

KNOWLEDGE AND SKILLS OF PREHOSPITAL CARE PERSONNEL IN SULTAN AHMAD SHAH MEDICAL CENTRE@IIUM: A CROSS- SECTIONAL SURVEY

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Abstract

Background: Pre-hospital care in Malaysia mostly consisted of Assistant Medical Officers (AMOs) and nurses played a big role in minimizing the consequences of the injuries by conducting a good assessment and executing the correct clinical treatment on scene before reaching the hospital. However, there is no structured training and competency program for pre-hospital personnel in the studied setting. **Aim:** The present study aimed to identify the baseline knowledge and skills of AMOs and nurses in prehospital care at Sultan Ahmad Shah Medical Center @ International Islamic University Malaysia (SASMEC @ IIUM). **Method:** This study employed a self-administered questionnaire that originated from the WHO's Essential Knowledge and Skills Questionnaire for prehospital care, using a cross-sectional survey design and convenience sampling. Pre-hospital care knowledge, skills, and demographic characteristics are all included in the questionnaire. The SASMEC @ IIUM Emergency and Trauma Department is where the data were collected. **Result:** A total of 73 participants participated in this survey. The perceived level of knowledge and skills of AMOs and nurses in prehospital care at SASMEC @ IIUM are still not completely performed as a whole, based on all the elements required in the self-evaluation questionnaire are not fully recognized and mastered. Nonetheless, there is a positive association ($p < 0.000$) between the AMOs and nurses' knowledge and abilities, indicating that the more prehospital care a person knows, the more proficient they are in providing it. **Conclusion:** This study's findings indicated that a specific initiative should be taken to enhance the prehospital service by providing structured in-house training.

Keywords: Prehospital Care, Competency, Knowledge, Skills, Assistant Medical Officer, Nurses.

INTRODUCTION

One of the most important parts of the healthcare delivery system is pre-hospital care. It is described as providing patients with emergency medical treatment prior to their hospital arrival following the activation of emergency medical services by either bystanders or prehospital care personnel (Wilson et al., 2015). The origins of prehospital care traced back to the initiatives of Dominique Jean Larrey during the Battle of Spire (Sanjay & Abhilash, 2019). Emergency medical services (EMS) rely heavily on prehospital care because it can save lives. Prompt and appropriate management, such as treating patients on the scene (out-of-hospital treatment) and

transferring them to a designated trauma centre, can reduce the risk of secondary injuries and enhance patient outcomes during the transfer process (Sanjay & Abhilash, 2019; Maegele, 2015).

The core focus of prehospital care revolves around delivering direct and sensible treatments based on the likely causes of early death. The objectives of prehospital care encompass addressing airway obstruction, preventing secondary brain injury, managing hemorrhagic shock, and averting the deterioration of an unstable spine (von & Bengler, 2014). In pursuit of these goals, prehospital providers have honed specific skills to extend care closer to the injury site. This comprehensive approach ensures effective and targeted interventions, emphasizing both practical and direct care to enhance patient outcomes (O'Connor et al, 2023; O'Connor et al, 2021).

In addition, the training of prehospital care providers has developed into two primary practice areas: emergency medical technician (EMT)-basic, which emphasizes quick transport and spine stabilization, and EMT-paramedic, which emphasizes all aspects of advanced life support (ALS) (von & Bengler, 2014). However, several of these advanced practices have faced significant challenges in prehospital care providers from the past decades till today (O'Connor et al, 2023).

Prehospital care services in Malaysia are run by hospital emergency departments, with the use of a universal system, sometimes known as the "999" system, which was implemented in 2008 to facilitate the dispatch of ambulances from the hospital to the scene. A Malaysian study looks at seven essential elements that are necessary for every prehospital care system's early development. (Chew & Chan, 2014). Manpower, training, facilities, communication, access to care, and organized patient record-keeping are some of these components. To ensure sustainability and continuity of efforts, however, the development of the prehospital care system should not be seen as a series of band-aid fixes, but rather as a means of addressing serious root issues (Chew & Chan, 2014).

