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Research

Emergency medical services core competencies: a Delphi study

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Abstract

Introduction

The emergency medical services (EMS) education in Saudi Arabia has evolved considerably during the past decade and this rapid improvement has seen a disparity of educational approaches. Therefore, a core competency framework which aligns with the requirements of Saudi EMS education should be identified and accommodated. The aim of this study was to obtain professional group consensus on the desirable core competencies for EMS Bachelor degree graduates in Saudi Arabia in order to develop a core competency framework for Saudi Arabian EMS.

Methods

A two-round Delphi method using a quantitative survey with a purposeful sampling technique of expert information-rich participants was used. The instrument comprised 40 core competency statements (rated on a 1-10 Likert scale, with 1 being 'not important at all' and 10 being 'extremely important') and an open-ended question. An international systematic scoping review and local national review informed the items in this study.

Results

At the end of the second round, the response rate was 70%, and the sample demonstrated diversity in terms of qualifications, expertise and discipline. All core competencies achieved a majority and stability in the first and second rounds. Core competency items achieved the 75% consensus requirement.

Conclusion

This study provided consensus on 41 core competencies specific to Saudi EMS industry requirements. However, the findings do not represent a definitive blueprint model for alignment into EMS curricula. Further research and statistical modelling for the core competencies are highly recommended.

Keywords:

attributes; competence; EMS; paramedic; Saudi Arabia

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Introduction

While the history of emergency medical services (EMS) in Saudi Arabia dates back to 1934 (1), educationally and academically the system remained stagnant for more than 70 years. In the past decade, however, the education of EMS has been revolutionised: first, with the development of local EMS diplomas, whereby paramedics were trained to provide advanced life support (ALS) care to patients; and second, by the replacement of diplomas in 2012 with Bachelor degrees, according to recommendations made by the World Health Organization (2).

Starting in 2007, Bachelor degree programs were developed either indigenously or in collaboration with other established universities, such as Flinders University in South Australia. Saudi Arabia has one of the most established EMS academic training programs (3), and currently offers over 10 university or college Bachelor degree programs (1). However, a diversity of educational approaches between the different universities and colleges is evident (1) and this inconsistency between academic programs risks the development of a mismatch between educational output and industry competency requirements specific to Saudi Arabia.

Such disparity of educational approaches can also result in variation in terms of how graduates from different EMS programs manage and communicate with patients, particularly as paramedic guidelines and medical oversight are fundamentally restrictive in managing the range of pre-hospital contexts and circumstances and levels of medical ambiguity (4). Furthermore, the delivery of adequate and safe patient care by paramedics is reliant on competence in making critical decisions about the incident scene, safety concerns, available equipment, the patient's condition and other complex aspects of pre-hospital care. As such, identifying the correct core competencies and applying them to EMS educational programs will facilitate the progression of competent EMS graduates into the workforce and the improvement of overall patient care.

Author contributions

Talal Alshammari: study conception, collated and analysed data, provided statistical assistance and helped write the paper. Paul Jennings: study conception, and helped write the paper. Brett Williams: study conception, discussed core ideas to study, and helped write the paper.

Methods

Study design

This study utilised a Delphi method, a quantitative survey technique that gathered the opinions of selected experts in the field of Saudi EMS with the aim of obtaining group consensus on the desirable core competencies for EMS Bachelor degree graduates. According to Crutzen (5) where there is scarcity

of scientific knowledge on a certain topic, it is useful to adopt the Delphi method. This is particularly relevant in the context of Saudi Arabia, where a relatively small disciplinary field, geographical distance and a lack of anticipated conferences and scientific gatherings means there is limited scope for EMS experts to meet face-to-face. The anonymity of a Delphi study is also conducive to merit-based responses and limits the effects of peer pressure (6). The iteration of a Delphi study was conducted to give the experts opportunity to amend their responses between rounds.

Setting

The surveys were distributed and returned using an internet-based Qualtrics questionnaire, which was delivered to participants via email. Ensuring participants' anonymity was crucial as it enabled them to freely divulge their professional judgements on the topic. The survey was sent to participants on an individual basis to ensure their identity remained anonymous and email addresses were protected. Individual responses were received via Qualtrics for collection by the researcher, thereby adding another layer of anonymity (7).

