Migration Letters

Volume: 20, No: 12 (2023), pp. 886-901

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)

www.migrationletters.com

Factors Influencing Decreased Patient Wait Times In The Emergency Department

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Abstract:

In this paper, we are looking for a study on the development of factors affecting reducing the waiting time for patients in the emergency department, The emergency department in all hospitals is the department that receives patients who need urgent treatment because their health condition cannot bear the long wait. The main problem is that many people need treatment quickly, so we need to reduce patient waiting time. This study aims to provide the main factors that can reduce the waiting time in emergency situations. To solve this problem, we distribute a questionnaire among several payments. The result showed that there are three main factors: medical services provided in the emergency department, medical staff, as well as medical devices and equipment. Through the results, these factors were developed, and results were obtained that helped reduce the patient's waiting time in emergency departments, making emergency departments one of the fastest departments in treating patients.

Keywords: *Factors; Reduce; Waiting-Time and Emergency.*

1. Introduction

The emergency Department is a section of the hospital that provides immediate high-quality care when fearing that any delay in treatment will lead to excessive suffering or life-threatening suffering [1]. In[1] most countries worldwide, the law requires emergency departments to examine anyone in need of medical attention [1]. The emerging COVID-19 pandemic has burdened health systems, healthcare workers, and overcrowded emergency departments (ED), which could put people at increased risk of infection [2].

Most of the causes of overcrowding in the emergency department were related to the number and type of people in the emergency department and exit from the emergency department on time, but the biggest reason remains the lack of sufficient beds to entranced patients in hospitals, thus accumulating and crowding patients in the corridors of emergency departments [3].

The small number of nursing staff and/or their continuous training [4], as well as the increasing number of patients, led to the length of waiting time for patients to take their turn, and therefore the overcrowding of these emergency departments arose. Also, Large numbers of older persons with complex and chronic conditions increase overcrowding in the emergency department.

The consequences of overcrowding are delaying treatment for patients and increasing the number of deaths. The proposed solutions to overcrowding in the emergency department focused on the movement of patients within the emergency department. Overcrowding affects all the countries of the world, and many medical sources believe that the lack of beds for hypnotic patients in hospitals is the most important cause of the problem of overcrowding emergency departments in various hospitals worldwide.

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This study aims to analyze all factors affecting patient waiting time in the ED, proposing a new framework.

2. Literature Review

There have been promising results for solutions aimed at using comprehensive system initiatives to meet the patient's exit date and increase basic care hours, Nevertheless, local factors that lead to overcrowding in the emergency department and the actual impact of improving patient mobility is still uncertain.

To reduce patient waiting time. By using quality function deployment, a frame was designed through six steps, commencing with customer (patients) requirements identification, and concluding with the weights of technical requirements [5].

The model has been applied to two hospitals. Results showed that Paired samples t-test results revealed a significant reduction in the average waiting time, increasing the served patients and improving the quality of emergency department services.

Another paper [6], explores what is currently known about safety culture in EDs and proposes a conceptual framework that could be used to inform practice and future research however, there is little analysis of the factors influencing patient safety culture in ED, and most of the conceptual understanding is drawn from other health service environments [6].

Another study aims to evaluate the efficiency of the emergency department in 20 Egyptian hospitals (12 private and 8 general hospitals) based on 13 performance metrics, The main two issues are department capacity and lead time [7]. This research suggests an integrated evaluation model to assess ED under a framework of plithogenic theory. This is the first paper to develop a plithogenic MCDM approach that combines AHP and DEA methods for evaluating the emergency department, and a case study was presented to prove the applicability of the proposed approach [7]. The results show that ten of the hospitals are providing efficient service in their emergency department, while the other ten are less efficient. The analysis of the results shows that 58% of private hospitals' emergency departments are operating efficiently, while efficient general hospitals represent 38%.

However, the lack of consensus on performance criteria to evaluate ED increases the complication of this process.

One of the studies that aims to describe the experience of health care professionals in delivering patients from ambulances to emergency department employees, and the factors that affect the quality of delivery, are Icelandic emergency medical technicians, doctors, and nurses who have experience in delivering patients [8].