Prehospital care systems exist in Malaysia today in a complex web of interconnected government, semi-government, and non-government organizations, each with its own requirements for qualifications and training. These systems, which are considered to be in the process of development, primarily provide ambulance services through government hospitals such as the nearby Hospital Tengku Ampuan Afzan (HTAA), semi-government organizations such as SASMEC @ IIUM, and non-governmental organizations like Private Hospitals and Clinics in Kuantan, Pahang. Furthermore, a growing portion of emergency medical services, including prehospital treatment, are provided by quasi-government organizations like the Civil Defense Department (MCCD), non-governmental organizations like the Red Crescent (RC), and St. John Ambulance of Malaysia (SJAM).

When it comes to prehospital care providers' education and training in Malaysia, they employ an ad hoc methodology (Hisamuddin, Hamzah & Holliman, 2007). Prehospital care professionals in ambulances and hospital-based Assistant Medical Officers (AMOs), who do prehospital care, when necessary, have different roles and related educational programs. (Perry, Reynolds & Clare, 2018). Other prehospital care workers frequently just receive extended basic or advanced first aid training, whereas AMOs receive tertiary training. Due to this diversity, the workforce is made up of people with different backgrounds, occupations, and points of view. This could result in competing interests that could obstruct Malaysia's efforts to advance prehospital care.

Furthermore, as of 2022, the Department of Statistics Malaysia (2022) reports that the leading cause of death in Malaysia is ischemic heart disease, which is followed by cerebrovascular diseases, pneumonia, transport accidents, and malignant neoplasms of the lung, trachea, and bronchus, with respective percentages of 15%, 12.2%, 8.0%, 3.8%, and 2.4%. Major causes of death such as transport accidents and ischemic heart disease are time-sensitive illnesses that need to be treated quickly, along with efficient prehospital care management from the scene of the accident to a final treatment facility. Moreover, prehospital care has always offered medical attention intending to prevent disability and save lives. Studies have shown that the ability of the staff, in particular their knowledge, abilities, and attitude to provide treatment at the scene and during transport to a definitive care centre, is crucial to the effectiveness of pre-hospital performance. (Sanjana, Widyandari & Agustini, 2023; Nurumal et al, 2022; Waldrop et al., 2020; Nurumal et al, 2014).

A study done by Jansson et al., (2020) on the quality of care provided before hospitalization has significant developments in care necessitate adjusting staff competency in areas such as on-scene care, care during transportation, and care for patients in time-critical situations. High staff competency may also improve prehospital care. Consequently, it is thought that a high level of competency, particularly in the context of prehospital care personnel's skills and knowledge, contributes to the prehospital care system's high efficacy rate of success, which can reduce the mortality rate brought on by the exacerbation of disease or complication on-scene or during hospital transportation.

Hence, the literature continues to grapple with the question of how education or training in prehospital care contributes to enhancements in patient care (O'Connor et al, 2023; Perry, Reynolds & Clare, 2018; Giddens et al., 2012; Spaite et al., 2000). This ongoing debate progressively focuses on determining the most beneficial way to provide training for the competency of prehospital care personnel.

The SASMEC @ IIUM started operating in May 2016. The SASMEC @ IIUM not only offers medical care to the local community, but it is also developing a tertiary referral centre, an undergraduate and graduate teaching hospital, and other facilities. This hospital is equipped with 300 inpatient beds and is supported by more than 133 specialists. Emergency Medicine and Trauma Service (EMTS) is regarded as the SASMEC @IIUM's frontline and critical service. It is a speciality domain that provides clinical care for a variety of acute medical infirmities, illnesses, or injuries. This entails providing emergency critical medical care, including diagnostic, resuscitation, and stabilisation components, as well as lifesaving interventions. Besides, the general scope of EMTS includes both pre-hospital and hospital-based medical care. Since this hospital has just been open for business for the past five years, research on the impact of non-tertiary training programs on the professional growth of prehospital care professionals developing systems is conspicuously lacking. In response to this gap in the literature, the present study aims to investigate the baseline knowledge and skills of Assistant Medical Officers (AMOs) and nurses in prehospital care at SASMEC @ IIUM.

METHOD

This study employed a quantitative cross-sectional study design to determine the baseline knowledge and skills of AMOs and nurses working at SASMEC@ IIUM's Emergency and Trauma Department (ETD), one of the hospitals actively involved in prehospital care in the Kuantan area. Furthermore, the SASMEC @ IIUM is clustered to deliver a prehospital service locality around Kuantan, Pahang. The medical personnel who worked in the ETD of SASMEC@ IIUM consisted of registered nurses, assistant medical officers, and emergency medical officers.

