The Role of Telemedicine Services in Reducing Emergency Department Overload in Saudi Arabia

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Abstract

Background: ED overcrowding is described as one of the main issues in emergency departments (EDs) of any hospital. In Saudi Arabia, the ministry of health applied new telemedicine technology to serve patients by using the mobile application which include Sehha application and 937 medical call center. The main aim of this study is to determine the role of different telemedicine services in reducing non-urgent visits to EDs in Saudi Arabia.

Methods: A cross-section study was conducted during August 2020 - May 2021 among 319 patients were using two telemedicine services in Saudi Arabia, including medical call center, and Sehha smart phone application. The primary endpoint of this study aims to determine the role of different telemedicine services in reducing non-urgent visits to EDs in Saudi Arabia.

Results: This study analyzed the data from 319 patients who completed the survey provided by the Saudi Ministry of Health that concerning on information related to their health status, and ED visits. Among patients that had the intention to visit the ED (N=159), 53 of them did not go to EDs after using telemedicine services (p-value < 0.01). Regarding medical call center and Sehha application, 9.6% and 24.4%, respectively of the patients used these telemedicine services had changed their mind concerning visiting ED after taking the medical advice (p-values < 0.01).

Conclusion: The implemented telemedicine services in Saudi Arabia, namely Sehha application and medical call center showed to be effective in reducing ED overload by providing medical advices to less- and non-urgent patients and deal with their minor medical issues.

Key words: Telemedicine; medical call center; Sehha application; non-urgent patient; emergency department visits; Saudi Arabia.

Introduction

ED overcrowding is described as one of the main issues in emergency departments (EDs) of any hospital [2]. ED overcrowding is defined as a condition occurred when healthcare providers' loss the capability to provide medical care service within short time [1].

In general, there are many reasons leading to ED overcrowding, and these reasons could be related to manpower and non-manpower deficiency. The deficiency of manpower resources includes nursing staff, specialist physicians, administrative staff, or other staff related to different departments in hospitals could cause ED overload. The non-manpower deficiency includes beds, medications, diagnostic tools or machines may also lead to ED overload [3].

However, there is another important reason for ED overload which is related to increased non and less- urgent patients presenting at ED. This issue is usually due to lack of patients' education or/and lack of telemedicine services [4]. Patients categorized as less- or non-urgent illness are highly distributed in every district of any city, therefore, presenting of these kind of patients in ED will lead to ED overcrowding, and may delay or reduce of healthcare efficacy in treating patients with very serious illness; which usually need resuscitation, emergent or/and urgent medical intervention. In addition, ED overcrowding may lead to reduce satisfaction of patients, and increase their risk [7].

The (Canadian Triage and Acuity Scale) CTAS system is used to classify patients at ED depending on severity into five categories: level I called resuscitation; which patients in this category need immediate correction of a specific physiological disorder. Level II called emergent; patients classified as emergent needs medical intervention within 15 minutes. Level II called urgent; which means that patients under this category needs medical treatment during 30 minutes. Level IV and

level V are called non-and less urgent, respectively, which patients under these two categories have minor injuries or illness, and should be seen by healthcare provider within 60-120 minutes [6].

In Saudi Arabia, the ministry of health applied new telemedicine technology to serve patients by using the mobile application which include Sehha application and 937 medical call center. These telemedicine applications support patients that unable to visit the clinics or living in remote areas far away from cities, help to reduce costs consumed without any significant needs and decrease overload at secondary and tertiary care facilities. Also, patients living in Saudi Arabia were showing high satisfaction rates after using the implemented telemedicine services.

The main aim of this study is to determine the role of different telemedicine services in reducing non-urgent visits to EDs in Saudi Arabia.

Research Design and Methods

Study design and patients' recruitment:

A cross-section study was conducted during August 2020 - May 2021 among 319 patients were using two telemedicine services in Saudi Arabia, including medical call center, and Sehha smart phone application. A systematic random sampling method with a sample interval of 1:15 was used to collect the patients from each of the two telemedicine services to determine their role in reducing less- and non-urgent visits to EDs in Saudi Arabia. The study excluded patient that already visited an ED before consulting the telemedicine services, and patients diagnosed with schizophrenia, bipolar, dementia, or any defects in cognitive skills that may interfere their participation in this study.