A framework was designed based on four main positions and nine sub-sections in leadership. The framework describes the communication between health care professionals before the disease arrives at the emergency department when the patient arrives at the emergency department and a written report on the patient's condition. The study mentioned the importance of training and teamwork and concluded that the lack of structured communication procedures and ambiguity about the responsibility of handing patient EMTs to ED healthcare professionals compromised patient safety. Reducing the level of responsibility and implementing standardized practices may improve patient delivery [8].

An experienced and evidence-based framework has been built to help build a structure for reviewing individual leaders, teams, organizational performance, and emergency preparedness [2]. To create this framework, 32 co-authors from 17 countries were collected and selected based on their relevant professional and/or academic experiences in various aspects of health leadership, healthcare, public health, and some related fields.

The framework has been built on the 10 imperatives of health leaders during the recovery phase of the Corona pandemic. This framework has many limitations, which are that it was

designed for a unique phenomenon and its nature is constantly evolving as well, despite the different participants in its preparation in terms of geographical location and experiences [2]. It is useful to verify the validity of the framework on a different geographical area in the world.

A study aims to design a unique framework to improve the performance of the emergency department in a large general hospital in Iran based on standard patient satisfaction indicators[9]. The framework was a practical approach to collecting the emergency departments in the improvement processes. The study used 5 variables to estimate the efficiency of the emergency department. These variables were divided into inputs and outputs according to the method of data feed analysis (DEA). The input variables are the emergency environment, the performance of doctors, the performance of nurses, and the quality of equipment [9].

The output variable is the processing time. The results of sensitivity analysis showed that some indicators such as doctors' performance, treatment time, and equipment quality have the greatest effect (weight) on patient satisfaction at the emergency department.

3. Theoretical framework

This study explains the factors that affect reducing the patient's waiting time to receive treatment in the emergency department of King Fahd Teaching Hospital to reach the maximum degree to reduce these factors so that this reduction is reflected in the satisfied patients and those accompanying them.
The most important factors that affect reducing the waiting time in the emergency department have been identified, and a theoretical framework has been provided for the study as shown in Figure 1, which aims to verify the factors that affect reducing the waiting time for patients. This framework also aims to clarify the factors that make the recipient of the medical service feel satisfied. When going to the emergency department.

3.1 Research Questions

Based on the theoretical framework in Figure 1, a question has been developed with the following research

What are the factors that affecting reduce waiting time for patients in the emergency department?

3.2 Research hypotheses

Based on the previous research question, three hypotheses were built, which will test the factors that affect the reduction of patient waiting time in the emergency department.

a. Medical services affecting reduced waiting time for patients in the emergency department.
b. Hospital staff affecting reduced waiting time for patients in the emergency department.
c. Emergence equipment reduces waiting time for patients in the emergency department.

The following Table.1 shows the hypothesis development

Table 1: Hypothesis development

No	Variable	Hypothesis development
H1	Medical services	Ease of new patient registration. Time to do the necessary tests and scans. The waiting time for the results of the tests. Priority to critical cases. Speed in diagnose the case. The patient is talked to in the language he understands. Patient care facilities are allowed.
H2	Hospital staff	The hypnosis process was fast and easy. Staff will listen and help patients with their needs. Employees provide services correctly. Staff Doctors and nurses are well qualified. Doctors and nurses care for patients. I have enough information about my health and treatment plan. The medical and administrative staff is appropriate compared to the capacity of the department. The departments have specialist emergency doctors. Regular doctor visits to the patient. Medication is provided on time. Doctors and nurses are responding quickly to my calls.
H3	Emergence equipment	The number of beds is appropriate. Medical equipment provides support its location is suitable. Advanced medical equipment is available. Direction signs in the hospital are clear. Clean toilets equipped for patient needs and a suitable location. The internal design of the emergency department is flexible to increase the capacity of patients. Medicines available at emergency pharmacy The emergency waiting rooms are comfortable, and their number and location are appropriate. The distance it takes for the patient to reach the emergency department units. An efficient communication system is available.

