Factors Influencing Patient Waiting Time as Key Performance Indicator of the Emergency Department Services at National Guard Health Affairs-Dammam Hospital

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Abstract-**Purpose: This study was conducted to identify the main factors that influence the average patient waiting time - from bed check-in to discharge as key performance indicator (KPI) of the emergency department at National Guard Health Affairs-Dammam Hospital.**

Methods: A cross-sectional study using a questionnaire that consisted of 29 items was developed to highlight the main factors that have an impact on patients' waiting time in the emergency room. Using convenience sampling, all emergency room caregiver staff at Dammam NGHA hospital was targeted to participate in this study. Between February and March 2013, 110 participants completed the survey with a response rate of 87.3%.

Results: The study revealed that patients' mean waiting time in the emergency department was 123.82 minutes after bed check-in. The study findings show that factors including participant's level of education, working schedule, years of experience as well as Health Information system accessibility had a statistically significant but weak relationship with the average waiting time after bed check-in (p <0.05) with the exception for work field which showed a medium positive relationship(r=0.302). The participants' working schedule and Health Information system accessibility were the most significant variables that influenced the patients' average waiting time after bed check-in in the emergency room.

Conclusion: This study has identified five factors that may influence patient waiting time after bed check-in in the emergency room at NGHA Dammam Hospital: participant's work field, level of education, working schedule, years of experience and Health Information system accessibility. Stakeholders need to take action to implement proper solutions which may lead to better delivery of patient care in the emergency room. Further studies should also target eliciting staff and patients' opinions to ensure high quality of services in the emergency room.

Keywords- Health Organizations; Key Performance Indicator (KPI); Emergency Department; Staff Performance; Waiting Time in ER; Patient Care; Saudi Arabia

I. INTRODUCTION

Health Organizations (HO) must have specific visions and missions in order to perform at the highest standards and develop Specific, Measurable, Attainable, Realistic, Timely (SMART) goals. HOs must also develop ways to manage and monitor these goals on a real-time basis in order to be proactive and prevent mistakes from happening, thus enhancing all kind of health services. Successful organizations around the world, including health providers, use Key Performance Indicators (KPIs) as one way to monitor and evaluate their performance. KPIs are essentially designed to evaluate the quality of the services offered at medical facilities. They can be measured and compared to the HO's SMART goals to evaluate whether or not they match their needs. Then, they can be analyzed in order to highlight the main issues and problems that may exist in the HO. That is a necessary process before the Health Organization can resolve the issues and problem and eventually enhance the services they provide [1].

In view of this, various departments in HOs have developed specific KPIs to enhance their services and prevent specific departmental problems. In 2008, the Ministry of Health in Malaysia (MOH) implemented KPIs to evaluate patients' waiting time in orthodontist's clinics that may influence patient satisfaction and subsequently have an impact on the healthcare outcome [2].

Hospitals all over the world are striving to provide high quality services in their Emergency Room (ER) department with a goal of putting the right patient on the right bed at the right time [3]. Measuring the waiting time period from bed check-in to discharge is an essential indicator of how well an ER is working and performing [4]. There are no internationally agreed upon benchmarks for waiting time, however, the general ER benchmark is four hours from patient presentation to discharge, with no more than two hours waiting between the bed check-in and discharge [3, 5, 6].

At the National Guard Health Affairs (NGHA) Hospital, the ER department is considered a critical section in the hospital. It is vital for the department to provide high level of services in order to ensure efficient healthcare service, improve healthcare outcomes and enhance patient satisfaction. Currently, the NGHA uses QuadraMed's Computerized Patient Record (QCPR) as the Health Information (HI) system. The system generates many reports for stakeholders about patient information and staff performance. This information, generated on a regular basis, enables stakeholders to study the factors behind specific results and help them solve problems to improve HO services [4].

