

ORIGINAL RESEARCH

Awareness of Emergency Department Workforce about the Operational Metrics: A Cross-sectional Study

Khalid Nabeel Almulhim^{1*}

1. College of Medicine, King Faisal University, Hofuf, Saudi Arabia

Received: August 2024; Accepted: September 2024; Published online: 31 October 2024

Abstract: **Introduction:** The awareness of the Emergency Department (ED) workforce about the department's operational guidelines and metrics is essential to optimize the workflow and reduce workload and patient revisits to the ED. Therefore, this study aimed to evaluate the knowledge of the ED workforce regarding operational metrics. **Methods:** We conducted a national cross-sectional study using an online survey in the Kingdom of Saudi Arabia between September and December 2020. ED personnel were studied regarding the ED operational metrics like laboratory/imaging turnaround times, ED length of stay, and patient revisits, linking them to quality care. Data was summarized and analyzed using the Jamovi statistical package. **Results:** One hundred sixty-six participants responded to our online survey. Ministry of Health hospitals represented the largest section (n=90, 54.2%), followed by academic hospitals (n=40, 24.1%). The frequencies of an exit block in the ED were reported as 2-3 days per week (29.5%), most days (24.7%), or daily (18.1%). 41% of the respondents did not know the metrics of lab and imaging turnaround time, while 21.7% did not know about the length of stay. Most respondents agreed that the principles of ED operation should be implemented in the training programs (88.6%) and reported their satisfaction with the productivity of their department in practicing effective operations (70.9%). **Conclusion:** About one-third of the ED workers were unaware of the key operational metrics of the ED. However, the respondents believe that implementing operational metrics for ED increases the quality of medical care and should be part of the training programs.

Keywords: Emergency Medicine, Saudi Arabia, Survey, Cross-sectional study, physicians

Cite this article as: Nabeel Almulhim K. Awareness of Emergency Department Workforce about the Operational Metrics: A Cross-sectional Study. Arch Acad Emerg Med. 2025; 13(1): e14. <https://doi.org/10.22037/aaem.v13i1.2451>.

1. Introduction

Although practicing emergency medical care is as ancient as medical practice, the field of Emergency Medicine (EM) has emerged since 1960 [1].

Afterward, developed countries started improving their EM delivery systems, especially with rapid technological advances, diagnostics, and therapeutics. Anderson et al. stated that EM is an important element of primary disease prevention and the mainstay of secondary disease prevention programs in the recent healthcare systems due to the simplicity, sustainment, and effectiveness of EM interventions, which can improve public health at all socioeconomic levels [1]. Graff et al. defined "medical quality" as the medical care that healthcare providers should receive if they are patients [2]. Healthcare quality measures include any data or elements related to the customers of the emergency department (ED), who are the patients visiting the ED, their family members, ED healthcare providers, purchasers, and payers. For example, decreasing the patients' waiting times,

visit duration, and revisits number is paramount for patients, their families, and healthcare providers; however, purchasers and payers are usually concerned about decreasing the cost and use of diagnostics and treatments [2].

Donabedian et al. designed a framework to assess the quality of care and divided it into structure, process, and outcome. The structure is parts of the ED, including its physical layout, medical and laboratory equipment, healthcare providers, clinical guidelines, and procedures.

On the contrary, outcome measures include the elements related to the patients, such as quality of life, morbidity, and mortality [3]. Exit or access block happens when ED patients cannot access adequate hospital beds within a reasonable timeline, indicating hospital dysfunction. This leads to more patient visits, longer hospital stays, and revisit times, highlighting the negative impact on workflow, increased workload, and patient mortality [4]. The Institute of Medicine has set 6 domains for standard quality of care: patient-centered, timely, safe, efficient, effective, and equitable. More importantly, efficiency and timeliness are paramount for emergency medicine. Using standard terminology and metrics is imperative to assess and measure the performance of ED physicians for ED operations management, regulatory burdens, and research [5].

High-income countries (HICs) currently have well-

*Corresponding Author: Khalid Nabeel Almulhim; College of Medicine, King Faisal University, Hofuf, Saudi Arabia Email: Knalmulhim@kfu.edu.sa; Tel: 00966548883299, ORCID: <http://orcid.org/0000-0001-8564-8620>.

developed quality assurance systems due to the advanced and powerful healthcare and patient statistics databases and registries, such as Scandinavia [2,6]. Saudi Arabia, a HIC, as of 2022, is one of the Middle East countries [7].

