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Addressing a community need: assessing the confidence and attitude of senior medical students in responding to in-flight emergencies

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Abstract
Traveling physicians will likely be called for medical assistance on board. In-flight medical emergencies (IMEs) are common and occur in a complex environment with limited medical

resources. This study evaluated senior medical students' willingness, understanding, confidence, and attitudes toward IMEs and their willingness to respond to them. This cross-sectional study was conducted among senior medical students in the College of Medicine, King Saud University, Riyadh, Saudi Arabia. These medical students were sent a self-administered online questionnaire, which consisted of basic demographic data, a survey to evaluate IME experiences, and a 10-item questionnaire to assess the attitude of students. Among 302 medical students, 52.3% were males, while 66.9% were over 22 years old. The prevalence of students who attended life support training was 62.6%, which was highly significant among the 5th-year level ($p = 0.001$). Neutral attitudes were found in most students (87.7%); 4.6% had positive attitudes, while 7.6% had negative ones. Being at the 5th-year level and having previous participation in life support training were associated with an increased attitude toward in-flight medical emergencies. The attitude of senior medical students toward IMEs was less than desired. However, the attitude was better among 5th-year medical students who attended training courses on managing IMEs. Thus, participation in training courses influenced the willingness to manage such cases. Subsequently, longitudinal studies are needed to extract more data on the knowledge and confidence of medical students toward IMEs.

Introduction

In-flight medical emergencies (IMEs) are surprisingly common and often unfold in a complex environment characterized by limited medical resources and heightened safety concerns. These incidents pose exceptional challenges for physicians and other individuals involved in air travel.[1] With statistics indicating an average of one medical emergency per 604 flights, the likelihood of a traveling physician being called on to provide medical assistance while onboard is significant.[2] Studies examining in-flight emergencies have highlighted the relatively low death rate among commercial passengers, estimated at approximately 0.31 to 0.34 per million passengers. Cardiovascular events account for approximately 70% of these incidents.[3] However, for the individual who has volunteered to offer aid, these statistics hold little significance in the face of the responsibility of caring for an ill passenger.

Globally, the body of literature comprises various reviews and case reports delving into IMEs.[3,4] However, comprehensive studies focusing on the readiness and confidence of senior medical students in responding to IMEs remain scarce.

IMEs pose significant challenges for travelers and healthcare providers. Airline cabin crews serve as first responders to IMEs, which makes their training in first aid and emergency procedures crucial for passenger safety. Previous research has emphasized that the "appropriate training of crew members, availability of adequate medical resources, and improved dialogue between aircraft and ground doctors contribute to positive outcomes for medical issues on board." Moreover, incorporating advanced telemedicine solutions further enhances safety and reassures passengers during flights.[5]

While licensed physicians often address IMEs, medical students may also find themselves in situations where they are the only available healthcare professionals. Limited research on senior medical students' preparedness, confidence, and attitudes regarding IMEs in Saudi Arabia highlights a critical knowledge gap in this region. Thus, our study aimed to fill this gap by comprehensively evaluating senior medical students' understanding, confidence, and attitudes toward IMEs and their willingness and self-perceived competency in responding to such emergencies while considering their potential roles in future emergency medicine practice and the unique medico-legal implications they face.

Materials and Methods
Study design, participants, and setting
This study employed a cross-sectional design to examine the preparedness of senior medical students at the College of Medicine, King Saud University, Riyadh, Saudi Arabia. Participants included male and female students in their fourth and fifth years of medical school (*i.e.,* senior students). The study was conducted between December 2023 and February 2024 with 302 of 570 senior medical students who were recruited using snowball sampling. The sample size calculation was based on a 5% margin of error and a 95% confidence interval (CI). The initial estimated sample size of 230 was increased to account for potential non-response, which resulted in the final target sample size of 302.

Instruments

This study utilized a questionnaire developed by Alarifi et al.,[6] which consisted of sociodemographic, academic, and personal history information via ten items on a 5-point Likert scale: i) demographic information (i.e., age and sex); ii) academic information (i.e., the current year of study); and iii) personal history information (i.e., the frequency of participant travel, and whether the participant underwent training courses in IME management, whether the participant received life support training (i.e., Basic Life Support [BLS], Advanced Cardiovascular Life Support [ACLS]) or attended another course with its name, the course type, and the number of times attended. If the participants affirmed attending life support training, they encountered two subsequent inquiries. First, they were asked to identify the conditions covered in the courses they attended, with multiple options available. Second, they were asked whether they had provided medical assistance during an IME. In the event of a negative response, the participants were required to specify the reason.