Data collection

The data were obtained from a previous survey designed by the Saudi Ministry of Health. The survey's data reflecting the patients' socio- demographic characteristics, chief complaint, type of consultation, time to reach the nearest ED, intention to visit ED, and ED visits within 24 hours of using telemedicine services.

Endpoints

The primary endpoint of this study aims to determine the role of different telemedicine services in reducing non-urgent visits to EDs in Saudi Arabia. The secondary endpoint is to compare between medical call center and Sehha application concerning their efficacy in decreasing the ED overload.

Statistical analysis:

For the analysis of the results, student T-test, fisher exact, and chi-square tests were used. The data were saved, organized and graphed by using Microsoft excel 2010 program. The level of significance was considered when the p-value was less than 0.05.

Ethical consideration:

The study proposal was reviewed and approved by an ethics review committee (the Central Institutional review board committee) in the Saudi Ministry of Health. The approval letter for this study was given in June 2020 with the central IRB log number: 20-96M.

Results

This study analyzed the data from 319 patients who completed the survey provided by the Saudi Ministry of Health that concerning on information related to their health status, and ED visits. The mean age of the enrolled patients was 35.94 years, and the majority of them were Saudi female living in Riyadh and Makkah regions (see table.1 and figure.1).

Almost 50% of the included patients had the intention to visit the ED before contacting the telemedicine services, and most of them need less than 30 minutes to reach the nearest ED. Besides, physicians working in the telemedicine services had categorized the severity of patients' medical status based on CTAS system, which revealed that 7.2%, 13.5%, and 79.3% of total patients were classified as CTAS level III, level IV, and level V, respectively (p-value < 0.05). Besides, more than 70% of the enrolled patients need 30 minutes or less to reach the nearest ED (see table.2).

Among patients that had the intention to visit the ED (N=159), 53 of them did not go to EDs after using telemedicine services (p-value < 0.01) (see figure.2). Regarding medical call center and Sehha application, 9.6% and 24.4%, respectively of the patients used these telemedicine services had changed their mind concerning visiting ED after taking the medical advice (p-values < 0.01) (see figure.3 and figure.4).

Respecting the patients who already visited an ED after contacting telemedicine services, the majority of them (>66%) were visiting governmental hospitals, not having medical insurance for private hospitals, and not willing to pay for medical charges at the ED (see table.3 and table.4).

Discussion

Patients categorized as less- or non-urgent illness are commonly presented in ED of any hospital globally. The existing of these kind of patients in ED could lead to ED overcrowding, and may delay or reduce of healthcare efficacy in treating patients with very serious illness, which usually need resuscitation, emergent and urgent medical intervention. Morover, ED overcrowding may lead to lower satisfaction rates among patients, and could increase the risk of delaying critical interventions [8].

In this study, the researchers were trying to found the role of applying telemedicine services in Saudi Arabia (medical call center and Sehha application) in reducing the ED overload by patients classified as CTAS level IV and level V, and to revealed the differences between the two telemedicine services regarding this issue.

Most of the included patients were young adults living in the central and western regions. The results of the study showed that the applied telemedicine services in Saudi Arabia had a role in avoiding ED overload by significantly decreasing the patients' visits to the hospitals for less- and non-urgent medical issues. Moreover, the researchers figured out that Sehha application had more significant effect in reducing ED visits by patients compared to medical call center.

On the other hand, this research suggesting that lacking of medical insurance for private hospitals and unwilling of people to pay for medical charges could be main factors for the ED overload in the governmental hospitals in Saudi Arabia.

Globally, few studies were assessing the impact of telehealth services on emergency visits. Some studies were determining the efficacy of telemedicine in reducing ED crowding in United

Kingdom (UK), however, these studies did not show significant difference in decreasing number of less- or non-urgent patients in ED after applying telemedicine services[9-14]. However, a previous study was revealed that 24 hours-walk-in clinics in the UK had the ability to decrease the overload of ED services and showed high satisfaction reflects from the patients[15].

Limitations of the study

The cross-sectional design, small sample size, and data based on self-report were the most drawbacks of this studies. In addition, due to coronavirus disease of 2019 (COVID-19) pandemic, some patients claiming that they didn't visit ED because their fear of SARS-CoV-2 infection, however, the number of those patients were significantly few compared to patients had declared that they got benefit of the telemedicine services.