Saudi Arabia represents 60% of the Gulf Cooperation Council (GCC) countries' healthcare expenditure. The Saudi healthcare system is the third largest element of the Saudi 2022 budget (14.4%), after education and military [8]. This large investment in healthcare infrastructure lays a solid platform for creating and tracking ED operational measures. Despite these tools, there are still problems in establishing consistent awareness and usage of these measures across all segments of the ED workforce. Understanding how the hospital context affects operational efficiency is crucial for enhancing ED performance and patient outcomes.

The awareness of the ED workforce about the department's operational guidelines and metrics is essential to optimize the ED workflow, reduce workload and patient visit duration, and revisit numbers. This study aimed to evaluate the knowledge of the ED workforce regarding operational metrics.

2. Methods

2.1. Study design and setting

We conducted an online survey-based cross-sectional study on the national level in the Kingdom of Saudi Arabia between September and December 2020. ED personnel were studied regarding the ED operational metrics like laboratory/imaging turnaround times, ED length of stay, and patient revisits, linking them to quality care. Ethical approval was sought from the Institutional Review Boards (IRBs) of KFU-REC-2022-OCT-ETHICS262.

2.2. Participants

Saudi ED healthcare providers, either physicians and nurses, regardless of their geographical area or healthcare sector, were invited to participate. Healthcare providers were excluded if they were non-ED' healthcare providers.

2.3. Data gathering

We used a convenience sampling method to recruit eligible participants. Afterward, our questionnaire was disseminated online through social media platforms such as email, Twitter (direct messages), SMS, and WhatsApp.

2.4. Data variables and questionnaire

The primary outcome was to assess the overall knowledge level of ED healthcare providers about ED quality metrics. In addition, the knowledge of each participant was scored by the number of correct answers they were aware of. A 24-item survey was designed based on the relative literature and consisted of two parts. The first part included questions related to the demographic characteristics of the study participants, such as sex, age group, healthcare sector, place of the

primary training program, geographical area, title, and average annual patients visiting the ED. The second part of the survey was developed by consensus and discussion with 3 ED professors with expertise in ED operational metrics. Exit block frequency, Laboratory and imaging turnaround time, ED Length of Stay, Patient Revisit Alerts, and other additional metrics included the tracking of studies (e.g., ECG, lab, plain film, and CT studies per 100 ED visits), staffing alignment with patient arrival patterns, and the use of electronic medical records (EMR) were among the included specific operational metrics. The aim was to ask the participants about their knowledge of the operational metrics of the ED.

2.5. Survey reliability and validation

After developing the first version, three experts (EM professors and ED chairs) validated its face, criterion, content, and construct components (Supplementary file 1). Relative reliability measures were used, including internal consistency (Cronbach's alpha), inter-rater reliability, and test-retest reliability/repeatability (Pearson correlation). The Cronbach's alpha was >0.8 . A pilot study was conducted on 10 ED physicians for further evaluation before final implementation. The final survey was formulated in the English language.

2.6. Sample size calculation

The sample size was calculated using Epi Info. Assuming that most ED physicians are aware of the ED quality measures, we calculated the sample size to detect an awareness rate of 90

2.7. Statistical analysis

Data were summarized using descriptive statistics. Categorical variables of the study data, such as gender, hospital sector, and responses to the survey questions, were all presented as frequencies and percentages. Continuous variables of the study data, such as age, were reported in the form of mean and standard deviation (SD). For comparison between the four healthcare sectors, we used the chi-square test. A P-value less than 0.05 was considered for statistical significance. Data were analyzed using the Jamovi statistical package (version 2.0 for macOS). Bar and progress bar charts were created for the graphical presentation of the data using MS Excel 2022 for macOS (Microsoft corporation, the USA).

3. Results

3.1. Characteristics of the survey respondents

One hundred sixty-six participants responded to our online survey (48.2

3.2. Awareness and knowledge about the quality measures of ED

Overall, most participants reported that a combination of handwriting and Electronic Medical Records (EMR) is used for the routine daily work in the department. The frequencies of the used EMR are shown in Figure 1. Regarding

the frequency of an exit block, it was reported as 2-3 days per week by 49 participants (29.5). Regarding ED staffing and scheduling, 38.6% of the participants reported they receive alerts in case of patient revisit within 72 hours (25.3). Regarding the metrics of laboratory and imaging turnaround time, 41% of participants showed the opinion of participants about ED operational metrics implementation. Most respondents agreed that the principles of ED operation should be implemented in the training programs (88.6).

3.3. Comparison between the responses of participants in different sectors

When comparing the responses between the four hospital sectors, more participants from the military hospitals were trained in external training programs (41.2).