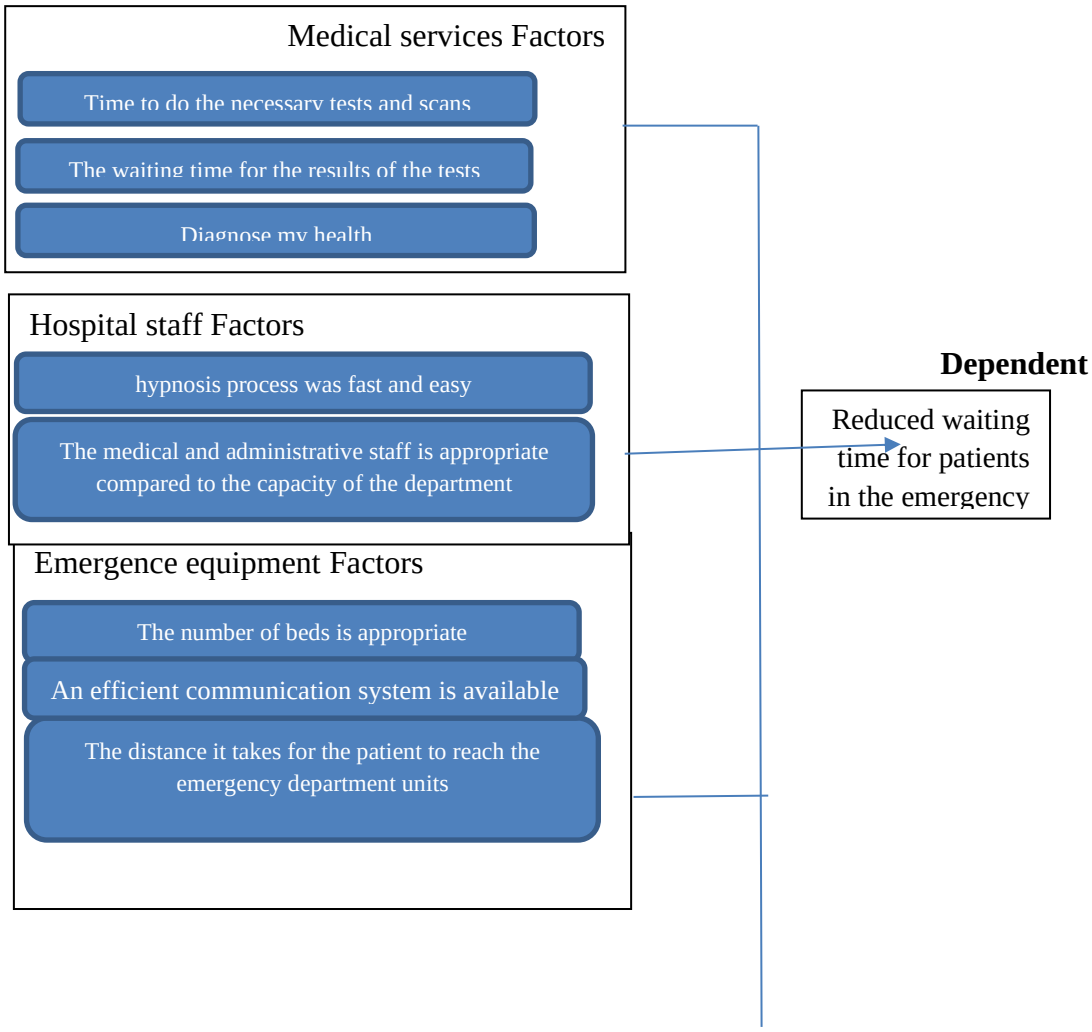

Figure 1: Theoretical framework

Table 2: Hypothesis Development Signification

No	Variable	Hypothesis development Signification
H1	Medical services	Time to do the necessary tests and scans affecting reduce waiting time for patients in the emergency department. Speed in diagnosing cases affecting reduce waiting time for patients in the emergency department.
H2	Hospital staff	The hypnosis process was fast and easy. The departments have specialist emergency doctors. The medical and administrative staff is appropriate compared to the capacity of the department.
H3	Emergence equipment	The number of beds is appropriate. The distance it takes for the patient to reach the emergency department units. An efficient communication system is available.

