

Effect of Queue Management System on Quality of Nursing Care and Patient Satisfaction

E.S.Guarte, F.F.Elsayed and S.I.Khalil

Nursing Administration Department, Faculty of Nursing, Benha University

E-mail: esguarte@sghgroup.net

Abstract:

Background: Queuing Management System usage become a symbol of the efficiency of majority of hospital worldwide. Managing the length of the client waiting line effect on quality of care and patient satisfaction. **Aim of the study:** assess the effect of queue management system on quality of nursing care and patient satisfaction. **Research Design:** A quasi-experimental design was utilized. **Setting:** outpatient department at Saudi German Hospital Cairo. **Subjects:** A 40 nurses who working in outpatient clinics and a 42 patients. **Tools for data collection;** Five tools were used as follow; Queue Management System knowledge questionnaire, Observational checklist regarding Queue Management System practices, nurses' attitude toward Queue Management System questionnaire, Quality of nursing care questionnaire and patient satisfaction questionnaire **Results:** the study results showed that, there was highly statistical significant difference improvement of nurses' knowledge scores at post and follow up program phases compared with preprogram phase, also, the most of nurses had satisfactory practice level at post program and follow up phases compared with preprogram phase, in addition, there was highly statistical significant difference improvement of nurses' attitude scores regarding queue management system throughout post and follow up program phases ; and the most of patients reported that there was high quality of nursing care level during post program and follow up phases compared with preprogram phase, finally, there was highly statistical significant difference improvement of patient satisfaction scores throughout post and follow up program phases compared with preprogram phase. **Conclusion:** Applying Queuing Management System can increase patient satisfaction and Quality of care. **Recommendations:** Hospital management should apply Queuing Management System for any service with waiting lines, For Nurses they should attended the continuous education programs, while for patients they should give feedback regarding the system and quality of nursing care.

Keywords: Patient satisfaction, Queuing Management System, Quality of nursing care.

1. Introduction

Innovative technology provide the superlative level of health care services based on contemporary information systems by accurate use of data, appropriate allocation of resources, and timely execution of processes are all necessary to maintain the patient flow within the clinics [1].

Queueing systems is defined as specifying the arrival pattern, the service mechanism, and queue discipline. Which occur at any time, there is a clients' demand service from some facility; usually, both the arrival of the client and the service times are assumed to be organized. Queuing management system improved by knowing how the dynamics of queues are working in real life. Serving patients quickly, reliably, and efficiently is the main goal of healthcare management by providing less waiting and delays with improved staff satisfaction [2].

Queuing system applications decrease nurse workload to increase the quality of nursing care, the quantity of physical and emotional support the patients receive and improve patient satisfaction. A good indicator of the quality of nursing service attained from better-quality daily activities, tasks of nurse and nursing assessment adequacy. In case all of the nursing staff are busy when new clients arrive, generally wait in line for the next available serving time, speed of delivery is being emphasized increasingly and can be partly attributed to increase competition and the value a patient place on time [3].

Quality of care services that provide a responsive, developmentally suitable environment for clients, enhance education, safety resources, support the needs of health professionals, promoting healthy and safe care. In the context of quality of care, connectivity and documentation are interfacing with the electronic medical system that communicates and integrates data from multiple devices and databases and provides a single comprehensive solution for data interpretation and management. The use of connectivity is the safest and most reliable method of data transfer, which permits automated, real-time, bi-directional, electronic wired, or wireless, lessens the time, eases the burden, and diminish errors. Health care institutions are included of acute care hospitals, community hospitals, long-term care facilities, primary clinics, and emergency units [4].

Also, Queue system applications decrease nurse workload and increase the quality of nursing care, the quantity of physical and emotional support the patients receive and improve patient satisfaction by providing a good indicator of the quality of nursing service attained from better-quality daily activities, tasks of nurse and nursing assessment adequacy. In case all of the nursing staff are busy when new clients arrive, generally wait in line for the next available serving time, speed of delivery is being emphasized increasingly and can be partly attributed to increase competition and the value a patient place on time [4].

Patient satisfaction is the major factor of hospital functioning which helps in improving the quality of health care services, that improved quality of nursing care and patient satisfaction, and attract new patients to this hospital rather than another hospital [5].

