level?** Bachelor, Junior Master or Senior Master
5. **What is the professional level you hope to reach?** Emergency physician, physician, dentist, pharmacist, veterinarian
6. **What's the highest level of your CBRN training up to now?** None, Basic, CBRN school
7. **What is the timeframe since your last CBRN training period?** Less than 1 year, 1–3 years, 3–7 years, longer than 7 years
8. **Do you live within a 20km range of a:** nuclear installation or high risk chemical installation (Seveso type)?
9. **Do you have any association with EMS or disaster management besides your military career?**
10. **Have you had any lectures or training in disaster medicine/ management?**
11. **Do you have any knowledge on how to deal with CBRN incidents and/ or affected patients?**
12. **Do you think that your university training should prepare you one way or another to deal with disaster situations?** Absolutely, could be useful, useless
13. **On a visual scale from 0(null) to 10 (expert) what's your estimation of your knowledge on:** nuclear incidents, chemical incidents, biological incidents (eg anthrax), epidemic, very contagious disease (eg swine or bird flu), epidemic very contagious disease with high morbidity/mortality risks (eg Ebola)?
14. **On a visual scale from 0 to 10 what's your estimation of your capability to deal with patients of:** nuclear incidents, chemical incidents, biological incidents (eg anthrax), epidemic, very contagious disease (eg swine or bird flu), epidemic very contagious disease with high morbidity/mortality risks (eg Ebola)?
15. **If you were confronted with the following scenarios during your apprenticeship would you engage yourself to actively participate in patient care (on a visual scale from 0 (not at all) to 10 (absolutely))?** Nuclear incidents, chemical incidents, biological incidents (eg anthrax), epidemic, very contagious disease (eg swine or bird flu), epidemic very contagious disease with high morbidity/mortality risks (eg Ebola)?
16. **Set of theoretical questions:** see table 3

circumstances was also assessed. Questions were multiple choice, and self-rated scores were given on a visual analogue scale from 0 to 10. Knowledge was tested by a mixed set of 10 theoretical questions and practical cases, each correct answer counting as 1 point out of 10. The survey was developed at the Center for Research and Education in Emergency Care (CREEC) at the University of Leuven and was based on the results of a literature search. It was validated by several disaster specialists. Data were compared with the results of a similar survey (identical except for some demographic data, typical for each group) of senior medical students.[8]

Stata SE V.10.1 (StataCorp LP, College Station, Texas, USA) was used for statistical evaluations. The Pearson χ^2 test was used for comparison of proportions/percentages and the two-sample (two-sided) t test was used for comparing means. For comparing medians, the Wilcoxon–Mann–Whitney test was used and normally distributed data were compared using the Pearson correlation coefficient. The Spearman correlation coefficient was used for non-parametric data. A p value <0.05 was considered to be significant.

RESULTS

The response rate of military students in medical sciences was 77.5%, a mean age of 23 years and a male to female ratio of 59:41. Overall, 54% of the military students were currently at a bachelor level, 19% were at a junior master level and 27% were at the senior master level; 46% wanted to become an emergency physician, 39% another type of physician, 12% pharmacists and 3% dentists. Some CBRN training (2/3 basic level) had been received by 95% and 22% had other disaster management training; 71% felt that they could deal with patients of CBRN incidents. Only 17% were involved in emergency medical service (EMS) in their spare time but 44% believed it was absolutely necessary that disaster management should be incorporated in the regular curriculum; only 2% stated that this training was useless.

Scores on self-estimated knowledge and capability, willingness to work at disasters and mean theoretical–practical test scores of military and civilian students are presented in Table 2. Self-estimated knowledge and capability were well correlated (Spearman $p<0.005$). Self-estimated capability for all incident types was significantly higher in the group that knew how to deal with CBRN patients and those students who were involved in EMS. Willingness to assist was strongly correlated with the different scenarios (Spearman $p<0.0005$). Students who planned to be pharmacists were significantly less willing to respond to infectious/contagious incidents. Test scores were significantly better in students who had attained higher educational levels. Results on the theoretical–practical questions of the survey are presented in Table 3.