4. Methodology

The survey methodology was used, and the research community consisted of all residents of the Eastern Province of Saudi Arabia (Khobar, Dammam, Qatif and Jubail) who frequented King Fahd Teaching Hospital. Individual questionnaires were used to collect data from patients or their families.

Different items were used to test the variations for each item. The corresponding Likert scale was used, with pivot points ranging from 1 strongly agree and 5 for strongly disagree. Each item was marked by the respondents from the user. 627 electronic questionnaires were

distributed, of whom 324 viewed the questionnaire, 200 started the questionnaire, and 100 completed all the questions, so the response rate to the questionnaire is 50%. The collected data were analyzed using the Statistical Package for The Social Sciences (SPSS).

4.1 Data collections

In this study, more than one data collection method was used to select and determine the factors that affect the reduction of patient waiting time in the emergency department. The questionnaire was the main method in addition to personal interviews with a number of individuals in the emergency department.

4.2 Primary Data

The questionnaire was used as a research tool, so one questionnaire was made to collect data from visitors to the emergency department of the hospital.

4.3 Secondary Data

Data from various internet sources such as international refereed journals and scientific articles on medical websites were used to obtain additional information and data related to the research.

5. Data Analysis

Researchers use descriptive analysis such as percentages, to analyze the data with the help of SPSS and APSS program applications.

5.1 T-Test

Used to determine whether there were statistically significant differences between the study sample's answers to questionnaire questions or whether the differences occurred by chance.

Table 3: Patient Wait Time

N	**Valid**	**100**
	Missing	**0**
Mean		**2.28**
Std. Deviation		**.900**
Variance		**.810**
Sum		**228**

Valid	Frequency	Percent	Cumulative Percent
<=1	**22**	**22.0**	**22.0**
>1<=2	**36**	**36.0**	**58.0**
>2<=3	**34**	**34.0**	**92.0**
>3	**8**	**8.0**	**100.0**
Total	**100**	**100.0**	

Through the above table, we found that the members of the study sample and their percentage is 36%, which is the largest percentage, as indicated by the statistics in the table, and they confirm that the time period spent by the patient in the emergency department from the beginning of his registration to taking the appropriate treatment or transferring him to the appropriate department according to his medical condition ranges from (<1>=2), while the general average of the time period is equal to two hours and 28 minutes (2:28).

Table 4: Medical Services

Question	Scale	Percentage	T-Test	St- deviation	Means
3	**Agree**	**79**	**9.22**	**1.03**	3.95
6	**Agree**	**70.6**	**4.57**	**1.16**	3.53
7	**Agree**	**69.4**	**3.67**	**1.28**	3.47
5	**Agree**	**80.4**	**9.27**	**1.1**	4.02
1	**Agree**	**73**	**5.33**	**1.22**	3.65
2	**Agree**	**83.4**	**12.19**	**0.96**	4.17
4	**Agree**	**74.8**	**5.97**	**1.24**	3.74

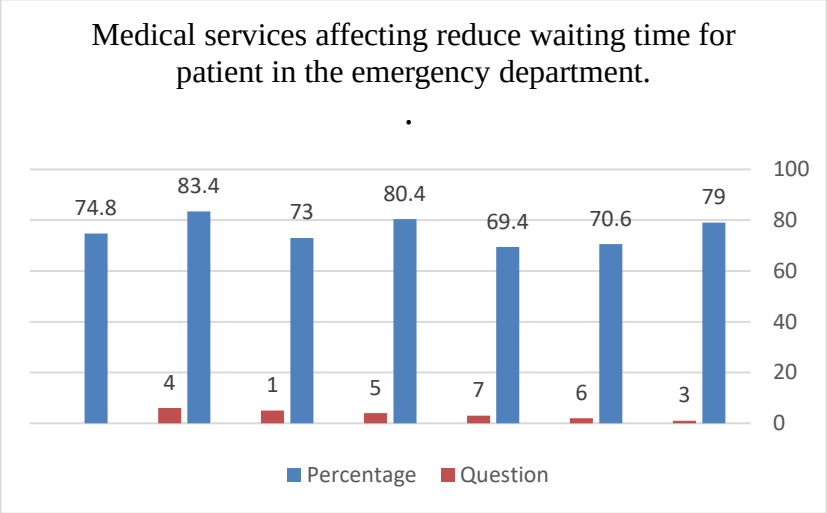

Figure1: Medical Services

1- The results of the Table 4 & Figure 1 above show that:

a- 83.4% of the study sample members agree question " Time to do the necessary tests and scans for patient in the emergency department

b- T- Calculate in all a question > 2 (T Tabulate) which means there are statistically significant differences in the answers of the sample members about all questions of the hypothesis (H1) with a degree of freedom 99.