At NGHA Dammam hospital, real efforts are undertaken in order to control patient waiting time and improve staff performance in ER. The management of the ER department has identified the most important KPIs for ER reports and created an official Department Policy and Procedure (DPP) to conduct a strict policy for patients' waiting time. Practically, the KPIs translate to patient waiting time. According to the DPP, every patient's waiting time during his or her time in the ER – starting from bed check-in all the way to discharge - should not be more than two hours. However, to date, despite the evaluation of these KPIs and the presented DPP, issues regarding ER patient waiting time have not been solved. For instance, figures from the ER quarterly reports for QI, Q2 and Q3 2012 report the maximum waiting time from bed check-in to discharge as 7.59 hours in May 2012 and 9.16 hours in September 2012. This comparison indicates that no improvements have been seen within these five months [7]. The current emergency workflow process is presented in appendix A, Fig. A-1.

While analyzing ER KPI, many factors have to be taken into consideration in order to discover their impact on ER service levels. A study by Rosenstein et al. revealed the impact of different factors such as training, unequal scheduling and shifting roles on medical staff behavior which eventually affect their performance levels in the HO [8]. Furthermore, the accessibility of HI system might be considered as one of the main factors that can enhance the flow of patient care delivery in the HO. Thus, any slowness or failure in the HI system will have a huge negative impact on the healthcare services in ER [4, 9]. Moreover, a number of studies have found a direct correlation between higher quality of services and reduced staff turnover. Other related factors that ultimately impact patient satisfaction, staff performance and better health outcomes in the HO include education and experience levels, skills, staffing, work stress and stable work schedules [10, 12].

The literature reviewed has clarified the influence of measuring KPIs on healthcare outcomes and highlighted some factors that might have an impact on the scores of ER KPIs. However, there remains a gap between the studies reviewed. In view of that, this study was conducted from ER staff point of view, to explore the main factors that have an impact on the average patient's waiting time after bed check-in in line with KPI scores. Using the results of the study, ER stakeholders will be able to identify the existing problems within ER and resolve them for quality assurance purposes. The main research objectives for this study were:

1- To identify the main factors that affect the average patient waiting time from bed check-in to discharge as one important KPI in ER at NGHA Dammam hospital.
2- To find out the level of effectiveness of different factors on the average patient waiting time from bed check-in to discharge in ER at NGHA Dammam hospital.

II. METHODS

A. Study Design

An exploratory cross-sectional study design using a questionnaire-based survey was developed to explore the effect of specific factors on the results of patient waiting time in the ER at NGHA Dammam hospital.

B. Selection and Description of Participants and Study Setting

NGHA hospital is considered one of the largest healthcare organizations in the Kingdom of Saudi Arabia. It has five different medical cities located in Dammam, Hasa, Riyadh, Jeddah and Madinah [13]. NGHA Dammam hospital is the smallest medical city with a 100-bed capacity. The ER department within this hospital plays a core role since it services around 4,000 patients each month. Inside ER, caregiver staff consists of physicians, nurses and Patients Services (PS) staff. The numbers presented in the table below were collected from ER management [14, 15].

Physicians	Nurses	PS	Total
ER physician 16 Other specialty in ER 64	36	10	126

The ER department at NGHA Dammam hospital has a 13-bed capacity and 126 ER caregiver staff. Since this is a small ER department, the entire population was invited to participate and no randomization was performed. Therefore, the target population for this study was all ER caregiver staff at Dammam NGHA hospital that fulfilled the eligibility criteria.

Eligibility criteria included all ER physicians and staff physicians who dealt with ER patients. This included staff in obstetrics/gynecology, pediatrics, surgery and internal medicine. Other physicians such as locums, resident physicians, family

medicine, medical imaging, anesthesia, laboratory and dental were excluded from the study as they were not involved regularly in ER issues. All ER nurses were included in the study, except the Unit Assistant nurses because they were not involved in the treatment process. For PS staff, only ER registration and admission staff was included [14, 16]. Participants were recruited to measure their opinions regarding the reasons behind the average patient waiting time from bed check-in to discharge using the convenience sampling technique [17, 18].

C. Study Survey

A survey was developed which highlighted eleven main factors. It was divided into five sections; an introduction of the study, a demographic information section, a section collecting staff work information and a fourth section representing the participants' opinions regarding the effect of various issues on their performance and patient waiting time in ER. In the last section, suggestions regarding different factors were collected to provide solutions in order to improve the services in ER. In order to avoid any bias, both the estimated waiting time and the suggestion questions were designed to be open ended questions.