DISCUSSION

In the event of a mass casualty incident all unaffected, available personnel are expected to help in controlling the situation; every local physician, regardless of specialty, should be able to assist.[13] When communities become isolated, as in some natural disasters, Family Practice physicians might be the only source of medical expertise available until external help is organised;[14] for this reason, the Association of American Medical Colleges recommends that all medical schools should thoroughly educate

Table 2 Mean scores on the 0–10 Visual Analogue Scale on the theoretical–practical case mix test, self-estimated knowledge, self-estimated capability and willingness to work in the listed disaster situations compared with the figures of the senior civilian medical students

	Military	Civilian[8]
Mean test score	5.52/10	4.34/10*
Knowledge nuclear incidents	3.97/10	1.81/10*
Knowledge chemical incidents	4.05/10	2.19/10*
Knowledge biological incidents	3.75/10	2.09/10*
Knowledge influenza pandemic	4.55/10	4.61/10 ns
Knowledge Ebola outbreak	4.1/10	2.79/10*
Capability nuclear incident	3.02/10	1.61/10*
Capability chemical incident	3.32/10	2.05/10*
Capability biological incident	3.1/10	1.99/10*
Capability influenza pandemic	4.29/10	4.3/10 ns
Capability Ebola outbreak	3.23/10	2.55/10*
Willing to work on nuclear incident	7.1/10	7.11/10 ns
Willing to work on chemical incident	7.25/10	7.48/10 ns
Willing to work on biological incident	7.0/10	7.36/10 ns
Willing to work on influenza pandemics	7.15/10	7.7/10 ns
Willing to work Ebola outbreak	7.1/10	7.03/10 ns

*p<0.05.
ns, not significant.

Table 3 Summary of the answers on the theory–case mix questions. The correct answers are in italics. The 'don't know' option was added to eliminate wild guess bias.

1. Chain collision, possible contaminated patients	
Isolate in distal corner	7.5%
Put them in waiting room	20%
Put them in garage	5%
Wait separately outside	*67.5%*
No action, instead hide	0%
2. Iodine tablets protect against	
External radiation	15%
Internal radiation	*42.5%*
Both external and internal	10%
No radiation protection at all	17.5%
Don't know	15%
3. The regulator means	
Operational leader of overall disaster management	7.5%
Controlling arriving ambulances	7.5%
Field hospital supplies	2.5%
Deciding which patients go where	*25%*
Don't know	57.5%
4. Postman with necrotic lesions on his hands, possible diagnosis	
Frostbite	7.5%
New chemical product in post handling	17.5%
Possible anthrax infection	*50%*
Don't know	25%
5. First step in chemical decontamination	
Oral antidote	2.5%
Antidote body smear	20%
Antidote spray special military cabin	32.5%%
Wash with water and soap	*7.5%*
Don't know	37.5%
6. What limits radiation damage the most?	
Protective clothing	2.5%
Fast decontamination	2.5%
Oral iodine tablets	2.5%
Limit time of exposure, increase distance and shielding	*90%*
Don't know	2.5%
7. Two most important objects to take along in evacuation (more than 1 possible)	
Smartphone	15%
Laptop	0%
ID/health insurance cards	*80%*
Syllabus/handbook	2.5%
Six-pack of beer	5%
Normally used medication	*7.5%*
Photo of loved one	2.5%
None of the above	12.5%
Don't know	0%
8. Superficial cuts and first degree burns after an explosion at a student party, go to	
Nearest hospital	20%
Nearest hospital with burn unit	10%
Home (recover and sleep)	12.5%
Hospital ED further away	*57.5%*
Don't know	0%
9. First step in nuclear decontamination	
Shower patient	25%
Administer iodine tablets	10%
Take off clothes and shoes	*47.5%*
Put on lead apron	2.5%
Don't know	15%
10. Traffic accident with 2 trucks (one leaking tanker) and 2 victims, what to do?	
Stop, call 112 and help lying victim	10%
Stop, call 112 and help limping victim	2.5%
Stop at safe distance and wait for clearance fire brigade	*87.5%*
Drive by and call 112 at hospital	0%
Act as if nothing happened	0%

their students about disaster medicine in order to bolster a coordinated response to weapons of mass destruction, or to other major acute public health threats.[15]