Attitudes toward IMEs were assessed using a 10-item questionnaire, with 5-point Likert scale categories ranging from "strongly disagree" (coded as 1) to "strongly agree" (coded as 5). The first three statements assessed the participants' knowledge of available medical supplies on commercial airplanes, their understanding of the training level of commercial aircrew in managing IMEs, and their comprehension of the collaboration between the aircrew, ground-based medical control, and onboard volunteer healthcare providers during such emergencies.

The subsequent three statements pertained to the participants' willingness to manage IMEs. Specifically, they were asked if they would identify themselves as doctors and offer assistance, if they would refrain from intervening if another individual was already assisting, and if they would offer help despite being unfamiliar with the nature of the emergency, even if they were the only healthcare professional on board.

Lastly, four statements sought to evaluate the participants' confidence and concerns regarding IME management. The participants were asked about their fear of potential medico-legal implications, whether they believed they required additional training in this area, their confidence in their existing medical training to render assistance during such emergencies, and their current level of confidence in responding to and providing competent care during an IME.

The total attitude score was calculated by adding the ten items, so scores ranging from 10 to 50 points were generated. The higher the score, the higher the attitude toward in-flight

emergencies. Furthermore, 50% and 75% were used to classify attitude levels: scores of less than 50% were considered negative, 50% to 75% were neutral, and above 75% were positive.

Data collection procedure and ethical approval

The KSU Institutional Review Board approved this project with approval reference number 23/0802/IRB in October 2023. An online survey was created through Google Forms and sent to all participants. The nature and purpose of the study, the primary investigator's contact information, and an explanation of the confidentiality and data anonymity policy were provided. Consent to participate was given by clicking on the informed consent link. After reading the informed consent statement, the participants clicked "Next" to access the study's survey, which took approximately 5 minutes to complete.

Statistical analysis

Categorical variables were described as counts and proportions (%), while continuous variables were computed and expressed as the mean and standard deviation. The differences between attitude scores related to sociodemographics and student IME experience were calculated using the Mann-Whitney z-test. Normality was assessed using the Shapiro-Wilk and Kolmogorov-Smirnov tests.

According to the results, attitudes followed a non-normal distribution. Thus, a non-parametric test was applied. Moreover, a chi-square test was used to determine the relationship between participation in life support training according to the basic demographic characteristics and the experience of senior students in IMEs. A p-value of less than 0.05 was considered statistically significant. All statistical data were analyzed using Statistical Packages for Social Sciences (SPSS) version 26 (Armonk, NY: IBM Corp., USA).

Results

The study enrolled 302 senior medical students. Approximately two-thirds (66.9%) were over 22 years old. Over half (52.3%) were males, and 51.7% were at the fifth-year level (Table 1).

When examining the experience of medical students regarding IMEs (Table 2), only 2.6% had attended training courses related to the management of IMEs, while only 10.6% had previously encountered cases of IMEs. The most commonly encountered medical emergencies aboard were cardiovascular events (40.6%). In this case, 31.3% of the

respondents offered medical assistance. Among those who did not ($n = 22$), the most common reason was another doctor attending to the patient (36.4%). Approximately 60.9% believed that an IME should cover all specialties. The prevalence of medical students who participated in previous life support training was 62.6%. BLS was the most prominent life support training course type: 52.4% attended at least once. In addition, 44.7% traveled on airplanes at least once annually.

Regarding the assessment of attitudes toward IMEs (Table 3), the three statements with the highest ratings were "I need more training in managing in-flight medical emergencies." (mean score: 4.49), "I am afraid of the medico-legal implications that may arise from my assistance in an in-flight medical emergency" (mean score: 3.91), and "I will stay out of an in-flight medical emergency if someone else is already offering their assistance" (mean score: 3.67). In contrast, "I have an adequate understanding of what medical supplies are available on commercial airplanes" showed the lowest rating (mean score: 2.29). Based on the above attitude items, the mean attitude score was 30.2 ($SD = 4.55$), with negative, neutral, and positive attitudes of 7.6%, 87.7%, and 4.6%, respectively.

When exploring the differences in the attitude score related to sociodemographic characteristics and experiences with IMEs, a higher attitude was associated with being a 5th-year-level student ($z = 2.313$, $p = 0.021$) and previous attendance at training courses for IMEs ($z = 1.936$, $p = 0.024$; Table 4).

When measuring the relationship between participation in life support training, basic demographic characteristics, and experiences with in-flight emergencies, 5th-year medical students were likelier to have attended previous life support training than 4th-year medical students ($p = 0.001$). Other variables showed no significant relationship with previous participation in life support training ($p > 0.05$; Table 5).

Discussion

This study investigated senior medical students' willingness, understanding, confidence, and attitudes toward IMEs. Although the overall mean attitude score indicated above-average threshold ratings, most students were neutral (87.7%) toward being involved in IMEs.