The survey consisted of two different questions with related answers to ensure reliability of the questions. In addition, a pilot study was conducted to ensure clarity, face and content validity. Some modifications were made to the survey based on the pilot survey results. The survey used a Likert scale (strongly disagree, disagree, undecided, agree or strongly agree) to extract the participant's satisfaction regarding specific factors. The surveys were distributed by hand to all ER staff during their daily shift in the wards or clinics and during the daily morning meetings of each specialty. All participants were given a clear explanation of the purpose of the study. The survey was distributed in the morning, then a follow-up was done in the afternoon and finally the survey was collected around 4 pm. No surveys were distributed on Saturdays and Wednesdays, as typically these days are known to affect employee reliability in responses due to heavy workload - since they signalled the end and beginning of a working week in Saudi Arabia.

D. Statistics

The results of the survey were analyzed using the Statistical Program for Social Sciences (SPSS) version 20 (SPSS, IBM, Chicago, Illinois, USA). Descriptive statistics were used to provide a general overview of the data and Likert scale was used to present the frequency, percentage and general trend of participants' opinions. Independent T-test and One-Way Analysis of Variance (ANOVA) analyses were conducted to compare the means of estimated average waiting time (DV) for each variable: independent variable and extraneous variable. In one-way ANOVA, Least Significant Difference (LSD) was conducted to perform multiple comparisons to find out the least significant difference between any two means.

A correlation analysis was used to measure as well as identify the strength and the direction of the relationship. Spearman's correlation coefficient test, using one tailed analysis, was performed with ordinal variables while Eta correlation test was used with nominal variables. In addition, multi-linear regression was conducted, using Stepwise method [14].

<center>III. RESULTS</center>

A. Sample

Between February and March 2013, 126 survey forms were distributed to all ER caregiver staff and 110 surveys were received. This represented an 87.3% response rate. The remaining 16 participants had not responded due to three main reasons: they were on sick leave, they were working the night shift, or they simply did not want to participate in the survey.

B. Overview of the Data

The demographic characteristics of the respondents showed that around half (45.5%) of the participants were between 30-39 years with more males than females. Moreover, the majority of the respondents were of Saudi nationality (29%) and more than half (57.3%) of them had a Bachelor's degree.

Regarding the work related information of the study participants, the data showed that 44.5% of the respondents were other physician specialties, 32.7% were ER nurses, 13.6% were ER physicians and 9.1% were ER patient services staff. The highest proportion of the sampled participants had more than 10 years of experience in dealing with ER issues and 60% spoke both English and Arabic when they communicated with ER patients. Almost half of the participants (49.1%) worked for 12 hours and 55.5% of them had undertaken between 1 and 10 courses. Around two thirds (65.5%) of the participants had not experienced any unprofessional behaviors.

Based on the participant's experience, the mean estimated patient waiting time from bed check-in to discharge was 123.82 minutes with a Standard Deviation (SD) of 41.04 minutes (minimum of 20 minutes and maximum of 240 minutes). The participant's opinions about the factors that influenced patient waiting time in ER are shown in Table 1.

TABLE 1 PARTICIPANTS OPINION ABOUT THE FACTORS THAT MIGHT AFFECT PATIENT WAITING TIME IN ER

Variables	Agree		Undecided		Disagree		Means (Trend)
	N	%	N	%	N	%	
With more years of experience, I find it easier to perform my tasks.	108	98.2	0	0	2	1.8	1.5 Strongly Agree
Speaking Arabic with patients affects my performance positively.	97	88.2	2	1.8	11	10	1.85 Agree
The current number of staff in ER is sufficient.	17	15.5	10	9.1	83	75.5	3.81 Disagree
The bed capacity in ER is sufficient.	56	50.9	13	11.8	41	37.3	2.83 Undecided
Formal training courses enhance my productivity and communication with staff and patients in ER.	98	89.1	5	4.5	7	6.4	1.87 Agree
Unprofessional behavior from staff in ER influences my performance and productivity negatively.	75	68.2	14	12.7	21	19.1	2.31 Agree
The current day/night shift schedule is proper.	57	51.8	20	18.2	33	30	2.81 Undecided
Night shift impacts my performance negatively in ER.	44	40	17	15.5	49	44.6	2.97 Undecided
Long working hours influence my performance negatively in ER.	73	66.4	6	5.5	31	28.2	2.34 Agree
When HI system is slow or down, my performance is negatively impacted.	94	85.5	7	6.4	9	8.2	1.87 Agree
In general, work satisfaction has a positive relationship with my performance in ER.	108	98.2	1	0.9	1	0.9	1.62 Strongly Agree