Conclusion and recommendation

The implemented telemedicine services in Saudi Arabia, namely Sehha application and medical call center showed to be effective in reducing ED overload by providing medical advices to less- and non-urgent patients and deal with their minor medical issues. The researchers recommending further studies concerning on the number of ED visitors before and after the telemedicine era in Saudi Arabia.

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Conflicting interest: The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

Funding: This study was not funded.

Ethical approval: The study proposal was reviewed and approved by an ethics review committee (the Central Institutional review board committee) in the Saudi Ministry of Health. The approval letter for this study was given in July 2020 with the central IRB log number: 20-96M.

Guarantor: Abdullah Alkattan

Contributorship: AK and AF contributed in conceptualization. AK, MA, and KS contributed in data collection. AK, AK and AA contributed in data analysis. AK, AF and AA contributed in writing – original draft preparation. MA and KA contributed in writing – review and editing. MS, MA, and KS contributed in resources. All authors have read and agreed to the published version of the manuscript.

Table.1 Demographics of patients used medical call center and Sehha application

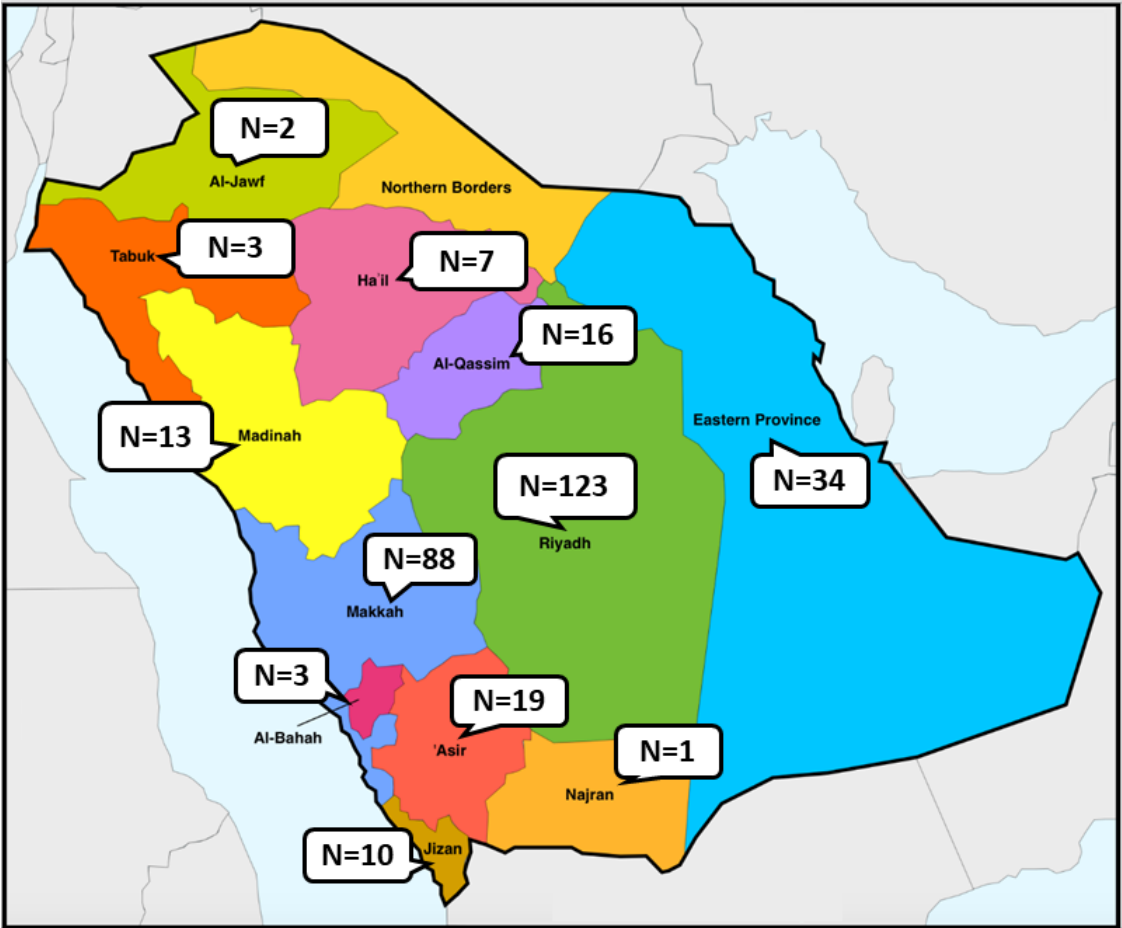| Variable	All patients (N=319)	Patients used medical call center (N=167)	Patients used Sehha application (N=152)
Age (mean±SD)	35.94±11.4	35.87±11.5	36.03±11.3
Female gender (%)	174 (54.5)	83 (49.7)	91 (59.8)
Saudi nationality (%)	290 (90.9)	148 (88.6)	142 (93.4)