The inclusion criteria for studied participants in this study were all the ETD of SASMEC@ IIUM staff such as nurses, AMOs and medical officers who were directly involved in prehospital care services for more than a year. Those who refused to participate in the study or were on leave at the time of the survey served as the study's exclusion criteria. Those who satisfied the requirements for inclusion were contacted and given the option to freely complete the self-administered survey. Using the Raosoft Sample Size Calculator, the sample size is determined with a 50% response distribution, a 95% confidence interval, and a 5% margin of error. After the calculation was completed, the recommended sample size for this study was 97 participants. However, only 73 participants participated in this study and the response rate of participants was 75.3% of the total sample size required.

This study employed a self-administered questionnaire from a previous research study. (Nurumal et al, 2014). The questionnaire originated from the Essential Knowledge and Skills Questionnaire (EKSQ) for prehospital care by the World Health Organization which is modified by the author to suit the cultural background of Malaysia setting. The questionnaire consisted of two parts; A) demographic data and B) knowledge and skills measurement on prehospital care. The demographic information includes the participants' age, gender, level of education, working experiences, and completion of professional development courses including Trauma, Advanced Life Support (ALS), and Basic Life Support (BLS). There are five primary subscales in the knowledge and skills: alert, scene survey, provider safety, patient assessment, and intervention. There are 58 items in total. The questionnaire is structured as a dichotomous option of "yes" or "no" and the competency of pre-hospital care personnel variable was in two columns, knowledge and skill. The minimum score of "0" refers to "no" knowledge or skills and the maximum score of "58" refers to "high" knowledge or skills of prehospital care competency of the studied participants. This questionnaire has been tested for reliability and it showed the Cronbach Alpha value of 0.89 in a previous study.

The International Islamic University Malaysia Research Ethics Committee (IREC), the Clinical Research Center (CRC) of SASMEC @ IIUM, and the Kulliyah of the Nursing Postgraduate Research Committee (KNPGRC) granted their ethical permissions prior to the data collection. Additionally, each participant in this study gave their informed consent. Because convenience sampling was utilized in this study to recruit participants and the data was not normally distributed, the data was analysed using both inferential statistical tests (Kruskal-Wallis and Mann-Whitney test) and descriptive statistical tests (frequency, percentage, mean, and SD) using IBM SPSS Version 26.0.

RESULTS

A total of 73 participants participated in this survey voluntarily and their demographic data is presented in Table 4.1. The majority of participants are female, with a total of 53 (72.6 %), while the minority of participants are male, with a total of 20 (27.4%). In terms of age, participants aged 21-30 made up 74% of the participants, with 54, while participants aged 31-40 made up 26% of the participants, with 19 persons out of 76. In terms of employment, nurses had the most replies (n=55, 75.3%), followed by Assistant Medical Officers (n=18, 24.7%).

For educational level, 70 participants (95%) hold a diploma in their respective disciplines with only 3 participants (5%) having a bachelor's degree. Regarding work history, the majority of participants (n=36, 47.4%) have had no experience at all to four years of employment, followed by 32 participants (42.1%), who have five to nine years of employment, and eight participants (10.5%), who have ten to fourteen years of employment.

The participants' working experiences as prehospital personnel were evaluated and classified into three categories, with the majority of participants having zero to four years of experience as prehospital staff (n=52, 71.3%). Meanwhile, the remaining participants (n=19, 26%) have five to nine years of experience as prehospital employees and just two (2.7%) have ten to fourteen years of experience as prehospital staff.

Requirement for prehospital care refers to credentials: Participants' credential qualifications are requested based on the qualifications of the prehospital care credential qualification. Only 68 participants (93.2%) had a valid basic life support certification, while the remaining participants (n=5, 6.8%) said that their basic life support certificates were expired and yet to be renewed. In terms of Advanced Life Support (ALS), the majority of participants (n=55, 75.3%) did not have the credential certification, and only 18 participants (24.7%) had. Trauma Care credential certification likewise has a low number of participants who have it, with just 13.7% (n=10) having it, while the remaining participants (n=63, 86.3%) do not.