Patient satisfaction is a crucial healthcare outcome, clinical safety and clinical effectiveness across healthcare settings. Thus, healthcare organisations focus on improving patient satisfaction have improved quality of care, which the main points to a strong link between staff experience, patient satisfaction, staff job satisfaction and work engagement are positively related to shaping the work environment for the workforce [6].

Significance of the study

With better understanding of queuing management system and nurse managers can make decisions that increase the quality of nursing care achieve more satisfaction for all nurses and management. Additionally, several studies documenting patient dissatisfaction with long waiting times and revealed that a pervasive problem in hospital practice and a common source of anxiety and dissatisfaction among patients. Accordingly, the positive impact of queuing system on patient satisfaction and decrease the workload and stress that nurses may encounter, but almost no studies in Egypt have been conducted for that issue.

Aim of the study

The study aimed to assess the effect of queue management system on quality nursing of care and patient satisfaction through the following objectives:

1. Assessing nurses' knowledge and practice regarding queue management systems through the program.
2. Identifying nurses' attitudes toward queue management systems through the program.
3. Assessing the quality of nursing care levels through the program.
4. Assessing the levels of patient satisfaction through the program
5. Designing and implementing an educational program for nurses about the queue management system
6. Assessing the effect of queue management system on quality of nursing care and patient satisfaction.

Research Hypothesis

There will be improvement for nurses' knowledge and practice regarding queue management system and it will be positive effect on both quality of nursing care and patient

2. Subjects and Methods:

Study design:

A quasi-experimental design was utilized to achieve the aim of the current study.

Study setting:

The current study was carried out at outpatient consist of 8 clinical clinics in Saudi German Hospital Egypt.

Study subjects:

The subjects of the present study included two groups:

- Staff nurses group
All staff nurses 40 nurses who working in outpatient clinics, and accept to participate in our study.
- Patients group:
Includes 42 patients who accepted to participate in our study. according to the following sample equation

$$n = \frac{N}{1 + N(e)^2}$$

(N = total sample, and e= 0.05 while 1 is constant)

Tools for data collection:

Five tools were used for data collection:

I. Queue management system knowledge questionnaire: A structured questionnaire was developed by the investigator after reviewing related literature (Bidgoli, 2018; Marynissen & Demeulemeester, 2019; Rindfleisch, 2019); Ameh, Sabo & Oyefabi, 2016).

It consisted of two parts: **Part (1);** Personal characteristics: it includes personal characteristics of nurses' age, gender, educational qualifications, Outpatient clinic specialty, years of experience, and previous training courses. **Part (2);** Queue Management System knowledge questionnaire is used to assess nurses' knowledge regarding QMS. It contained 25 questions in the form of multiple-choice, true or false questions.

Scoring system: Each staff response scores as follow as correct answer 1 degree, incorrect answer (zero). Total scores were summed, more than 60 % is considered a satisfactory level of scores.

II. Observational checklist regarding queue management system practices:

(Marynissen & Demeulemeester, 2019; Rindfleisd, 2019; Bidgoli, 2018; Ameh, Sabo, and Oyefub, 2016) to assess staff nurses practice regard QMS. It includes 46 items divided into four domains; communication skills 7 items, hand washing 12 items, automatized vital signs measurement 23 items, and patient fall management 4 items.

Scoring system: Each done one score and incorrect or not done. The scoring system was reversed for negative items. Each staff level of practice regarding the queue management system was categorized as either satisfactory or unsatisfactory according to checklists scores, 80 % is considered the satisfactory level of scores.

III. Nurses' attitude toward queue management system questionnaire:

A Structured questionnaire was developed by the investigator based on reviewing the related literature review (Marynissen & Demeulemeester, 2019; Rindfleisd, 2019; Bidgoli, 2018; Ameh, Sabo, and Oyefub, 2016) to assess staff nurses' attitudes toward QMS. It included 20 items divided into four domains: Confidence 5 items, the usefulness of queue management system 8 items, work motivation 3 items, and satisfaction 4 items.

Scoring system: three-point nurses' responses were rated on three-point Likert points follows: agree (3 points), uncertain (2 point) and disagree (1 point). Range of scores from (20-60). Each staff nurse had chosen one best answer after reading carefully and understanding. Finally, the answer was assigned numerical values so, the staff nurses' attitude toward the queue management system was categorized as the following; Positive attitude if the percent $\geq 60\%$, negative attitude if the percent $< 60\%$ that equal < 36 points.