Several studies have discussed the level of understanding of healthcare providers toward IMEs. For instance, Ng and Abdullah reported that the knowledge score of doctors regarding

the management of IMEs was below the average threshold and that the overall confidence of physicians was unsatisfactory.[7] Katzer *et al.* found that the average knowledge score regarding IMEs was 64%, and their confidence in responding to IME cases was deemed low.[8] However, comparing medical students' knowledge before and after lectures and simulation cases, the knowledge score of the paired test increased from 61% to 91%, which suggested that students may improve their knowledge after attending a course on IMEs,[9] in agreement with other studies.[10]

Increasing academic year level and attendance to training courses in the management of IMEs were associated with better IME attitudes. This finding agrees with a study conducted by AlShamlan and their group of licensed physicians working in Saudi Arabia.[2] The willingness to assist in IMEs was associated with being male, being involved in a previous IME incidence, attending life support and IME courses, traveling more frequently, and working as a physician in the Central Region. Consistent with previous reports, Sayuti *et al.*[11] indicated that, based on bivariate analysis, BLS training impacted knowledge and skills, which was also consistent with the study of Padaki *et al.*[12] Moreover, in a paper conducted by Alsulimani *et al.*,[13] medical students who completed the BLS course exhibited significantly better knowledge than those who did not attend. No other variables showed a significant association with knowledge. In our study, attitude levels did not differ significantly by age, gender, experience with IMEs, or life support training.

Nearly two-thirds (62.6%) of the respondents had received certification for life support training, particularly BLS and ACLS, but participation in training courses on the management of IME was suboptimal (2.6%). This finding mirrored the study of Alarifi and AlRowais.[6] Only 36.8% would respond in IME cases. Interestingly, a similar percentage (36.5%) of the respondents believed they could offer competent care and asserted that their medical education was sufficient to treat IMEs (34.5%).

Furthermore, 5th-year medical students were more likely to participate in life support training than 4th-year medical students. However, participation in life support training did not vary significantly by age or gender, training courses in managing IMEs, or personal experience with IMEs. In the US,[10] emergency medical residents' self-competency increased after attending a 5-hour in-situ curriculum; residents showed high expectations of the curriculum. However, the author mentioned several limitations that could hinder the full implementation

of this curriculum (e.g., air flight traffic, varying airport security protocols, and weather conditions).

Medical students recognized help provided by another doctor (36.4%) and a lack of knowledge (31.8%) as the most common reasons for not providing medical assistance to IMEs. These outcomes were comparable to a study conducted by Ng and Abdullah.[7] The willingness to assist in IMEs decreased if someone else responded to the case and the participant's knowledge about managing IMEs was inadequate. Contradicting these reports, AlShamlan et al.[2] disclosed that nearly half of physicians were concerned about the medico-legal consequences of their actions, such that standard guidelines should be available to respond to incidents like IMEs.

This investigation was conducted only in one college, which limited the generalizability of the results. Furthermore, using snowball sampling might not accurately mirror the larger population.

Conclusion and future directions

The desirability of student participation in IMEs is complex. While students can provide valuable assistance, it is essential to consider the risks involved and the need for appropriate training and guidance. Encouraging students to participate in training courses and providing clear guidelines for when and how to intervene can help mitigate these risks and ensure their assistance is beneficial. BLS training may certainly impact the willingness to assist in IMEs. In addition, periodic training courses on IMEs are necessary to enhance the knowledge and skills of senior medical students.

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Table 1. Basic demographic characteristics of the senior medical students ($n = 302$).

Study variables	N (%)
Age group	
≤22 years	100 (33.1)
>22 years	202 (66.9)
Gender	
Male	158 (52.3)
Female	144 (47.7)
Academic year level	
4th-year level	146 (48.3)
5th-year level	156 (51.7)

Table 2. Experienced of in-flight medical emergencies ($n = 302$).

Variables	N (%)
Received training courses in the management of in-flight medical emergencies	
Yes	08 (02.6)
No	294 (97.4)
Have you ever encountered any in-flight medical emergency before?	
Yes	32 (10.6)
No	270 (89.4)
Type of medical emergency being encountered ($n = 32$) *	
Allergic reaction	02 (06.3)
Cardiovascular (e.g., syncope, chest pain)	13 (40.6)
Gastrointestinal (e.g., nausea/vomiting, diarrhea)	10 (31.3)
Neurological (e.g., strokes, seizures)	05 (15.6)
Psychological (e.g., acute anxiety, psychosis)	08 (25.0)
Respiratory (e.g., asthma exacerbation, suspected pneumothorax)	03 (09.4)
Others	05 (15.6)
Have you provided medical assistance? ($n = 32$)	
Yes	10 (31.3)
No	22 (68.8)
If no, please provide a reason ($n = 22$)	
No reasons	05 (22.7)
There was another doctor	08 (36.4)
Lack of knowledge	07 (31.8)
Others	02 (09.1)
In your opinion, training on an in-flight medical emergency has to be covered in which specialties? *	
All specialties	184 (60.9)
Emergency medicine	125 (41.4)
Family medicine	31 (10.3)
Internal medicine	19 (06.3)