Table 4.1: Sociodemographic Data (N=73)

Variables	Frequency (n)	Percentage (%)
Age		
21-30	54	73.9
31-40	19	26.1
Gender		
Male	20	27.4
Female	53	72.6
Job		
Nurse	55	75.3
Assistant Medical Officer	18	24.7
Educational Level		
Diploma	70	95
Post Basic	8	11
Bachelor	3	5
Year of experience as Nurse/ AMO/ Medical Officer		
0-4	52	71.3
5-9	19	26
10-14	2	2.7
Year of experience as Prehospital Staff:		
0-4	52	71.3
5-9	19	26
10-14	2	2.7
Credential Qualification:		
-Basic Life Support (BLS)		
Valid	68	93.2
Due for renewal	5	6.8
-Advanced Life Support (ALS)		
Yes	18	24.7
No	55	75.3
-Trauma Care		
Yes	10	13.7
No	63	86.3

In table 4.2, it represents the data of the total score for the knowledge level of prehospital care. It is being measured by using the Essential Knowledge and Skills Questionnaire (EKSQ). The knowledge level has a minimum score of 13 and a maximum score of 58, with a median total score of 55 (8).

Table 4.2: Prehospital Care Knowledge Level (N=73)

Characteristics*	Median (IQR)	Minimum	Maximum
Total Score of Knowledge	55 (8)	13	58

Table 4.3 shows the level of skills in prehospital care which is also being measured by using the Essential Knowledge and Skills Questionnaire (EKSQ). The participant's skill level was determined by a median total score of 55(15), with a minimum score of 2 and a maximum score of 58.

Table 4.3: Prehospital Care Skills (N=73)

Characteristics*	Median (IQR)	Minimum	Maximum
Total Score of Skills	52 (15)	2	58

The statistical analysis of the Mann-Whitney test or the Kruskal-Wallis test is also used to assess the relationship between prehospital care knowledge and sociodemographic data. Table 4.4 displays the tests' results.

Table 4.4: Relationship between Socio-demographic Data and Prehospital Care Knowledge N=73)

Variables*	Frequency (%)	Z-score	Statistical Test	p-value*
Age				
21-30	54 (73.9)	2.097	Mann-Whitney Test	0.018
31-40	19 (39.5)			
Gender				
Male	20 (27.4)	1.960	Mann-Whitney Test	0.025
Female	53 (72.6)			
Job				
Nurse	55 (75.3)	2.257	Mann-Whitney Test	0.012
Assistant Medical Officer	18 (24.7)			
Educational Level				
Diploma	70 (95)	2.878	Mann-Whitney Test	0.002
Post Basic	3 (5)			
Bachelor				
Year of experience as Nurse/AMO/MO				
0-4	52 (71.3)	2.878	Kruskal-Wallis Test	0.002
5-9	19 (26)			
10-14	2 (2.7)			
Year of experience as Prehospital Staff				
0-4	52 (71.3)	2.878	Kruskal-Wallis Test	0.002
5-9	19 (26)			
10-14	2 (2.7)			
Credential Qualification of:				
-Basic Life Support (BLS)				
Valid	68 (93.2)	2.748	Mann-Whitney Test	0.003
Due for renewal	5 (6.8)			
-Advanced Life Support (ALS)				
Yes	18 (24.7)	-	Mann-Whitney Test	0.000
No	55 (75.3)			
-Trauma Care				
Yes	10 (13.7)	3.090	Mann-Whitney Test	0.001
No	63 (86.3)			

***Mann Whitney U Test, p < 0.05**

The statistical analysis of the Mann-Whitney test or the Kruskal-Wallis test is also used to assess the relationship between prehospital care skills and sociodemographic data. Table 4.5 displays the tests' results.

Table 4.5: Relationship between Socio-demographic Data and Prehospital Care Skills (N=73)