In order to enhance the results of our study, participants' suggestions to solve waiting time issues and improve the services in ER were collected and are presented in Table 2. The results of the survey reveal that around half (40.9%) of the participants recommended various training courses including special medical courses, specific skills courses, triage courses and management courses in addition to computer courses. More than half (60%) of the surveyed participants provided various suggestions in order to enhance ER services and these suggestions are presented in appendix A, Fig. A-2.

TABLE 2 PARTICIPANT'S SUGGESTIONS TO REDUCE PATIENT WAITING TIME IN ER

Variable	Frequency (n=110)	Percentage %	*Mode
In your opinion, which work field needs to increase its staff number in ER?			Nurse & Physician
None	4	3.6%	
Nurse	17	15.5%	
Patient Services staff	2	1.8%	
Physician	17	25.5%	
Nurse & Physician	50	45%	
Physician & Patient Services staff	2	1.8%	
All	10	9.1%	
Other	8	7.3%	

What kind of formal training courses do you suggest to enhance the performance of staff in ER?			Other
None	26	23.6%	
Saudi Culture	39	35.5%	
Other	45	40.9%	
In your opinion, which work field needs to improve their work behaviors in ER?			None
None	29	26.4%	
Nurse	13	11.8%	
Patient Services staff	7	6.4%	
Physician	24	21.8%	
Nurse & Physician	11	10%	
Nurse & Patient Services staff	1	.9%	
All	18	16.4%	
Other	7	6.4%	
How would you improve the shift schedule for ER services?			Add more staff within one shift
No improvement is needed	8	7.3%	
Shifts distributed equally (days & nights)	19	17.3%	
Add more staff within one shift	35	31.8%	
Add more days off between shifts	6	5.5%	
Add more staff within one shift & add more days off between shifts	13	11.8%	
Shifts distributed equally & add more staff within one shift	9	8.2%	
All	15	13.6%	
Other	5	4.5%	
What do you suggest regarding the working hours for ER services?			Add more staff
None	7	6.4%	
Reduce working hours to 8	31	28.2%	
Add more staff	48	43.6%	
Reduce working hours to 8 & add more staff	19	17.3%	
In your opinion, are there any additional factors that influence the services in ER, especially the patient waiting time?			No
No	73	66.4%	
Yes	37	33.6%	
Finally, do you have any additional suggestions to improve ER services at NGHA?			Yes
No	44	40%	
Yes	66	60%	
*Mode: most frequent answer			

C. Factors that Influence Patient Waiting Time in ER

The study shows that participants' work field groups had statistically significant difference with their estimated average patient waiting time ($p=0.017$, $F=3.537$). Patient services staff reported significantly less average patient waiting time than Nurse and Other physician specialty participants ($p=0.007$ & $p=0.008$ respectively). In addition, a statistically significant difference was also found between participants' years of experience and average patient waiting time ($p=0.005$, $F=3.917$). Participants with less than one year and those with 1-2 years of experience reported significantly different average patient waiting time than other experience levels.

Factors that showed no significant difference with the average patient waiting time ($p > 0.05$) were work schedule groups, participants' opinions regarding the sufficiency of current shift schedule, night shift and long working hours. However, there

was a statistically significant difference in the average patient waiting time between participants with 8-hour work schedules and those with other work schedules (on rotation/on Call) (p=0.023). Moreover, none of the questions under "formal training courses & language" factors were found to have statistically significant differences regarding the average patient waiting time (p > 0.05). This was also true between different participants' opinions regarding the sufficiency of the current number of ER staff and bed capacity with the average patient waiting time (p=0.469 & p=0.500 respectively). Furthermore, participants' different opinions about the impact of unprofessional behavior, HI inaccessibility and job dissatisfaction on their performance showed no significant impact on their estimated average patient waiting time (p=0.849, p=0.284 & p=0.790 respectively).