4. Discussion

Improving healthcare personnel's knowledge of ED systems and metrics is critical for optimizing efficiency, reducing burden, and lowering patient revisit rates. In this study, about one-third of ED staff are unaware of critical operational measures despite understanding their importance in enhancing treatment quality. Our study of 166 ED healthcare practitioners in Saudi Arabia yielded several findings. MOH hospitals had the most replies (54.2). Our results come in line with Jones et al. found that exit block was 64%. Regarding the ED staffing and scheduling, 33% more study is needed in Saudi Arabia to assess the efficacy of new training programs and healthcare system redesigns. Future studies should include larger, more diverse populations and evaluate long-term results. Furthermore, investigating new technologies to improve metric awareness and incorporating patient opinions can boost ED efficiency and care quality.

5. Strength points and limitations

Our study is the first to tackle the knowledge and awareness of emergency physicians about the ED system and quality metrics collectively. Participation of different sectors with different healthcare providers can be one of the strength points of the study, which can lead to the generalization of the results across Saudi Arabia; however, due to the small sample size, the findings must be interpreted with caution. Our study did not include an analysis of the knowledge of the ED's patients, which is needed to improve the ED's services and quality of care in the future. The number of participants shared in the survey is not an accurate representation of the overall number of Saudi ED physicians in each healthcare sector or geographical area. Also, the participants expressed their personal experiences in different provinces of Saudi Arabia with variable healthcare and socioeconomic classes. It is also important to note the sample size in the current study while interpreting the study findings, which may limit the external validity of the study. Lastly, the electronic nature of the survey hinders its reach out to low-resourced

healthcare providers across Saudi Arabia; besides, the generalized population- ED's healthcare providers- we conducted without focusing on specific individuals such as physicians; thus, we recommend further studies to tackle such areas in ED's healthcare providers such as physicians or nurses as them being the first defense line encountering ED's cases.

6. Conclusions

About one-third of the ED workers were unaware of the key operational metrics of the ED. However, the respondents believe that implementing operational metrics for ED increases the quality of medical care and should be part of the training programs.

7. Declarations

7.1. Acknowledgments

The authors would like to thank DataCliniX Ltd, Istanbul, Turkey, for analyzing the data and drafting the initial version of this manuscript.

7.2. Funding source

None to declare; this work was not funded by any third party.

7.3. Conflict of interest

None to declare.

7.4. Availability of data

Will be available on request.

7.5. Using artificial intelligence chatbots

None to declare.

References

- Anderson P, Petrino R, Halpern P, Tintinalli J. The globalization of emergency medicine and its importance for public health. *Bull World Health Organ.* 2006;84(10):835-9.
- Graff L, Stevens C, Spaite D, Foody J. Measuring and improving quality in emergency medicine. *Acad Emerg Med.* 2002;9(11):1091-107.
- Donabedian A. Evaluating the quality of medical care. *Milbank Q.* 2005;83(4):691-729.
- Mason S, Knowles E, Boyle A. Exit block in emergency departments: a rapid evidence review. *Emerg Med J.* 2017;34(1):46-51.
- Welch SJ, Asplin BR, Stone-Griffith S, Davidson SJ, Augustine J, Schuur J. Emergency department operational metrics, measures and definitions: results of the Second Performance Measures and Benchmarking Summit. *Ann Emerg Med.* 2011;58(1):33-40.
- Sørup CM, Jacobsen P, Forberg JL. Evaluation of emergency department performance - a systematic review

- on recommended performance and quality-in-care measures. *Scand J Trauma Resusc Emerg Med.* 2013;21:62.
7. Review WP. High-Income Countries 2024: World Population Review; 2024 [Available from: <https://worldpopulationreview.com/country-rankings/high-income-countries>].
 8. Saudi Arabia - Healthcare 2019 [Available from: <https://www.trade.gov/country-commercial-guides/saudi-arabia-healthcare>].
 9. Khaled Fahim N, Negida A. Sample Size Calculation Guide - Part 1: How to Calculate the Sample Size Based on the Prevalence Rate. *Adv J Emerg Med.* 2018;2(4):e50.
 10. Jones PG, Olsen S. Point prevalence of access block and overcrowding in New Zealand emergency departments in 2010 and their relationship to the 'Shorter Stays in ED' target. *Emerg Med Australas.* 2011;23(5):587-92.
 11. Richardson D, Kelly AM, Kerr D. Prevalence of access block in Australia 2004-2008. *Emerg Med Australas.* 2009;21(6):472-8.