Variables*	Frequency (%)	Z-score	Statistical Test	p-value*
Age				
21-30	46 (60.5)	1.341	Mann-Whitney Test	0.090
31-40	30 (39.5)			
Gender				
Male	27 (35.5)	2.457	Mann-Whitney Test	0.007
Female	49 (64.5)			
Job				
Nurse	49 (64.5)	2.512	Kruskal-Wallis Test	0.006
Assistant Medical Officer	13 (17.1)			
Medical Officer	14 (18.4)			
Educational Level				
Diploma	53 (69.7)	2.748	Kruskal-Wallis Test	0.003
Post Basic	9 (11.8)			
Bachelor	10 (13.2)			
Postgrad	4 (5.3)			
Year of experience as Nurse/AMO/MO				
0-4	36 (47.4)	2.409	Kruskal-Wallis Test	0.008
5-9	32 (42.1)			
10-14	8 (10.5)			
Year of experience as Prehospital Staff				
0-4	66 (86.8)	1.960	Kruskal-Wallis Test	0.025
5-9	9 (11.8)			
10-14	1 (1.3)			
Credential Qualification of:				
-Basic Life Support (BLS)				
Valid	67 (88.2)	2.748	Mann-Whitney Test	0.003
Due for renewal	9 (11.8)			
-Advanced Life Support (ALS)				
Yes	26 (34.2)	-	Mann-Whitney Test	0.000
No	50 (75.0)			
-Trauma Care				
Yes	19 (25.0)	-	Mann-Whitney Test	0.000
No	57 (75.0)			

***Mann Whitney U Test, p < 0.05**

The relationship between sociodemographic data and the knowledge of prehospital care, the result from the statistical test shows that there is an association between age, gender, job, educational level, year of working experience as clinical staff, year of working experience as a prehospital care staff and credential qualification with the knowledge of prehospital care with a p-value of < 0.05. As for the association between sociodemographic data and skill of prehospital care, all sociodemographic data shows statistically significant except for age with a p-value of, 0.05. For knowledge and skills, male participants scored higher in the overall knowledge and skill score.

DISCUSSION

Prehospital care is critical for reducing victim mortality and morbidity in the out-of-hospital setting. As a result, prompt response to provide immediate care is required before the victim is transported to the care centre. This study focused on assessing the baseline knowledge and skills of AMOs and nurses in prehospital care at SASMEC @ IIUM, given the critical role they play in minimizing the consequences of injuries before patients arrive at the hospital. Moreover, the absence of standardized training and competency for prehospital personnel in the current study setting also highlighted a crucial gap based on this study's findings. Therefore, the self-administered questionnaire employed in this study's cross-sectional survey design which was derived from the Essential Knowledge and Skills Questionnaire provided insightful information about the participants' current level of prehospital care knowledge and skills.

The results revealed that the perceived level of knowledge and skills among prehospital care personnel at SASMEC @ IIUM is not fully comprehensive. The self-evaluation questionnaire indicated that certain elements required for proficient prehospital care are not fully recognized and mastered by the participants. This underscores the need for targeted interventions to bridge these knowledge and skills gaps. This is also supported by a previous study done by Nandasena & Abeysena (2018) on the knowledge, attitudes, and abilities of physicians, nurses, and emergency medical technicians in Sri Lanka. They likewise received an overall good score for knowledge and skills, with the exception of a few areas like cricothyroidotomy (23%), pleural drainage (26%), and laryngoscope and intubation (31.4%). These results are consistent with research by Jansson et al. (2020) on the self-reported competency of 500 prehospital care nurses, which found that men performed better than women in the competency categories of medical technical Care and Care Environments Serious Events.

Regarding the working experiences of the studied participants, this study found that participants with longer working experiences scored better than those with less working experience. Jansson et al. (2020) discovered similar results, reporting that nurses possessing over three years of experience in ambulance services demonstrated significantly superior competence. This study's findings also twinned a previous study's finding where nurse experience was an important factor in improving competency skills in prehospital care (Nugroho, Soeharto & Utami, 2019). However, they described that the length of working experience may not be the only factor in improving the experience of nurses handling prehospital care. Besides the length of working experiences, providing regular training and simulation as similar and complex in prehospital care could also be performed for the prehospital care personnel to increase their competency skills in the hospital setting (Lawrence, Messias & Cason, 2018). Providing training and a good simulation program had the advantage of lowering the risk that the patient would face in prehospital care (Christensen et al, 2016). Therefore, while population-based studies encompassing all diagnoses are rare, prior research indicated that a quality simulation program could also enhance the knowledge of nurses and other healthcare professionals in providing prehospital care services to patients suffering from cardiac arrest, myocardial infarction, trauma, and stroke (Christensen et al, 2016; Lawrence, Messias & Cason, 2018; Nugroho, Soeharto & Utami, 2019).