A weak correlation was shown between all variables and the estimated average patient waiting time after bed check-in except the work field variable. A medium positive relationship was noted between participants work field and their estimated average patient waiting time (r=0.302). As displayed in Table 3, a statistically significant correlation was found between the positive effect of experience years on the participants performance and the average patient waiting time (p=0.042) with weak inverse relationship (r=-0.165). Regarding shift and work schedule factors, a weak and positive statistically significant correlation was noted between the hours of working schedule and the average patient waiting time (p=0.035, r=0.173). Moreover, the inaccessibility of the HI system showed a weak and positive statistically significant correlation with the average patient waiting time (p=0.029, r=0.182).

TABLE 3 CORRELATION ANALYSIS BETWEEN THE INDEPENDENT VARIABLES AND THE AVERAGE PATIENT WAITING TIME AFTER BED CHECK-IN

Variables	Spearman's value/ Eta value	P-value
What is your work field?	0.302[b]	
How many years of experience do you have in dealing with ER issues?	-0.111[a]	0.123
With more years of experience, I find it easier to perform my tasks.	-0.165[a]	0.042**
What is your working schedule?	0.173[a]	0.035**
The current day/night shift schedule is proper.	0.022[a]	0.41
Night shift impacts my performance negatively In ER.	-0.074[a]	0.222
Long working hours influence my performance negatively in ER.	-0.006[a]	0.474
Which language do you use when you are communicating with patients in ER?	0.180[b]	
Speaking Arabic with patients affects my performance positively.	-0.151[a]	0.058
How many formal training courses did you attend during your working period?	0.097[a]	0.157
Formal training courses enhance my productivity and communication with staff and patients in ER.	-0.066[a]	
Have you experienced any unprofessional behaviors?	0.087[b]	
Unprofessional behavior from staff in ER influences my performance and productivity negatively.	-0.061[a]	0.264
The current number of staff in ER is sufficient.	-0.075[a]	0.218
The bed capacity in ER is sufficient.	0.021[a]	0.414
When HI system is slow or down, my performance is negatively impacted.	0.182[a]	0.029**
In general, work satisfaction has a positive relationship with my performance in ER.	-0.021[a]	0.413

**correlation is significant at 0.05

a: Spearman's value

b: Eta value

Multi linear regressions, using Stepwise method, were conducted on the study variables. After the analysis, only two factors had a statistically significant influence on the average patient waiting time after bed check-in. These were working hours schedule (p=0.019) and HI system accessibility (p=0.031).

There was no statistically significant difference noted between different participants' gender, age, nationality and educational level regarding their estimated average patient waiting time (p > 0.05). However, participants with high school education had significantly different average patient waiting time than participants with higher education (p=0.028). Furthermore, there was no statistically significant correlation found between the participants age and the average patient waiting time (p=0.294> 0.05). In the area of participants gender and nationality, a weak positive relationship was noted between gender as well as nationality and the average patient waiting time (r=0.065 & r=0.195 respectively). A statistically significant correlation was found between the participants level of education and the average patient waiting time (p=0.0435); with a weak and positive relationship between them.

IV. DISCUSSION

A. Relevance of Findings

The findings of this study have shown statistically significant but weak correlations between the participants' level of education, years of experience, working schedule and HI accessibility and their estimated average waiting time after bed check-in. The exception was in the area of work field, which showed a medium positive relationship. Additionally, working schedule and HI accessibility impacted most significantly on the average waiting time after bed check-in.

The estimated average patient waiting time after bed check-in in ER was almost similar to the real-time average patient waiting times in ER for the hospital for the second and third quarters of 2012, with only 15 minutes difference. Despite these similarities, both of them exceed the hospital's DPP instructions as well as the international general ER benchmark [3].

Whilst no previous studies have focused on the impact of staff specialty on the ER waiting time, this study has found a moderate positive relationship between participants work field and average waiting time. PS staff had less average patient waiting time than nurses and other physician specialties. This may be due to the minimal contact with patients. This highlights the need to conduct a meeting with PS staff to discover the main reason for these good numbers.

Moreover, this study showed a weak and positive relationship between participants' education level and average waiting time. This is in contrast to the findings of Lankshear et al. [10], which showed a negative relationship between participants' level of education and average waiting time. A possible explanation for this can be attributed to the role of staff that has higher educational qualifications, such as ER consultants. These ER consultants are usually involved only in critical cases that need more time to provide accurate treatments. However, ER stakeholders need to undertake further investigation to know the real reason behind this result.