Table 5: Hospital staff

Question	Scale	Percentage	T-Test	St- deviation	Means
7	**Strongly Agree**	**86**	**16.88**	**0.77**	4.3
4	**Agree**	**83.8**	**13.37**	**0.89**	4.19
1	**Agree**	**83.6**	**13.11**	**0.9**	4.18
9	**Agree**	**83.6**	**13.88**	**0.85**	4.18
6	**Agree**	**82.8**	**12.81**	**0.89**	4.14
11	**Agree**	**82.6**	**11.77**	**0.96**	4.13
8	**Agree**	**82.2**	**12.76**	**0.87**	4.11
5	**Agree**	**81.2**	**11.16**	**0.95**	4.06
2	**Agree**	**80**	**9.09**	**1.1**	4

3	**Agree**	**79.4**	**8.82**	**1.1**	3.97
10	**Agree**	**76.4**	**8.77**	**1.1**	3.89

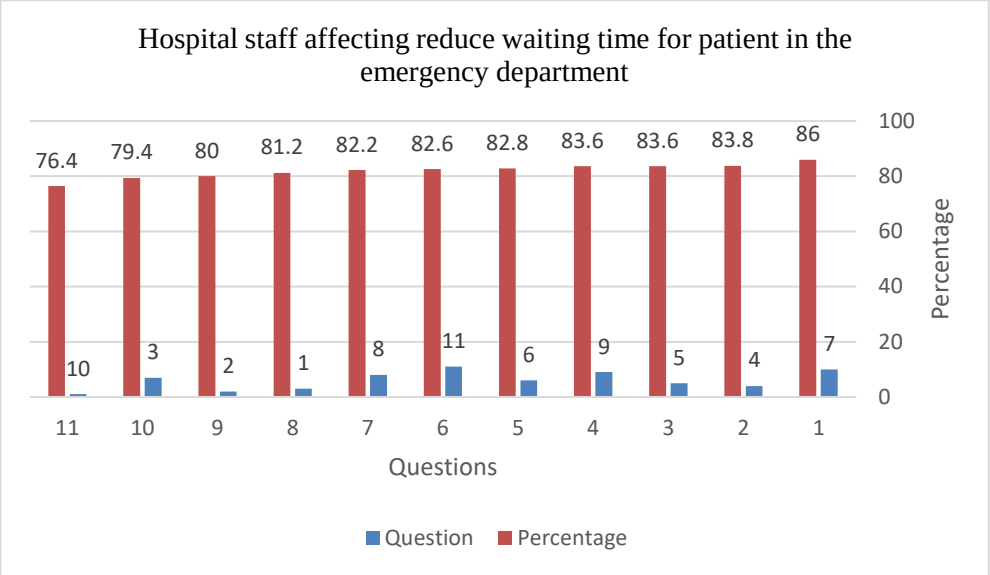

Figure 2: Hospital staff

The results of the Table 5 & Figure 2 above show that:

a- 86 % of the study sample members Strongly agree question " The medical and administrative staff is appropriate compared to the capacity of the department affecting reduced waiting time for patients in the emergency department.

b- T- Calculate in all a question > 2 (T Tabulate) which means there are statistically significant differences in the answers of the sample members about all questions of the hypothesis (H2) with a degree of freedom 99.