Surprisingly, AMOs and nurses in this study have no difference regarding their knowledge and skills related to prehospital care. This finding is in contrast to a previous study's finding where AMOs have a greater number of competencies than other healthcare professionals, such as nurses and doctors, enabling them to diagnose and treat a wider range of illnesses (von Vopelius-Feldt, & Bengner, 2014). In this study, there is an association between educational level and the skill and knowledge of prehospital care. There is a contradiction with previous research by Jansson et al., (2020) which stated that there is no correlation between education level and prehospital care skill, higher education does appear to enhance participants' cognitive capacities. The contradiction might exist due to the local and cultural context of the research which may show that the educational curriculum is different.

For the credential qualification, the result of this study shows an association which shows that personnel with credential qualifications have higher skills and knowledge of prehospital care. Another research by Suryanto et al., (2018) also stated that the prehospital care knowledge and skills of the study participants were improved by the emergency-related training courses they completed. Besides, in this study, some of the participants were yet to renew their BLS credentials which might lead them to less competency skills in prehospital care. This finding was similar to a previous study where the author described that there was a lack of competence in resuscitation among prehospital personnel (Sulistyanto et al, 2022). Therefore, continuous professional development training is necessary to maintain prehospital care personnel's professional proficiency.

According to studies, prehospital medical staff have found that the simulation training program is an effective means of instruction and training (Suryanto et al., 2018; Jansson et al, 2020). It enables the practice of diagnosing, treating, and using tools and processes in real-world scenarios. The prehospital care staff must be knowledgeable about and trained in the indicated themes, which include triage, CPR, trauma care, intubation, and ventilation. These topics collectively make up a significant portion of prehospital care. Thus, providing training and monitoring of the renewal of BLS certificates for prehospital care personnel is essential in this process.

Lastly, the positive association obtained between knowledge and skills ($p < 0.000$) indicates that as the knowledge of prehospital care increases, so does the corresponding skill level. This association emphasizes the importance of investing in educational programs to enhance the overall competency of prehospital care personnel. Strengthening both knowledge and skills is crucial for improving the quality of prehospital care and, subsequently, patient outcomes. A previous investigation also brought attention to the insufficient knowledge and abilities of prehospital personnel in the assessment and management of burn victims, as well as in the areas of ventilation and adult and pediatric CPR (Abelsson et al, 2014).

CONCLUSION

This study draws attention to the current insufficiencies in prehospital care staff members' knowledge and abilities at SASMEC@IIUM. The absence of standardized training underscores the need for a specific initiative to enhance prehospital services. To address these issues effectively, comprehensive and standardized competency training should be developed and implemented. This initiative would not only improve

the quality of care provided by AMOs and nurses but also contribute to the overall efficiency of the prehospital care system.

LIMITATION

One of the potential limitations of this research study is its cross-sectional study design as it could only measure the variables at that current time and was unable to properly define the causal and effective relationship between sociodemographic data and the knowledge and skills of prehospital care. The relationship between the prehospital care knowledge and skills and the sociodemographic characteristics may possibly be impacted by additional unexplained confounding variables. To gain a better understanding, a qualitative research study should be carried out in the future to ascertain how prehospital care staff see their knowledge and abilities.

In this study, the data was collected by using a self-rated questionnaire which can cause reporting and recall bias. There is also a possibility that the frequency of symptoms or items in the survey given are under-reported, or the answers were exaggerated, thus the results had to be cautiously interpreted. Nevertheless, the participants have been informed by the researcher that their identities will remain anonymous, and confidentiality is assured to ensure that they are able to answer the questions honestly.

RECOMMENDATIONS

The results of this study suggest that specific interventions be put in place to improve the prehospital care staff at SASMEC@ IIUM about their knowledge and skills. A crucial step forward would be the development and implementation of a standardized competency educational programme for prehospital care. This programme should cover essential aspects of prehospital care, ensuring that personnel are well-equipped to handle diverse situations.

Furthermore, interventions such as simulations or short refresher programs are recommended to reinforce and update the latest theories and skills related to prehospital care. These initiatives can serve as valuable opportunities for continuous learning, allowing personnel to stay abreast of advancements in the field. Continuous education and skill development are essential for maintaining the competency of prehospital care personnel and ensuring the delivery of high-quality care to patients in need.

A Conflict of Interest

There are no conflicts of interest among the authors.

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