IV. Quality of nursing care questionnaire: It was developed by Freitas (2014), to assess the quality of nursing care delivered for patients. It was filled by the patients. It consists of two parts:

The first part: Patient personal data it includes personal data about patient' age, gender, educational qualification, and medical specialty.

The second part: consists of 16 items about quality of care divided into three dimensions as the following: The art of treating patient 5 items, rationing of nursing care quality 7 items, and health education 4 items.

Scoring system: The patient's responses were rated based on a three-point Likert scale as follows: always (3 points), sometimes (2 points), and never (1 point). Range of scores from (16-48), and the cut point was done at $60\% = 29$. Each patient had chosen one best answer after reading carefully and understanding. High quality of care if the percent $\geq 75\%$ that equal ≥ 36 points, moderate quality level of care from 60% to less than 75% equal to $29 - < 36$ points and low-quality of care level $< 60\%$ that equal to < 29 points.

V. Patient Satisfaction questionnaire: It was adopted from Saudi German Hospital (2019) to assess patient satisfaction regarding queue management system. It consisted of 25 items divided into three domains, the following: Direct nursing care (8 items), direct Physical care (13 items), and provide educational guidance to patients (4 items).

Scoring system: The patients' responses were rated based on a three-point Likert scale as follows: Satisfied (3 points), neutral (2 points), and dissatisfied (1 point). Range of scores from (25-75), and the cut point was done at $60\% = 45$. Each patient had chosen one best answer after reading carefully and understanding. Finally, the answer was assigned numerical values so, the patients' satisfaction levels were categorized as the following; High if the percent

$\geq 75\%$ that equal ≥ 56 points, moderate level from 60% to less than 75% equal to $45 - < 56$ points and low satisfaction level $< 60\%$ that equal to < 45 points.

Procedure:

The following phases were: Assessment, planning, implementation, and evaluation phases, it takes 6 months from November 2020 to May 2021.

Assessment phase:

The data collection was carried out in November 2020. The investigator was available at the previously mentioned settings two days weekly at morning shift to collect baseline data. In the beginning, the investigator welcomed the study subjects, gave a brief idea about the aim and activity of the program for study subjects (staff nurses and patients). Then, the investigator collected data from staff nurses by using the following QMS knowledge questionnaire and observational checklist; and for patients the patient satisfaction questionnaire and quality of nursing care questionnaire. The time required for finishing each questionnaire was around; 15-20 minutes for staff nurses observational checklist, and 25-30 minutes for patients. The average number collected was 5 nurses per day and from 5-6 patients per day. The observational checklist for nurses' practices was collected three times before, after, and three months after the application of the program.

Planning phase:

Based on baseline data obtained from pre-test assessment and relevant review of literature, the educational program was developed by the investigator. This was taken two months from the beginning of December 2020 till the end of January 2021.

- Program construction is a form of printed English and Arabic form to improve nurses' knowledge and practice regarding queue management systems (Appendix VIII). It included different topics related to the program description, introduction about QMS, benefits, general steps for QMS, steps followed in OPD as per hospital policies and procedures, principles of communication, dealing with troubleshooting, patient identification, hand washing procedure, vital signs procedure, the risk for fall assessment and management and nurses role in QMS.

Implementation phase:

The implementation phase was achieved through sessions in February 2021. The investigator divided the studied staff nurses into five groups. The educational program has taken 12 hours for each group, distributed as the following; (6) theoretical sessions, each session lasted from 1.5-2 hours and were implemented according to working circumstances. These sessions were repeated with the same to each group of staff nurses. The educational

program sessions took two days (Sunday and Wednesday) per week over 4 weeks. Different methods of teaching were used such as lectures and group discussions. The investigator explained the topics, staff nurses listened and took notes. Suitable teaching media were planned included an educational booklet that was distributed to all staff nurses on the first day of the educational program.

Evaluation phase:

After program implementation, the post-test was carried out to assess (knowledge and practice) by using the same tools as the pretest. This helped to evaluate the effect of the implemented program. This was done immediately after the program and after 3 months (follow up). The time of the data collection lasted for four months from the beginning of March 2021 to the end of June 2021 for patient satisfaction and questionnaire for quality.