Table 6: Medical Equipment

Question	Scale	Percentage	T-Test	STDEV	Means
10	**Agree**	**83.8**	**12.93**	**0.92**	4.19
9	**Agree**	**82.2**	**11.33**	**0.98**	4.11
1	**Agree**	**82.2**	**11.21**	**0.99**	4.11
3	**Agree**	**78.4**	**8.60**	**1.07**	3.92
2	**Agree**	**77.6**	**8.22**	**1.07**	3.88
4	**Agree**	**77**	**7.80**	**1.09**	3.85
6	**Agree**	**77**	**7.66**	**1.11**	3.85
7	**Agree**	**76.8**	**7.30**	**1.15**	3.84
8	**Agree**	**76**	**6.96**	**1.15**	3.8
5	**Agree**	**74.6**	**6.52**	**1.12**	3.73

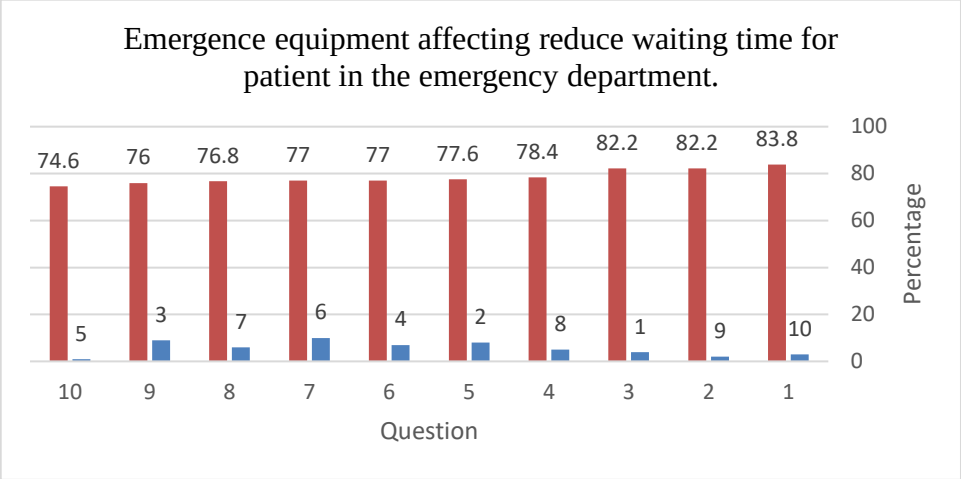

Figure 3: Medical Equipment

2- The results of the Table 5 & figure 3 above show that:

a- 83.8 % of the study sample members agreed question " An efficient communication system is available at the internal and external working environment level

b- T- Calculate in all a question > 2 (T Tabulate) which means there are statistically significant differences in the answers of the sample members about all questions of the hypothesis (H3) with a degree of freedom 99.

5.2 Chi-Square Test

Person's Chi-square test is a hypothesis testing method. Used to determine whether there is a statistically significant difference between the expected frequencies and the observed frequencies in one or more categories.

5.3 Correlation

Correlation analysis is used in this research as a statistical method used to measure the strength of the linear relationship between two variables and compute their association.

Table 7: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	44.270a	12	<.001
Likelihood Ratio	38.810	12	<.001
Linear-by-Linear Association	21.089	1	<.001
N of Valid Cases	100		

Table 8: Correlations

		Reduce Time	Time to do tests and scans
Reduce Time	Pearson Correlation	1	.462**
	Sig. (2-tailed)		<.001
	N	100	100
Time to do tests and scans	Pearson Correlation	.462**	1
	Sig. (2-tailed)	<.001	
	N	100	100

The results of the Table 7 & 8 above show that:

a- Time to do the necessary tests and scans, the value of it is <0.001 less than 0.05, that means is significant for reducing patient waiting time but this significance is not weakly and not strongly equal "0.462".

Table 9: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	77.654a	6	<.001
Likelihood Ratio	62.058	6	<.001
Linear-by-Linear Association	46.440	1	<.001
N of Valid Cases	100		

Table 10: Correlations

		Reduce Time	Speed in diagnosis case
Reduce Time	Pearson Correlation	1	.685**
	Sig. (2-tailed)		<.001
	N	100	100
Speed in diagnosis case	Pearson Correlation	.685**	1
	Sig. (2-tailed)	<.001	
	N	100	100

The results of the Tables 9 & 10 above show that:
a. Speed in diagnose case, the value of it is <0.001 less than 0.05, that means is significant for reducing patient waiting time and this significance is very strongly equals "0.685".