Furthermore, our study results were similar to those of Wagner & Bear and Lankshear et al., who indicated a reverse correlation between participants' years of experience and patient length of stay [10, 12]. Staff with 1-2 years of experience had more average patient waiting time than those with 3-5 years, 6-10 years and over 10 years of experience. The results clearly demonstrate that ER stakeholders must focus more on employing ER staff with high professional/technical experience in order to optimize services in ER.

Similar to the results found in the Shader et al. study where nurses with more stable work schedules had lower anticipated turnover and better healthcare outcomes, our study showed a weak positive significant relationship between the participants' working schedule and the average waiting time [11]. Staff with 8-hour work schedules had less average patient waiting time than staff with 12 or 24 hours or professionals who were on rotation/on call work schedule. Many of the participants suggested reducing working hours to 8 hours and adding more staff. This indicates a need for flexibility within management and the organization regarding working schedules in order to meet the needs of ER staff and improve their performance in ER.

Whilst other studies found that a modified and flexible shifting schedule may reduce the average length of stay for patients by up to 50 minutes [19], our study found no relationship between participants shift schedule and average waiting time. Furthermore, we found no difference between staff behavior/use of a language and average waiting time. This is in contradiction with the findings of other studies where staff behavior and the language used in ER had an impact on average waiting time [12, 19]. In addition, conversely to the findings of Morey et al. study and Lankshear et al. study, in this present study, no statistically significant relationship was noticed between formal training courses as well as current number of staff in ER and the average waiting time [9, 10]. Other studies have found that work satisfaction had an inverse relationship with retention rate [11], whilst our study found no such relationship between the participants' work satisfaction levels and the average patient waiting time in ER.

The results of our study show that HI inaccessibility has a direct correlation to average patient waiting time. These results correspond to another study, which also showed that increasing the accessibility to HI system had a positive relationship with improving the efficiency of the hospital and the quality of emergency care [20]. Clearly, there is a need to ensure continuous accessibility and availability of HI system in the ER to reduce or even eliminate the negative influences on staff performance and ensure continuous services to all ER patients.

This study has confirmed the real issues behind a waiting time of more than two hours which was previously extracted from HI system reports. The study exposed that the five main factors that had a significant relationship with patients' waiting time after bed check-in were participants' field of work, level of education, years of experience, working schedule and HI accessibility. Of these five, the two most influential factors on the patients waiting time after bed check-in in ER at NGHA Dammam hospital were work schedule and HI accessibility.

B. Study Limitations

Several limiting factors were noted in this study. The first is the difficulty to generalize our findings with other ER departments inside or outside our setting due to the factor differences such as staffing levels, levels of work experiences, formal training and presence/use of advanced technologies. However, the results of this study may provide insights into the general factors that may influence patient waiting time in ER and offer a remarkable opportunity for further research in this

area. The second limiting factor noted in the study was that participants' responses to the average waiting time were based on their own experiences and perceptions, which may not truly represent the actual situation. Nonetheless, this study was focused on the factors from an ER staff point of view thus, their own estimation was essential. The third and last limiting factor during the study was that the literature lacks studies about patient waiting time KPI in ER conducted in Saudi Arabia. This made it difficult for the researchers to build on this study based on pervious work that might have been done in this area.

C. Future Work

The central premise of this study is to glean insights into the factors influencing patient waiting time as key performance indicator of the Emergency Department Services at Dammam Hospital. To address the issue effectively, it is essential to address firstly the issues on factors that have a sequential effect on the waiting time as enumerated above. Then, ER stakeholders have to conduct continuous and sustained consultations and meetings in order to study, discuss and analyze these issues. The next step is to design and implement proper solutions to resolve patient waiting time issues and develop best practices for better delivery of patient care in ER. The participants' recurring suggestions in this study must be taken into utmost consideration to ascertain new factors that may still have to be unearthed.

Furthermore, continuous observation and ongoing surveys must be conducted within the premises of the ER of Dammam Hospital for staff feedback on current process in ER, weaknesses and recommendations for improvement. In addition, efforts must continue to regularly acquire patient's opinions. It is of utmost importance to clarify their needs in order to enhance their satisfaction and improve healthcare outcomes.