Participants

As expert information-rich participants were the target sample, a purposeful sampling technique was utilised. There are generally no specific guidelines for choosing experts in the Delphi method (8). However, there are three general criteria for eligibility as a Delphi participant: 1) that participants hold a relevant degree and have the requisite background and experience in the field (to meet this criterion in the current study a minimum qualification of Bachelor degree was set); 2) participant's willingness to contribute to the study; and 3) a willingness to review the initial judgements with the aim of attaining study consensus (8,9). It is important to acknowledge that the expert selection method utilised may be subjective.

The expert participants on the Delphi study panel comprised two main groups. The first group represented the 10 academic EMS programs in Saudi Arabian universities and colleges and were targeted for their specific perspectives on academic practice, student concerns, research and, ultimately, the core competencies they deemed would best serve the Saudi EMS system. The second group of 10 experts represented industry stakeholders from the different hospital and EMS providers, and occupied leadership, clinical and administrative positions. This group also included one of the few Saudi female paramedic leaders. This group of experts represented the different fields involved in Saudi EMS provision including disaster management, emergency medicine, quality management, EMS training, accreditation and medical and operational supervision. The literature on the Delphi method recommends 10 to 18 expert participants (10) therefore 20 individuals were invited to participate in the study to allow for drop-outs between Delphi rounds and those who declined to participate (11).

Instrumentation

Before delivering the instrument via the Delphi process, a pilot face and content validity study was undertaken. Validity measures an instrument's scientific utility, specifically how well an instrument measures what it purports to measure (12). The study involved the nomination and sending of invitations to eight academics from various health professional disciplines involved in EMS education and research. The instrument was prepared in English and the nominated participants included two native Arabic speakers who were fluent in the English language. Several amendments were performed based on the participants' feedback.

The purpose of the Delphi study was to produce a Saudi-specific EMS core competency instrument, which is the result of an international scoping review (13) and a review of Saudi national EMS Bachelor programs (1). The first part of the survey comprised seven demographic questions which included gender, age, qualification, experience, medical discipline, professional role and nationality. The second part comprised 40 core competency statements rated on a 1-10 Likert scale where 1 represents 'not important at all' and 10 represents 'extremely important'. Finally, an open-ended question was added: 'If there is another core competency statement that you think is missing, please write it here'. The survey was amended following each round. This is an important advantage of the Delphi technique as the sequential nature of Delphi questionnaire rounds permits modification of the study instrument between rounds (14).

Procedures

First round

The 20 prospective expert participants were contacted by email via a Qualtrics software anonymous link, and consent to participate in the study was implied by their accessing of the Qualtrics email link and completion of the survey. One week after the initial email, a follow-up reminder email was sent, after which the first round of the study concluded.

Feedback report

Of the 20 expert prospective participants contacted, 17 agreed to participate in the study. All participants completed the entire survey and five participants responded to the optional open-ended question. Following a review of comments by the authors a decision was made to add another core competency item, 'be able to demonstrate English language proficiency to an adequate level for appropriate professional communication', to reflect the fact that English is the medical language used in Saudi Arabia. Another item regarding disaster preparation and management was amended to include the phrase 'and terrorist incidents', based on input from three of the expert participants. Two other responses were disqualified for the following reasons:

1. Statement: 'health advocacy for the community' was already

included under item 13, 'be able to provide health and social advocacy responsibly'.

2. Statement: 'be able to maintain personal wellbeing and fitness' was already included under item 32, 'understand the need to maintain an appropriate level of physical and mental fitness'.

The statistical feedback report was made up of seven categories as follows: minimum, maximum, central tendency (mean), level of dispersion (standard deviation), variance, count (frequency) and the number and percentage of responses to each of the item levels. The feedback report omitted the demographic information and was limited to collective responses to ensure anonymity of the participants during the collection process. The adopted consensus level was 75%, as per the recommendation of Keeney (15). While all core competency statements reached consensus above 75%, the statements were included in the second round of the Delphi survey to allow participants an opportunity to change their opinion based on the feedback report and personal judgement. Moreover, since only one new statement was generated and one amendment made, carrying all statements through the entire Delphi process represented best practice (16).