Table 1: Demographic characteristics of the study participants

Variable	N (%)	Variable	N (%)
Age group (year)		Sex	
20 – 30	80 (48.2)	Female	87 (52.4)
31 – 40	58 (34.9)	Male	79 (47.6)
41 – 50	25 (15.1)	Sector	
51 – 60	1 (0.6)	Academic hospitals	40 (24.1)
> 60	2 (1.2)	Military hospitals	17 (10.2)
Geographical area		Ministry of Health hospitals	90 (54.2)
Central Region	13 (7.8)	Private hospitals	19 (11.4)
Eastern Province	114 (68.7)	Training program	
Northern Province	3 (1.8)	External training program	38 (22.9)
Southern Province	10 (6.0)	Haven't started	14 (8.4)
Western Province	20 (12.0)	Local programs\$	114 (68.7)
Other (please specify)	6 (3.6)	Title	
Average annual visits (number)		Admin#	9 (5.4)
< 50,000	26 (15.7)	Attending Physician	25 (15.1)
50,000 to 70,000	28 (16.9)	Leader*	13 (7.8)
70,000 to 100,000	18 (10.8)	Nurse	43 (25.9)
> 100,000	32 (19.3)	Paramedic	2 (1.2)
I don't know	62 (37.3)	Specialist/fellow	20 (12.0)
		Trainee (resident or nurse)	54 (32.5)

Data are presented as numbers (%). \$: SCFHS programs; #: non-healthcare provider; *: section head, chairperson, director.

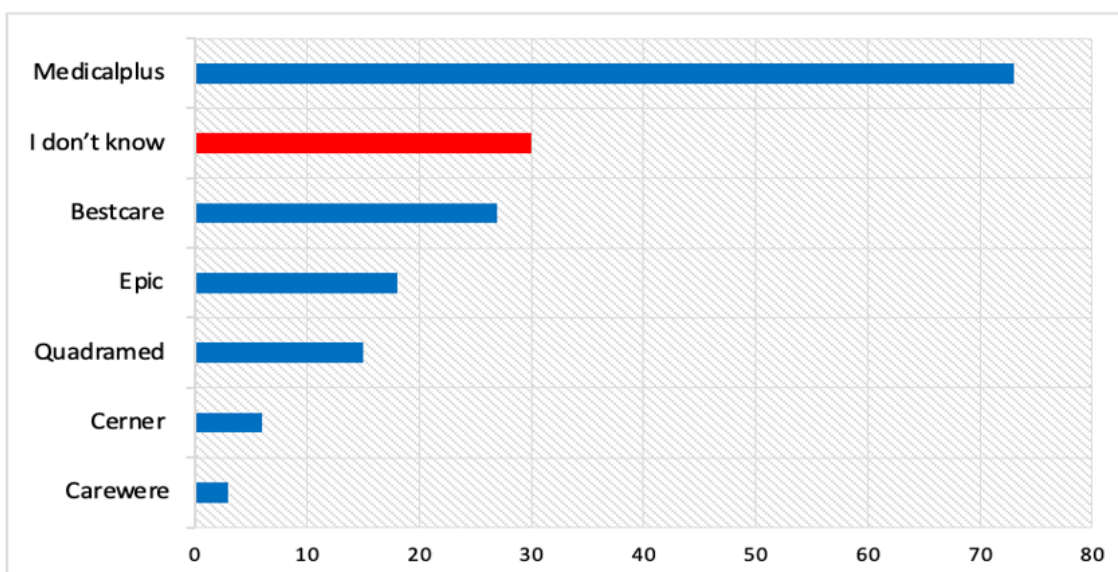


Figure 1: The frequency of the used Electronic Medical Records (EMR) reported by the survey respondents.

Table 2: Knowledge of participants about emergency department (ED) statistics of electrocardiography (ECG), imaging, laboratory (lab) findings, turnaround time, and length of stay sub-grouped according to the health sectors

Questions	Responses	Hospitals			
		Academic	Military	MOH	Private
Do you have in your department statistics about ECG studies, lab studies, plain film studies and CT scan studies (number of studies per 100 ED visits)?	I do not know	35.0	23.5	25.6	57.9
	No, not reported	22.5	17.6	24.4	5.3
	Yes, partially reported	25.0	41.2	22.2	4.0
	Yes, reported	17.5	17.6	27.8	15.8
Does your department usually report the metrics of lab and imaging turnaround time regularly?	I do not know	45.0	23.5	40.0	52.6
	No, not reported	27.5	41.2	13.3	21.1
	Yes, reported	27.5	35.3	46.7	26.3
Does your department usually report the metrics of ED Length of Stay regularly?	I do not know	32.5	5.9	17.8	31.6
	No, not reported	20.0	11.8	13.3	15.8
	Yes, reported	47.5	42.4	68.9	52.6

Data are presented as percentages. MOH: Ministry of Health; CT: computed tomography scan.