V. CONCLUSION

This study has investigated the factors that can influence the undesired scores of a specific KPI, patient waiting time in ER from bed check-in to discharge, at NGHA Dammam Hospital. It has provided insights into the factors that may influence ER staff performance in a setting not previously reported and can be of relevance for other future studies planning for interventions in similar environments. Additional research in the ER area is recommended where waiting time issues in other NGHA hospitals should be explored in order to detect the other factors that can be compared between hospitals and generalized to the rest of ER hospitals.

Summary Table

Already known

- Current work process in the ER at NGHA Dammam hospital.
- Patient waiting time KPI in ER from bed check-in to discharge is not compatible with hospital DPP and international agreement benchmark.
- General factors that impact patient waiting time in ER based on previous studies.
- KPI effectiveness in measuring staff performance in HOs.

Specific factors added to our knowledge

- The general level of staff satisfaction about the current work process/environment in the ER at NGHA Dammam hospital.
- The study confirms the issue of waiting time using participants' own estimation and experience in ER.
- The influence of specific factors on patient waiting time KPI from bed check-in to discharge in ER at NGHA Dammam Hospital.
- The study has provided insight of the effective way to highlight and analyze ER waiting time issue via using KPI results.

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Appendix A

Fig. A-1 Emergency work flow process at NGHA Dammam Hospital

Once the NGHA patient enters the ER main door, registration is carried out where the unit assistant determines the case priority. This is done by asking the patient about their issues. Then, the patient goes to PS staff in order to complete the registration papers. Following this, the patient waits in the waiting area until the nurse takes him/her to the triage room. In the triage room, the nurses use the five levels of treatment which are: Level 1 (Resuscitative) with 0 waiting time, Level 2 (Emergent) with less than 15 minutes waiting time, Level

3 (Urgent) with less than 30 minutes waiting time, Level 4 (Less urgent) with less than 1 hour waiting time and Level 5 (Not urgent) with less than 2 hours waiting time. Based on the assigned treatment level, the patient waits until he/she is allocated a bed. A patient with a priority level of 1, 2 or 3 is given the treatment in the ER area. Conversely, a patient with a priority level of 4 or 5 is given treatment in a fast track area. Once the physician sees the patient, the necessary tests, procedures and treatments are given before a decision is taken as to whether to discharge the patient, refer him/her to another specialty department or admit him/her to inpatient department for further treatment and care [12]. In ER, the work process includes three main steps: registration process, triage process and treatment process. Each one contains its own issues. However, this study focused practically on the treatment process that is conducted from bed check-in to discharge for three main reasons. Firstly, the extracted reports showed that the main issues are practically related to steps 2 & 3. Secondly, step 3 is the only step that involves all ER caregiver staff: physicians, nurses and patient services staff. Thirdly, this step is the main step that ER stakeholders have focused on and generated specific DPP to control its waiting time issue. In view of that, this study focused on the main factors that influence patient waiting time, after bed check-in, from an ER staff point of view and experience. The results of the survey that studied the average waiting time after bed check-in was collected from the participants' estimation in order to highlight and compare their results with the real results in the extracted report in addition to check the main factors that impacts their results.

Fig. A-2 Participant's suggestions to improve ER services at NGHA Dammam Hospital

1. Non-emergency/cold/simple cases should be redirect to PHC, which must be kept open 24/7.

2. Triage system must be improved by increasing the number of its courses and rooms, implementing triage away policy in addition to involving ER physicians in the triage room.

3. More qualified, well-experienced experts and trained physicians in all specialties should be added in ER, along with permanent ER consultants.

4. ER staff should have the necessary management support and the desired job satisfaction in order to provide full support to each other and make the right and quick medical decisions.

5. Patients need clear education and instructions about ER cases, procedures/work flow and best behavior. In addition, hospitals need an effective way to present information about the current availability of beds and expected average waiting time, besides applying an efficient way to access, distribute and discharge patients in ER.

6. The current ER process needs some changes: patient relation, social services and radiology staff should be available in ER 24 hours. In addition to this, working processes should be paperless using only the HIS of the hospital.