Obstetrics and Gynecology	32 (10.6)
Pediatrics	16 (05.3)
Surgical specialties	19 (06.3)
Others	05 (01.7)
Have you received any life support training?	
Yes	189 (62.6)
No	113 (37.4)
If yes, what type of training ($n = 189$)	
Basic Life Support (BLS)	146 (77.2)
Advanced Cardiovascular Life Support (ACLS)	06 (3.2)
Both	34 (18.0)
Others	03 (01.6)
How many times have you taken (life support training)? ($n = 189$)	
None	18 (09.5)
Once	99 (52.4)
2–3 times	71 (37.6)
4–5 times	01 (0.50)
How frequently do you travel via airplane? (in a regular year)	
Never	48 (15.9)
Once a year	135 (44.7)
2–3 times a year	97 (32.1)
More than 3 times in a year	22 (07.3)

Table 3. Assessment of attitude toward in-flight medical emergencies ($n = 302$).

Statement	Mean ± SD
1. I need more training in managing in-flight medical emergencies.	4.49 ± 0.78
2. I am afraid of the medico-legal implications that may arise from my assistance in an in-flight medical emergency.	3.91 ± 1.01
3. I will stay out of an in-flight medical emergency if someone else is already offering their assistance.	3.67 ± 1.06
4. I would not offer assistance if I am not familiar with the nature of the emergency, even though I am the only healthcare professional onboard.	2.94 ± 1.20
5. I would identify myself as a doctor and offer assistance in the event of an in-flight medical emergency.	2.82 ± 1.10
6. My medical training has given me adequate knowledge and skills to render assistance during an in-flight medical emergency.	2.67 ± 1.02
7. I would currently feel confident responding to an in-flight medical emergency and providing competent care.	2.53 ± 1.01
8. I have an adequate understanding of the manner in which the aircrew, ground-based medical control, and the onboard volunteer healthcare provider collaborate to manage an in-flight medical emergency.	2.49 ± 1.11
9. I have an adequate understanding of the level of training of commercial aircrew in managing in-flight medical emergencies.	2.38 ± 1.08
10. I have an adequate understanding of what medical supplies are available on commercial airplanes.	2.29 ± 1.09
Total attitude score	30.2 ± 4.55
Level of attitude	N (%)
Negative	23 (07.6)
Neutral	265 (87.7)
Positive	14 (04.6)

Table 4. Differences in the score of attitude related to the basic demographic characteristics and experiences with in-flight emergencies ($n = 302$).

Factor	Attitude Score (50) Mean ± SD	Z-test	P-value [§]
Age group			
≤22 years	30.1 ± 5.62	0.112	0.910
>22 years	30.2 ± 3.94		
Gender			
Male	30.5 ± 4.87	0.806	0.420
Female	29.8 ± 4.17		
Academic year level			
4th-year level	29.3 ± 4.37	2.313	0.021 **
5th-year level	30.9 ± 4.59		
Received training courses in the management of in-flight medical emergencies			
Yes	33.8 ± 5.20	1.936	0.024 **
No	30.1 ± 4.51		
Have you ever encountered any in-flight medical emergency before?			
Yes	29.8 ± 4.08	0.741	0.459
No	30.2 ± 4.61		
Have you received any life support training?			
Yes	30.2 ± 4.42	0.252	0.801
No	30.1 ± 4.78		

Table 5. Relationship between participation in life support training among the basic demographic characteristics and experiences with in-flight emergencies ($n = 302$).

Factor	Received life support training		P-value[§]
	Yes N (%) ($n = 189$)	No N (%) ($n = 113$)	
Age group			
≤22 years	60 (31.7)	40 (35.4)	0.514
>22 years	129 (68.3)	73 (64.6)	
Gender			
Male	93 (49.2)	65 (57.5)	0.161
Female	96 (50.8)	48 (42.5)	
Academic year level			
4th-year level	78 (41.3)	68 (60.2)	0.001 **
5th-year level	111 (58.7)	45 (39.8)	
Received training courses in the management of in-flight medical emergencies			
Yes	07 (03.7)	01 (0.90)	0.266
No	182 (96.3)	112 (99.1)	
Have you ever encountered any in-flight medical emergency before?			
Yes	21 (11.1)	11 (09.7)	0.707
No	168 (88.9)	102 (90.3)	