Second round

The feedback report from the first round was emailed to participants together with an invitation to complete the second round of the Delphi study. The response rate fell to 14, and only one response was received to the open-ended question to generate new or missing core competency statements. The generated statement 'be familiar and friendly to a multi-cultural society in hospitals, companies and Hajj' was disqualified as it was already included under item 2 'be able to practise with respect and non-discriminatory manner'.

Data analysis

Delphi method consensus varies between different studies both statistically and in the use of terminology; some include post hoc figures while other studies assign specific ranges that vary from 51-80% or utilise other techniques (6,9). In the current study, the established 75% item consensus was adopted and a systematic procedure for Delphi termination was adopted from Dajani (17), where the basic tenets of the procedure are as follows:

- Consensus: complete and unanimous agreement between the participants
- Majority: more than 50% agreement between participants
- Bipolarity: when there is an equal divide between participants
- Plurality: the agreement of the largest subgroup between the respondents
- Disagreement: when each participant has differing views from all other respondents.

Another approach to testing consensus and stability is proposed by Scheibe (18), where the basic aim is to achieve a state of equilibrium between each iteration and a marginal change of less than 15% for each Delphi item. The survey data was exported from the Qualtrics software into a Microsoft Excel spreadsheet for analysis.

Ethics

Consent was implied when participants opened the Qualtrics email link and they completed the survey electronically. Approval from the Monash University Human Research Ethics Committee was granted on 28 February 2017, and the study ascribed project number 8072. In addition, the Saudi Red Crescent Authority granted approval on 18-5-1438 Hijra, equivalent to 15 February 2017, project number 81211.

Results

As presented in Table 1, a diverse range of qualifications, expertise and disciplines was found among the expert participants.

In accordance with established Delphi stability and agreement criteria, Dajani (17) all core competency statements achieved a majority in each round. Moreover, all core competency items (whether original, new or modified) surpassed the 75% consensus requirement (Table 2) (15). All items in this study achieved the Scheibe (18) criteria, with the highest marginal difference in item 36 at 9.1% change between the two rounds. All items demonstrated an increase in the level of consensus between rounds, with a minimum increase of 0.2% for item 9, and indicated the highest level consensus possible. (16)

The initial round generated five statements with a new core competency and an amendment, while the second round only generated one disqualified statement which therefore indicated stability (19). In order to maintain research rigor, a 70% response rate is considered the minimum recommended rate (16). In the current study, the response rates in the first and second rounds were 85% (17 out of 20) and 70% (14 out of 20), respectively. It was therefore anticipated that the response rate would fall below 70% if another round was introduced (20,21).

Discussion

The findings demonstrate that the Delphi technique is an effective methodology for establishing consensus in the development of EMS core competencies. Within health sector research, there is evidence of the Delphi method's usefulness as expert knowledge in the different disciplines is held by a group of recognised field experts (7). Moreover, educational research has sometimes depended on the use of the Delphi method, especially for curriculum outcome development. In the

context of conducting the current study, the method has proved useful in overcoming the major disadvantages of nominal group techniques, including senior expert dominance, geographical distance and difficulty in reaching consensus (22).

Complete consensus was obtained in this study and all results were shown to be stable between rounds. The choice of consensus percentage was decided before data collection as it was expected that all items would be considered important for the newly established Saudi EMS educational system (1).

Table 1. Demographic information

	Category	First round	Second round
Gender	Male	16	13
	Female	1	1
	Total	17	14
Age group (years)	18-28	1	1
	29-39	10	9
	40-49	6	4
	50 or above	0	0
	Total	17	14
Highest qualification	Certificate	0	0
	Diploma	0	0
	Bachelor degree	6	5
	Master degree	8	7
	PhD	3	2
	Total	17	14
Years of EMS experience	1-4	3	3
	5-9	4	3
	10 or more	10	8
	Total	17	14
Primary medical discipline	Paramedic	9	8
	Nurse	2	2
	Physician	5	4
	Respiratory care	1	0
	Total	17	14
Main professional role	Administrative/ leadership	11	9
	Education/ academic	5	4
	Clinical/patient care	1	1
	Total	17	14
Nationality	Saudi	15	13
	Egyptian	1	1
	Jordanian	1	0
	Total	17	14