Table 11: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	21.846a	12	.039
Likelihood Ratio	24.372	12	.018
Linear-by-Linear Association	11.146	1	<.001
N of Valid Cases	99		

Table 12: Correlations

		Reduce Time	The hypnosis process was fast and easy.
Reduce Time	Pearson Correlation	1	.337**
	Sig. (2-tailed)		<.001
	N	100	99
The hypnosis process was fast and easy.	Pearson Correlation	.337**	1
	Sig. (2-tailed)	<.001	
	N	99	99

The results of the Tables 11 & 12 above show that
a- Hypnosis process was fast and easy, the value of it equals 0.039 less than 0.05, which means is significant for reducing patient waiting time but this significance is not strongly equal to "0.337".

Table 13: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	63.226[a]	6	<.001

Likelihood Ratio	69.907	6	<.001
Linear-by-Linear Association	42.358	1	<.001
N of Valid Cases	100		

Table 14: Correlations

		Reduce Time	staff is appropriate
Reduce Time	Pearson Correlation	1	.654**
	Sig. (2-tailed)		<.001
	N	100	100
staff is appropriate	Pearson Correlation	.654**	1
	Sig. (2-tailed)	<.001	
	N	100	100

The results of the Tables 13 & 14 above show that:

a- The medical and administrative staff is appropriate compared to the capacity of the department, The value of it is <0.001 less than 0.05, which means is significant for reducing patient waiting time and this significance very strongly equals "0.654".

Table 15: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	**65.018a**	**12**	**<.001**
Likelihood Ratio	**62.499**	**12**	**<.001**
Linear-by-Linear Association	**37.492**	**1**	**<.001**
N of Valid Cases	**100**		

Table 16: Correlations

		Reduce Time	specialist emergency doctors
Reduce Time	**Pearson Correlation**	**1**	**.615****
	Sig. (2-tailed)		**<.001**
	N	**100**	**100**
specialist emergency doctors	**Pearson Correlation**	**.615****	**1**
	Sig. (2-tailed)	**<.001**	
	N	**100**	**100**

The results of the Tables 15& 16 above show that:

a- The departments have specialist emergency doctors, the value of it is <0.001 less than 0.05, that means is significant for reducing patient waiting time and this significance is very strongly equals "0.615".

Table 17: Chi-square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	**22.338a**	**12**	**.034**
Likelihood Ratio	**26.416**	**12**	**.009**
Linear-by-Linear Association	**5.977**	**1**	**.014**
N of Valid Cases	**100**		

Table 18: Correlations

		Reduce Time	The number of beds
Reduce Time	**Pearson Correlation**	**1**	**.255***
	Sig. (2-tailed)		**.014**
	N	**100**	**93**
The number of beds	**Pearson Correlation**	**.255***	**1**
	Sig. (2-tailed)	**.014**	
	N	**100**	**100**

The results of the Tables 17 &18 above show that:

a- The number of beds is appropriate, the value of it is equals "0.034" less than 0.05, that means is significant for reduce patient waiting time, but this significant is weakly equals "0.255"

Table 19: Chi-square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	**24.696a**	**12**	**.016**
Likelihood Ratio	**28.316**	**12**	**.005**
Linear-by-Linear Association	**7.847**	**1**	**.005**
N of Valid Cases	**100**		

Table 20: Correlations

		Reduce Time	The distance it takes for the patient to reach the emergency units
Reduce Time	**Pearson Correlation**	**1**	**.294****
	Sig. (2-tailed)		**.004**
	N	**100**	**92**
The distance it takes for the patient to reach the emergency units	**Pearson Correlation**	**.294****	**1**
	Sig. (2-tailed)	**.004**	
	N	**100**	**100**

The results of Tables 19& 20 above show that: The distance it takes for the patient to reach the emergency department units, The value of it is equals "0.016" less than 0.05, that means is significant for reducing patient waiting time, but this significance is weakly equals "0.294".