Table 3: Opinion of participants about emergency department (ED) operational metrics implementation sub-grouped according to the health sectors

Subject	Hospital	Agree	Disagree	Unsure
Effective implementation of ED operational metrics can improve the quality of medical care	Academic	90.0	0.0	10.0
	Military	82.4	5.9	11.8
	MOH	85.6	1.1	13.3
	Private	94.7	0.0	5.3
Principles of Emergency Department operation should be implemented in our training programs	Academic	90.0	0.0	10.0
	Military	100.0	0.0	0.0
	MOH	85.6	2.2	12.2
	Private	89.5	10.5	0.0
Receiving and reporting continuous feedback and updates regarding basic ED operational performance and workflow is essential for everyone working in the department	Academic	90.0	2.5	7.5
	Military	100.0	0.0	0.0
	MOH	93.3	0.0	6.7
	Private	84.2	5.3	10.5
Overall, I am satisfied with the productivity of my department in practicing effective operations	Academic	71.8	12.8	15.4
	Military	94.1	0.0	5.9
	MOH	64.4	20.0	15.6
	Private	78.9	10.5	10.5

Data are presented as percentages. MOH: Ministry of health.

Table 4: Comparison between the responses of participants in different health sectors

Questions	Hospitals				Total (N=166)	P value
	Academic (N=40)	Military (N=17)	MOH (N=90)	Private (N=19)		
Where did you receive your primary training (residency or nursing training program)?						
External training program	6.0 (15.0)	7.0 (41.2)	20.0(22.2)	5.0 (26.3)	38.0 (22.9)	0.002
I haven't started my training yet	2.0 (5.0)	1.0 (5.9)	5.0 (5.6)	6.0 (31.6)	14.0 (8.4)	
Local programs (SCFHS programs)	32.0 (80.0)	9.0 (52.9)	65.0(72.2)	8.0 (42.1)	114.0 (68.7)	
Where is your Institution's location?						
Central Region	4.0 (10.0)	0.0 (0.0)	5.0 (5.6)	4.0 (21.1)	13.0 (7.8)	<0.001
Eastern Province	31.0 (77.5)	6.0 (35.3)	67.0(74.4)	10.0(52.6)	114.0(68.7)	
Northern Province	1.0 (2.5)	0.0 (0.0)	0.0 (0.0)	2.0 (10.5)	3.0 (1.8)	
Other	0.0 (0.0)	1.0 (5.9)	5.0 (5.6)	0.0 (0.0)	6.0 (3.6)	
Southern Province	1.0 (2.5)	1.0 (5.9)	8.0 (8.9)	0.0 (0.0)	10.0 (6.0)	
Western Province	3.0 (7.5)	9.0 (52.9)	5.0 (5.6)	3.0 (15.8)	20.0 (12.0)	
Which of the following best describes your profession?						
Admin (non-healthcare provider)	2.0 (5.0)	0.0 (0.0)	5.0 (5.6)	2.0 (10.5)	9.0 (5.4)	0.008
Attending Physician	7.0 (17.5)	8.0 (47.1)	8.0 (8.9)	2.0 (10.5)	25.0 (15.1)	