Table 2. List of core competencies for both rounds

Item	First round		Second round	
	Mean	Std	Mean	Std
Be able to practise within the legal and ethical boundaries of the profession (Item 22)	9.59	.69	9.64	.61
Be able to maintain appropriate and effective safety procedures (Item 23)	9.59	1.19	9.64	.48
Be able to practise with respect and non-discriminatory manner (Item 2)	9.41	1.09	9.64	.48
Be able to conduct appropriate decision making and critical thinking (Item 9)	9.41	1.46	9.43	.49
Be able to provide appropriate and effective clinical care (Item 8)	9.35	1.23	9.79	.56
Be able to work as part of a team in a collaborative and professional approach (Item 3)	9.18	1.38	9.64	.61
Have the ability to take patient history and conduct examination and assessment of both adults and children (Item 24)	9.18	.86	9.50	.63
Be able to conduct appropriate scene management (Item 25)	9.18	.98	9.57	.49
Be able to effectively communicate information verbally and non-verbally to patients, colleagues and others (Item 1)	9.12	1.18	9.43	.82
Be able to demonstrate English language proficiency to an adequate level for appropriate professional communication (Item 41)	-	-	9.07	.96
Be able to maintain good coping skills to deal with stressful situations (Item 20)	8.94	.87	9.21	.56
Be able to demonstrate a high level of understanding for practice standards and protocols (Item 35)	8.94	1.00	9.21	.67
Be able to conduct themselves to a high professional behavioural standard (Item 19)	8.88	1.41	9.43	.61
Have the theoretical knowledge of key concepts in the EMS profession (Item 7)	8.82	1.82	9.14	.99
Be responsible for the quality of patient care (Item 18)	8.82	1.46	9.57	.73
Be able to maintain the appropriate personal characteristics of being trustworthy and accountable (Item 26)	8.82	1.10	9.50	.50
Be able to problem-solve by assessing professional issues and calling upon the required experience and knowledge to resolve them (Item 10)	8.76	1.35	9.29	.59
Be able to maintain situational awareness at all times, whilst working in unpredictable situations (Item 11)	8.76	1.39	9.21	.77
Be able to maintain appropriate patient interaction and welfare of patients (Item 16)	8.76	1.11	9.29	.88
Be able to work as autonomous professionals with high levels of personal professional judgement (Item 28)	8.76	1.11	9.29	.70
Be able to work with different equipment and technology within the scope of practice (Item 32)	8.76	1.63	9.43	.62
Be able to maintain accurate and comprehensible record keeping within the scope of practice (Item 33)	8.76	1.52	9.14	.74
Be committed to a process of continuous lifelong learning and professional development (Item 21)	8.65	2.08	8.86	.83
Be able to reflect on their own experience and practise as professionals (Item 15)	8.59	1.19	9.29	.59
Be able to maintain an appropriate level of training through different professional courses (Item 30)	8.59	1.14	8.93	.88
Understand the need to maintain an appropriate level of physical and mental fitness (Item 31)	8.59	1.42	9.14	.64
Be able to manage personal emotions and those of patients and relatives (Item 12)	8.53	1.29	9.00	.76
Be able to provide mentoring and education when training others (Item 14)	8.53	1.88	8.64	1.11
Be able to provide care according to evidence-based practice (Item 17)	8.53	1.68	9.36	.72
Be able to work in different transportation modes (Item 29)	8.53	1.04	8.64	1.23
Be able to practise with appropriate Islamic values (Item 38)	8.53	2.23	9.29	1.33
Be able to maintain involvement with public and community health (Item 39)	8.41	1.42	8.64	.89
Be able to effectively practise in Umrah and Hajj (Item 40)	8.41	2.40	8.50	1.76
Be able to conduct an appropriate level of professional quality management (Item 34)	8.35	1.78	8.93	.80
Be able to demonstrate leadership skills (Item 5)	8.29	1.67	8.64	.89
Be able to provide health and social advocacy responsibly (Item 13)	8.24	1.31	8.86	.74
Be able to demonstrate an understanding of new technologies for clinical practice (Item 37)	8.24	1.93	8.86	.64
Be able to effectively supervise students and colleagues (Item 6)	8.18	1.76	8.21	1.21
Be information literate, by having the capacity to search and apply information (Item 4)	8.12	1.97	8.79	.56
Be flexible in learning from different sources including guidance from other colleagues (Item 27)	7.94	1.89	8.79	.77
Be able to prepare for and manage disasters and terrorist incidents (Item 36)	7.88	2.35	8.79	1.21

As the core competency statements were extracted, clustered and duplicates removed from previously published literature reviews (1,13), the initial Delphi round for item generation was removed. Therefore, the study concentrated on the following two Delphi rounds to achieve item consensus.