Figure.1 Geographical areas of patients used medical call center and Sehha application in Saudi Arabia.

Table.2 Patients intention to go to ED before contacting with medical call center or Sehha application, and time to reach it.

| Variable	All patients (N=319)	Patients used medical call center (N=167)	Patients used Sehha application (N=152)
Patients have an intension to go to ED (%)	159 (49.8)	75 (44.9)	84 (55.3)
- Time to reach ED (%)			
< 30 min	232 (72.7)	127 (76)	105 (69.1)
30-60 min	68 (21.3)	33 (19.7)	35 (23)
60-120 min	10 (3.1)	2 (1.2)	8 (5.2)
> 120 min	9 (2.8)	5 (3)	4 (2.6)
- CTAS system classification (%)			
Level-1	0	0	0
Level-2	0	0	0
Level-3	23 (7.2)	12 (7.2)	11 (7.2)
Level-4	43 (13.5)	21 (12.6)	22 (14.5)
Level-5	253 (79.3)	134 (80.2)	119 (78.3)
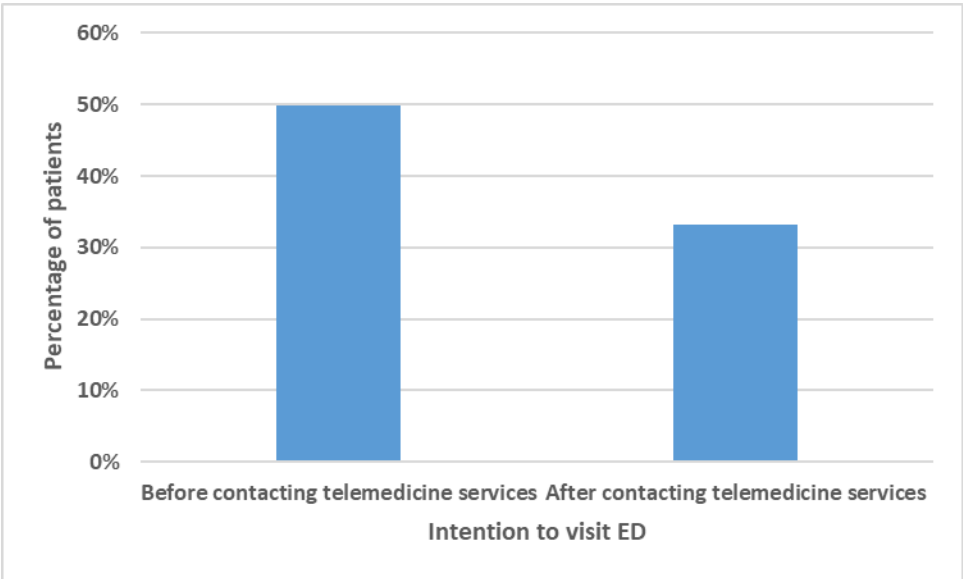
Figure.2 Patients intension to visit ED before and after contacting telemedicine services in Saudi Arabia.
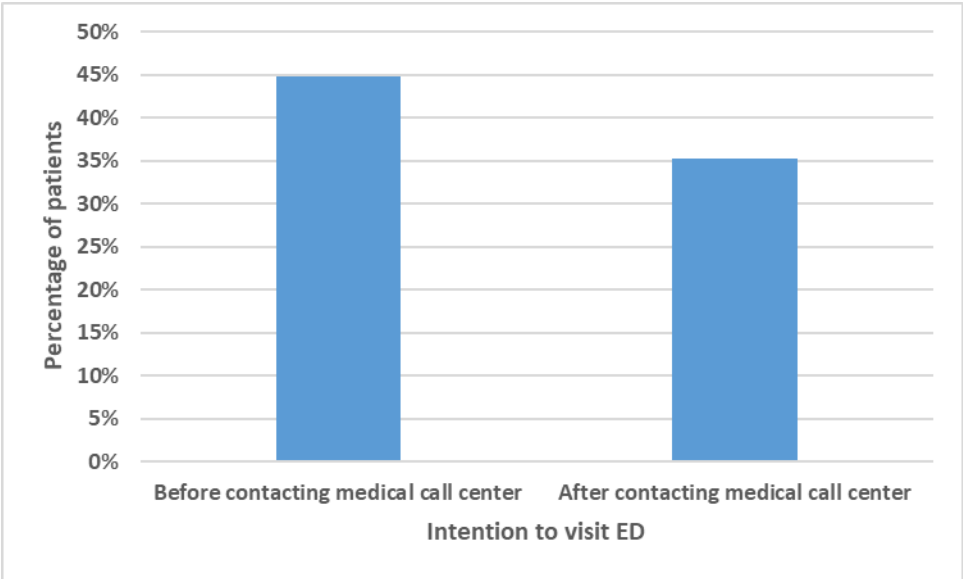