Leader (section head, chairperson, director)	1.0 (2.5)	2.0 (11.8)	7.0 (7.8)	3.0 (15.8)	13.0 (7.8)	
Nurse	6.0 (15.0)	3.0 (17.6)	31.0(34.4)	3.0 (15.8)	43.0 (25.9)	
Paramedic	0.0 (0.0)	0.0 (0.0)	1.0 (1.1)	1.0 (5.3)	2.0 (1.2)	
Specialist/fellow	6.0 (15.0)	3.0 (17.6)	10.0(11.1)	1.0 (5.3)	20.0 (12.0)	
Trainee (resident or nurse)	18.0 (45.0)	1.0 (5.9)	28.0(31.1)	7.0 (36.8)	54.0 (32.5)	
How many patients visit Your Emergency Department (Annual Patients' Visits)?						
50,000 to 70,000	5.0 (12.5)	6.0 (35.3)	14.0(15.6)	3.0 (15.8)	28.0 (16.9)	0.103
70,000 to 100,000	4.0 (10.0)	5.0 (29.4)	5.0 (5.6)	4.0 (21.1)	18.0 (10.8)	
Fewer than 50,000	6.0 (15.0)	2.0 (11.8)	15.0(16.7)	3.0 (15.8)	26.0 (15.7)	
I don't know	16.0 (40.0)	2.0 (11.8)	38.0(42.2)	6.0 (31.6)	62.0 (37.3)	
More than 100,000	9.0 (22.5)	2.0 (11.8)	18.0(20.0)	3.0 (15.8)	32.0 (19.3)	
Electronic Health Records vendor						
Medicaplus	8 (20)	1 (5.88)	60 (66.67)	4 (21.05)	73 (62.93)	<0.001
I don't know	10 (25)	3 (17.65)	12 (13.33)	5 (26.32)	30 (25.86)	
Bestcare	4 (10)	14 (82.35)	2 (2.22)	7 (36.84)	27 (23.28)	
Epic	9 (22.5)	1 (5.88)	6 (6.67)	2 (10.53)	18 (15.52)	
Quadramed	15 (37.5)	0 (0)	0 (0)	0 (0)	15 (12.93)	
Cerner	2 (5)	1 (5.88)	2 (2.22)	1 (5.26)	6 (5.17)	
Medica cloud	0 (0)	0 (0)	3 (3.33)	0 (0)	3 (2.59)	
Trackcare	0 (0)	0 (0)	3 (3.33)	0 (0)	3 (2.59)	
HIS	0 (0)	0 (0)	2 (2.22)	0 (0)	2 (1.72)	
CareWere	0 (0)	0 (0)	0 (0)	1 (5.26)	1 (0.86)	
Cortex	0 (0)	0 (0)	1 (1.11)	0 (0)	1 (0.86)	
John Hopkins	0 (0)	0 (0)	0 (0)	1 (5.26)	1 (0.86)	
The routine daily work of your department is mainly dependent on						
A combination of handwriting and EMR	19.0 (47.5)	7.0 (41.2)	68.0(75.6)	10.0 (52.6)	104.0 (62.7)	0.009
EMR (Electronic Medical Records)	19.0 (47.5)	10.0 (58.8)	20.0(22.2)	9.0 (47.4)	58.0 (34.9)	
Handwriting only	2.0 (5.0)	0.0 (0.0)	2.0 (2.2)	0.0 (0.0)	4.0 (2.4)	
How often does your ED experience an exit block (i.e., most of the ED beds are occupied by admitted patients)?						
2-3 days per week	14.0 (35.0)	7.0 (41.2)	23.0(25.6)	5.0 (26.3)	49.0 (29.5)	<0.001
Daily	6.0 (15.0)	1.0 (5.9)	22.0(24.4)	1.0 (5.3)	30.0 (18.1)	
Most days	7.0 (17.5)	2.0 (11.8)	31.0(34.4)	1.0 (5.3)	41.0 (24.7)	
Never	4.0 (10.0)	1.0 (5.9)	1.0 (1.1)	3.0 (15.8)	9.0 (5.4)	
Once a week	5.0 (12.5)	4.0 (23.5)	7.0 (7.8)	2.0 (10.5)	18.0 (10.8)	
Rarely	4.0 (10.0)	2.0 (11.8)	6.0 (6.7)	7.0 (36.8)	19.0 (11.4)	