Recent objective evaluations prove that disaster education of medical students is still limited, provoking a call for instituting a national medical disaster-training curriculum.[16 17] Looking at the status of this kind of education presently in Europe, Germany is the only country with a well-established curriculum,[18] Italy is in the experimental phase of testing such a programme and using these educational methods in several medical schools[19] with motivated students expressing the clear need to do so.[20] Belgium has a limited introduction of such an educational programme in three faculties,[8] and the Netherlands has no disaster medicine programmes in their medical schools, but one faculty has expressed interest after participating in a recent national survey.[21]

If these military student data are compared with those of a similar survey given to civilian senior master medical students, significantly higher score on self-estimated knowledge and capability is observed, although only 27% were senior master students; one exception regards the knowledge and capability of influenza pandemics. Results on willingness to work in various disaster scenarios are comparable between the two groups, and the results of the theoretical question/case section were significantly more favourable for the military student group.

The data support our study hypothesis that a military background makes students in medical sciences better prepared and educated for disaster situations. They score better in self-estimated knowledge and capability, as well as in the theoretical questions/practical case mix part of the survey. Taking into account that only about one quarter of the study population were senior master students and that seniority was an important promoting factor, we are compelled to notice the positive impact of basic military training on disaster management. The only exception was for the influenza pandemic scenario, in which both civilian and military students performed comparably, which is probably because this subject is now extensively covered in the regular medical science curriculum, after it was seen to be lacking before the most recent influenza pandemic threats. It should also be stressed that this survey was administered before the recent West African Ebola outbreak emerged so publicly, so the virtual Ebola outbreak scenario in the survey was recognised only as a dangerous unknown.

The scores on the set of 10 practical and theoretical questions were compared with those obtained in the study with civilian

senior master medical students, revealing that performance on this part was also significant higher in the military group. Taking into account that 55% of the military students would use antidotes instead of water and soap as a first step in chemical decontamination, as this is taught in their CBRN courses, the difference could even be greater. Only 20% of the military students reported that they would put potentially contaminated victims of a chain collision in the waiting room, whereas half of their civilian counterparts said they would; the use of iodine tablets in nuclear scenarios is also better known: only 25% believed that they protected against external radiation compared with 47% of civilians and only 10% of military students would use iodine tablets as a first step in nuclear decontamination versus 48% of civilian students. Knowledge that limiting time of exposure, increasing distance and shielding limits radiation damage the most was higher in the military students (90% vs 78%) and more would not go uninformed and unprotected into a traffic accident involving leaking tanker versus (87.5% vs 65%).

Giving this outcome, it can be stated that basic military training and background makes the military medical sciences student better educated and prepared for disaster situations than their civilian counterparts. This result suggests the need for greater involvement of the military in disaster medicine training and education, as is common in other countries.[22] The ideal situation would be one that evolves into a basic disaster medicine education in the regular national medical education curriculum with a clear input from military knowledge and experience. However, up to now this possibility is not even in a nascent stage. Our centre is delighted to have an established joint venture with the military in its disaster management course but unfortunately this is only at a postgraduate level.

This study has some limitations in that the use of surveys and self-reported data could result in collecting bias; on the other hand, we compared these data with those of a similar study using the same methods and bias, so we may conclude that the comparison is at least consistent.

CONCLUSION

Basic military training and its associated background make the military population better educated and prepared for disaster situations than their civilian counterparts.

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Contributors LJMM wrote the manuscript, was involved in the survey design and performed the literature search. JL adapted the survey to the military situation and recruited the respondents. GD performed the statistical analysis. MBS launched the study concept, was involved in the survey design and was the liaison with the military command. LJMM is responsible as guarantor.

Competing interests None declared.

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