Table 21: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	**68.380a**	**9**	**<.001**
Likelihood Ratio	**58.204**	**9**	**<.001**
Linear-by-Linear Association	**39.281**	**1**	**<.001**
N of Valid Cases	**100**		

Table 22: Correlations

		Reduce Time	An efficient Communication system
Reduce Time	**Pearson Correlation**	**1**	**.630****
	Sig. (2-tailed)		**<.001**
	N	**100**	**100**
An efficient communication system	**Pearson Correlation**	**.630****	**1**
	Sig. (2-tailed)	**<.001**	
	N	**100**	**100**

The results of the Tables 21 & 22 above show that:

An efficient communication system is available The value of it is <0.001 less than 0.05, which means is significant for reducing patient waiting time, and that significance very strongly equals "0.630".

5.4 Regression

is a set of statistical processes for estimating the relationships between a dependent variable ('outcome') and one or more independent variables (often called 'predictors', or 'features'). The general form for multiple regression is: $Y=a+b1X_1+b2X_3+\ldots+bnX_n$, here Y is the dependent variable and $X_1,\ldots, X_n$ are the n independent variables. In calculating the weights, a, b1,…, bn.

Table 23: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	**(Constant)**	**.082**	**.149**		**.549**	**.584**
	An efficient communication system	**.337**	**.073**	**.334**	**4.640**	**<.001**
	Number of staff	**.392**	**.080**	**.341**	**4.880**	**<.001**
	specialist emergency doctors	**-.033-**	**.045**	**-.048-**	**-.719-**	**.474**
	Time to do tests and scans	**.061**	**.051**	**.082**	**1.195**	**.235**
	Speed in diagnosis case	**.420**	**.096**	**.327**	**4.388**	**<.001**

As a result of this table, it is clear to us that there are variables that have a very strong effect on reducing the patient's waiting time in the emergency department, such as **(** An efficient communication system**, number of medical and administrative staff,** Speed in diagnose case), as for the other variables(**specialist emergency doctors, Time to do tests and scans**) their effect on each other is stronger than their effect on reducing the patient's waiting time. so the linear equation expresses that

Reducing waiting time= 0.82 + 0.337* (An efficient communication system**) + 0.392*(number staff) +0.420*(** Speed in diagnose case).

6. Research Validity

6.1 Content validity

The verification used in this research is based on verifying the validity of the content of the search tools by reviewing the research literature that has been used, which includes research related to reducing the time for patients waiting in the emergency departments of hospitals and based on these studies and research has been created and built data collection questions through questionnaire and Personal interviews.

6.2 Construct validity

Many statistical methods are used to prove construction health, including correlation analysis, factors analysis, multi-style, multi -style and matrix of correlation. Table 1 shows the link between the number of beds compared to the number of patients and the result

shows that The number of beds is appropriate compared to the number of patients " The value of it is equal to 0.034 less than 5, that means is significant for reduce patient waiting time, but that significant is weak equal "0.255".

7. Conclusion

Hospital emergency departments play the largest role in receiving critical cases of patients in various medical specialties. This study contributed to the theoretical understanding of the work of the emergency department by building a theoretical framework for the work of the emergency department. This framework depends on the basic factors that help reduce waiting time for patients in the emergency department.

The emergency departments must include qualified medical personnel in all specialties. A sufficient number of nurses must also be available. The emergency departments must be designed in such a way that the speed of movement between the radiology department, the laboratory and the pharmacy, contributes to reducing the waiting time for the patient. The emergency department must be equipped with all diagnostic equipment. Sophisticated and advanced.

This study relied on three main factors: the medical services provided in the emergency department, medical staff, as well as medical devices and equipment. Through the development of these factors, results can be obtained that help reduce the waiting time for patients in emergency departments, which makes emergency departments one of the fastest departments in treating patients. It is expected that this study will contribute to shedding light on the factors affecting reducing the waiting time for patients in the emergency department. Contribute to reducing patient waiting time.

This study presents a proposal for the application of one of the technologies of the Internet of Things through the development of a chip inside ambulances, this chip sends a signal to the emergency department for the patient who uses the ambulance to reach the hospital, this chip sends the patient's data and health status before the patient arrives at the hospital based on the data sent to the emergency department, the patient's condition is determined, and everything that helps to speed up the treatment of the patient is prepared before arriving at the hospital.

It is expected that the results of this study will contribute to the literature on reducing the waiting time for patients in the emergency department of hospitals in particular. This study will contribute to setting controls and steps aimed at serving patients in a short time.

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