Table 4: Comparison between the responses of participants in different health sectors

Questions	Hospitals				Total (N=166)	P value
	Academic (N=40)	Military (N=17)	MOH (N=90)	Private (N=19)		
Do you think your ED staffing and scheduling align with patient demand (patient arrival patterns)?						
I don't know	16.0 (40.0)	6.0 (35.3)	25.0(27.8)	8.0 (42.1)	55.0 (33.1)	0.687
No, our staffing schedule is not based on patient arrival data and statistics	10.0 (25.0)	3.0 (17.6)	29.0(32.2)	5.0 (26.3)	47.0 (28.3)	
Yes, our staffing schedule is based on patient arrival data and statistics	14.0 (35.0)	8.0 (47.1)	36.0(40.0)	6.0 (31.6)	64.0 (38.6)	
Do you have an alert notification that draws attention to patient re-visits (72 hours after hospital or ED discharge)?						
I'm not sure	9.0 (22.5)	2.0 (11.8)	22.0(24.4)	3.0 (15.8)	36.0 (21.7)	<0.001
No, we don't have EMR alert notifications	19.0 (47.5)	4.0 (23.5)	40.0(44.4)	2.0 (10.5)	65.0 (39.2)	
We have non-automated alert notification	4.0 (10.0)	0.0 (0.0)	16.0(17.8)	3.0 (15.8)	23.0 (13.9)	
Yes, we have an alert notification in our EMR	8.0 (20.0)	11.0 (64.7)	12.0(13.3)	11.0 (57.9)	42.0 (25.3)	
Do you have statistics about ECG, lab, plain film, and CT studies (number of studies per 100 ED visits)?						
I don't know	14.0 (35.0)	4.0 (23.5)	23.0(25.6)	11.0 (57.9)	52.0 (31.3)	0.168
No, these statistics are not calculated or reported	9.0 (22.5)	3.0 (17.6)	22.0(24.4)	1.0 (5.3)	35.0 (21.1)	
Some of these statistics are calculated and reported	10.0 (25.0)	7.0 (41.2)	20.0(22.2)	4.0 (21.1)	41.0 (24.7)	
Yes, these statistics are calculated and reported	7.0 (17.5)	3.0 (17.6)	25.0(27.8)	3.0 (15.8)	38.0 (22.9)	
Does your department usually report the metrics of lab and imaging turnaround time (TAT) regularly?						
I don't know	18.0 (45.0)	4.0 (23.5)	36.0(40.0)	10.0 (52.6)	68.0 (41.0)	0.053
No, we don't have data about lab and imaging TAT	11.0 (27.5)	7.0 (41.2)	12.0(13.3)	4.0 (21.1)	34.0 (20.5)	
Yes, lab and imaging TAT is reported in our departmental metrics	11.0 (27.5)	6.0 (35.3)	42.0(46.7)	5.0 (26.3)	64.0 (38.6)	
Does your department usually report the metrics of ED Length of Stay (LOS) regularly?						
I don't know	13.0 (32.5)	1.0 (5.9)	16.0(17.8)	6.0 (31.6)	36.0 (21.7)	0.129
No, we don't have data about LOS	8.0 (20.0)	2.0 (11.8)	12.0(13.3)	3.0 (15.8)	25.0 (15.1)	
Yes, LOS is reported in our department metrics	19.0 (47.5)	14.0 (82.4)	62.0(68.9)	10.0 (52.6)	105.0 (63.3)	
Does your department have a full capacity protocol, i.e., when your department is full of admitted patients?						
I'm not sure	16.0 (40.0)	8.0 (47.1)	24.0(26.7)	10.0 (52.6)	58.0 (34.9)	0.244
No, we don't have a full-capacity protocol	8.0 (20.0)	2.0 (11.8)	17.0(18.9)	2.0 (10.5)	29.0 (17.5)	
Yes, we have a full-capacity protocol, and it is effective	11.0 (27.5)	4.0 (23.5)	20.0(22.2)	4.0 (21.1)	39.0 (23.5)	
Yes, we have a full-capacity protocol, but it is not effective	5.0 (12.5)	3.0 (17.6)	29.0(32.2)	3.0 (15.8)	40.0 (24.1)	
Does your department usually report the percentage of patients who leave without being seen (LWBS) regularly?						
I don't know	18.0 (45.0)	3.0 (17.6)	30.0(33.3)	8.0 (42.1)	59.0 (35.5)	0.152
No, we don't report LWBS statistics	10.0 (25.0)	2.0 (11.8)	17.0(18.9)	2.0 (10.5)	31.0 (18.7)	
Yes, LWBS is reported in our department metrics	12.0 (30.0)	12.0 (70.6)	43.0(47.8)	9.0 (47.4)	76.0 (45.8)	
Does your department usually report the metrics of boarding hours regularly?						
I don't know	16.0 (40.0)	1.0 (5.9)	25.0(27.8)	8.0 (42.1)	50.0 (30.1)	0.020
No, we don't have data about boarding hours	11.0 (27.5)	3.0 (17.6)	14.0(15.6)	1.0 (5.3)	29.0 (17.5)	
Yes, boarding hours are reported in our departmental metrics and in time intervals	13.0 (32.5)	13.0 (76.5)	51.0(56.7)	10.0 (52.6)	87.0 (52.4)	
Does your department have an automated dashboard that tracks and manages patient flow?						
I'm not sure	12.0 (30.0)	2.0 (11.8)	14.0(15.6)	4.0 (21.1)	32.0 (19.3)	0.223
No, we don't have an automated dashboard	13.0 (32.5)	5.0 (29.4)	33.0(36.7)	4.0 (21.1)	55.0 (33.1)	
Yes, we have an automated dashboard, and it is effective	10.0 (25.0)	7.0 (41.2)	36.0(40.0)	6.0 (31.6)	59.0 (35.5)	
Yes, we have an automated dashboard, but it is not effective	5.0 (12.5)	3.0 (17.6)	7.0 (7.8)	5.0 (26.3)	20.0 (12.0)	

Table 4: Comparison between the responses of participants in different health sectors