The expert participants overall ratings were high. However, five core competency statements emerged as the most important for Saudi EMS, namely legal and ethical practice, safety procedures, respect and non-discrimination, decision making and critical thinking and clinical practice. These results both converge and diverge from previous research in other EMS industries. When looking at the first concept of legal and ethical practice, an obvious similarity is with attributes from Australian graduates (23). However, in the United Kingdom study by Kilner (24) the same law and ethics concept was ranked only 30th in mean rank for paramedics. The importance of law and ethics can be seen in the study by O'Brien (25) and the UK Health and Care Professions Council (26) which established an entire dimension for ethical and legal responsibilities, consisting of four and eight statements, respectively. Legal and ethical EMS practice in Saudi represents the most important core competency, especially considering the nascent nature of the profession and the need to establish the associated legal structures.

Safety procedures were the second most important core competency for Saudi EMS. Safety is the first step in any interaction between paramedics both before and after arrival at a scene. Although not highly rated by UK paramedics (24), or adequately researched within the field of EMS, safety remains a mandatory tenet of any professional EMS governing association (26-29).

Respect and non-discrimination were also important concepts for Saudi EMS in a country with a multi-cultural population, especially during Hajj and Umrah. According to Spencer (30), 'health outcomes deteriorate when health professionals do not provide care that is culturally appropriate'. The concept not only affects patient interaction, but also other team members in their dealings with one another (31). As the workforce in Saudi Arabia is multi-national, educational curricula should accommodate the need for training and simulation which represent societal needs.

Decision-making and critical thinking was rated as the fourth most important core competency. This result was anticipated, as a previously conducted international literature review identified the same concept as the fourth most studied or endorsed core competency by eight different publications and professional EMS associations (13). Moreover, in the context of pre-hospital care, making critical decisions involves considerable cognitive and mental skills (24). In addition, the clinical duties of paramedics include many factors such as working in an exposed pre-hospital environment and, in particular, managing cases which the paramedic has never

dealt with before (32). Making critical decisions in the context of Saudi EMS is more holistic than simply providing clinical care (33). Therefore, educational curricula and simulation should involve other facets of pre-hospital care such as the police, civil defence and trauma centres.

Competence in clinical practice is central to being a pre-hospital care provider and is considered a critical facet of all EMS providers (34). Moreover, the importance of clinical competence in paramedic practice is highly rated (23,24). Unlike other core competencies, clinical practice is well established in educational curricula, (24) especially when conducted with appropriate internships (25,32). There is, however, a need for all other important core competencies to be accommodated in EMS curricula and training.

Following the findings of this Delphi study, it is recommended that future research involves a national study of Saudi Arabian EMS in which a larger sample size is statistically modelled. This would generate a competency framework model which best portrays the specific needs of EMS in Saudi and other countries.

While the Delphi methodology is an accepted research technique that has been practised for more than 50 years, (35) the methodology has been criticised for its limitations, primarily difficulties in generalising the results to the larger population. Small sample size is a common factor in Delphi studies (36). Due to the nature of Delphi studies, timing and logistical restraints, patient perspectives were not included in this study.

Conclusion

This is the first study that represents the views of key experts and stakeholders in Saudi EMS with the aim of reaching consensus on a core competency framework. The Delphi study achieved the required recommendations for majority, consensus, stability and response rate. The findings represent core competencies expected for paramedics in Saudi Arabia. However, the study results do not offer a definitive blueprint for the formation of EMS curricula. Further research and statistical modelling based on larger samples is recommended to develop a complete core competency model for adoption into university curricula.

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Conflict of interest

The authors declare no competing interests. Each author of this paper has completed the ICMJE conflict of interest statement. Brett Williams is an Associate Editor of the *Australasian Journal of Paramedicine*.

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