Figure.3 Patients intension to visit ED before and after contacting medical call center in Saudi Arabia.
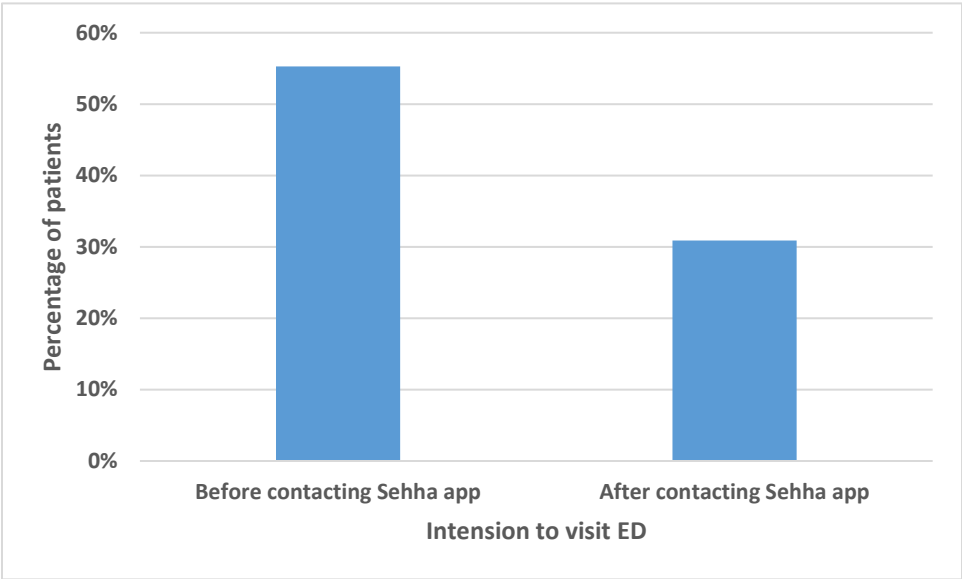
Figure.4 Patients intension to visit ED before and after contacting Sehha application.

Table.3 Type of the visited hospital among the included patients who went to ED.

Variable	All patients (N=106)	Patients used medical call center (N=59)	Patients used Sehha application (N=47)
-Type of visited hospital (%)			
Governmental hospital	81 (76.4)	45 (76.3)	36 (76.6)
Private hospital	25 (23.6)	14 (23.7)	11 (23.4)

Table.4 Type of medical insurance and status of willing to pay for medical services in the ED in case of not having medical insurance among included patients.

Variable	All patients (N=319)	Patients used medical call center (N=167)	Patients used Sehha application (N=152)
-Type of medical insurance (%)			
Covering governmental and private hospitals	55 (17.2)	31 (18.5)	24 (15.8)
Covering governmental hospitals only	213 (66.8)	106 (63.5)	107 (70.4)
Not covered governmental or private hospitals	51 (16)	30 (18)	21 (13.8)
-Willing to pay in case of lacking medical insurance (%)			
Yes	88 (27.6)	42 (25.1)	46 (30.3)
No	231 (72.4)	125 (74.9)	106 (69.7)