Questions	Hospitals				Total (N=166)	P value
	Academic (N=40)	Military (N=17)	MOH (N=90)	Private (N=19)		
*Do the physicians and nurses usually work physically in teams with assigned beds?						
I'm not sure	6.0 (15.0)	3.0 (17.6)	10.0(11.1)	4.0 (21.1)	23.0 (13.9)	0.575
No, physicians and nurses don't work as a team	10.0 (25.0)	4.0 (23.5)	12.0(13.3)	3.0 (15.8)	29.0 (17.5)	
Yes, physicians and nurses work together as a team	14.0 (35.0)	7.0 (41.2)	43.0(47.8)	5.0 (26.3)	69.0 (41.6)	
Yes, physicians or nurses only work as a team	10.0 (25.0)	3.0 (17.6)	25.0(27.8)	7.0 (36.8)	45.0 (27.1)	
Does any authorized personnel have access to data abstraction (e.g., ED volume, time of registration, length of stay, etc.)?						
I don't know	12.0 (30.0)	3.0 (17.6)	26.0(28.9)	5.0 (26.3)	46.0 (27.7)	0.666
No, we don't have the ability to track such information in our department	9.0 (22.5)	2.0 (11.8)	11.0(12.2)	2.0 (10.5)	24.0 (14.5)	
Yes, we have access, but it requires other than automated computer work	5.0 (12.5)	3.0 (17.6)	19.0(21.1)	2.0 (10.5)	29.0 (17.5)	
Yes, we have the ability to track any details of the patient through our Electronic Medical Record (EMR)	14.0 (35.0)	9.0 (52.9)	34.0(37.8)	10.0 (52.6)	67.0 (40.4)	
During training, have you been exposed to the concept of ED operations?						
I'm not sure	7.0 (17.5)	2.0 (11.8)	15.0(16.7)	5.0 (26.3)	29.0 (17.5)	0.003
No, we did not receive training	18.0 (45.0)	2.0 (11.8)	24.0(26.7)	4.0 (21.1)	48.0 (28.9)	
Yes, we have been trained in the practice of ED operation	9.0 (22.5)	2.0 (11.8)	33.0(36.7)	4.0 (21.1)	48.0 (28.9)	
Yes, we were exposed at some point to the concept of ED operation but without sufficient training	6.0 (15.0)	11.0 (64.7)	18.0(20.0)	6.0 (31.6)	41.0 (24.7)	
Effective implementation of ED operational metrics can improve the quality of medical care.						
Agree	36.0 (90.0)	14.0 (82.4)	77.0(85.6)	18.0 (94.7)	145.0 (87.3)	0.540
Disagree	0.0 (0.0)	1.0 (5.9)	1.0 (1.1)	0.0 (0.0)	2.0 (1.2)	
Unsure	4.0 (10.0)	2.0 (11.8)	12.0(13.3)	1.0 (5.3)	19.0 (11.4)	
Principles of Emergency Department operation should be implemented in our training programs.						
Agree	36.0 (90.0)	17.0 (100.0)	77.0(85.6)	17.0 (89.5)	147.0 (88.6)	0.081
Disagree	0.0 (0.0)	0.0 (0.0)	2.0 (2.2)	2.0 (10.5)	4.0 (2.4)	
Unsure	4.0 (10.0)	0.0 (0.0)	11.0(12.2)	0.0 (0.0)	15.0 (9.0)	
Receiving and reporting continuous feedback and updates regarding basic ED operational performance and workflow is essential for everyone working in the department.						
Agree	36.0 (90.0)	17.0(100.0)	84.0(93.3)	16.0 (84.2)	153.0 (92.2)	0.387
Disagree	1.0 (2.5)	0.0 (0.0)	0.0 (0.0)	1.0 (5.3)	2.0 (1.2)	
Unsure	3.0 (7.5)	0.0 (0.0)	6.0 (6.7)	2.0 (10.5)	11.0 (6.6)	
Overall, I am satisfied with the productivity of my department in practicing effective operations.						
N-Miss	1.0	0.0	0.0	0.0	1.0	0.272
Agree	28.0 (71.8)	16.0 (94.1)	58.0(64.4)	15.0 (78.9)	117.0 (70.9)	
Disagree	5.0 (12.8)	0.0 (0.0)	18.0(20.0)	2.0 (10.5)	25.0 (15.2)	
Unsure	6.0 (15.4)	1.0 (5.9)	14.0(15.6)	2.0 (10.5)	23.0 (13.9)	

Data are presented as numbers (%). *: e.g., 1 MD and 2 RNs are responsible for a specific number of beds.