Statistical design

All data were collected, coded, tabulated, and subjected to statistical analysis. Statistical analysis was performed by Statistical Package for Social Sciences (SPSS version 20.0), also Microsoft Office Excel is used for data handling and graphical presentation. Descriptive statistics were applied in the form of mean and standard deviation for quantitative variables and frequency and percentages for qualitative variables. Qualitative categorical variables were compared using the Chi-square test. Pearson correlation coefficient was calculated between variables. Whenever the expected values in one or more of the cells in 2x2 tables were less than 5, Fisher exact test was used instead. Statistical significance was considered at p-value $p \leq 0.05$ and considered highly statistical significance at p-value $p \leq 0.001$. parametrical tests (e.g., paired(t) test to compare mean scores between the same sample at different study phases).

3. Results

Table (1) indicates that; total studied staff nurses were (40); about two thirds of nurses were aged from 20 to less than 25 years old, and the majority of them were females. In relation to educational levels, more than half of them had Associate Degree of Nursing. Additionally, the majority of nurses had experience less than 5 years. Moreover, the vast majority of them had attended previous training courses about queue management system. As far as distribution of nurses in outpatient department specialty, one fifth of nurses were working at cardiology outpatients' department.

Table (2) regarding to the distribution of patients' regarding their personnel characteristics study finding shows that, about two fifth of patients were aged more than 40 years old and more than half of

them were males. As far as, educational levels less than three quarter of patients had bachelor's degree. Additionally, about two thirds of patients had stay inside Outpatient department more than 2 Hours and had not previous visited Outpatient department respectively. As far as distribution of the patients who attend in outpatient department specialty, less than one quarter of patients was admitted at Internal medicine units at Outpatients department.

Table (3): Indicates that, there was highly statistical significant difference improvement of nurses' knowledge scores regarding queue management system at post and follow up program phases, it indicated that the mean and standard deviation of nurses' knowledge immediately post and follow up program were $(19.22 \pm 1.62$ and 17.80 ± 4.90) respectively compared with preprogram phase (11.70 ± 2.07)

Table (4): Illustrates that, there was highly statistical significant difference improvement of nurses practice scores regarding queue management system throughout post and follow up program phases

Table (5): Indicates that, there was highly statistical significant difference improvement of nurses' attitude scores regarding queue management system throughout post and follow up program phases.

Table (6) Shows that, there was highly statistical significant difference improvement of quality of nursing care scores throughout post and follow up program phases, which indicated that the program had a positive effect on improvement of quality of nursing care after program implementation compared with preprogram phase.

Table (7) Demonstrates that, there was highly statistical significant difference improvement of patient satisfaction scores throughout post and follow up program phases, which indicated; the highest total mean and standard deviation of patient satisfaction related to direct physical care domains at post and follow up program was $(35.01 \pm 5.17$ and 32.41 ± 5.30) respectively compared with preprogram phase (21.66 ± 3.55) .

Table (8) illustrates that, there was a positive highly statistically significant correlation between total nurse knowledge, practice and attitude regarding Queue Management System. This means that when nurse's knowledge increased, their practice and attitude regarding Queue Management System increased too, also, quality of nursing care and patient's satisfaction increased

Table (1) Distribution of nurses' regarding their personnel characteristics (n= 40)

Personal characteristics		No.	%
Age (years)	20 -< 25	10	5.0
	25 -<30	26	65.0
	30-40	4	10.0
	Mean ± SD	31.92±3.49	
Gender	Male	5	12.5
	Female	35	87.5
Educational level	Diploma	11	27.5
	Associate Degree of Nursing	21	52.5
	Bachelor of Nursing Science	8	20.0
Years of experience	< 5 years	35	87.5
	5-10 years	4	10.0
	More than 10 years	1	2.5
	Mean ± SD	4.52±1.06	
Previous Training Courses	Yes	39	97.5
	No	1	2.5

Table (2) Distribution of patients' regarding their personnel characteristics (n= 40).

Personal characteristics	Patients (n=42)	
	No.	%
Age (Years)	< 30	21.4
	30-40	35.7
	More than 40	42.9
	Mean ± SD	38.47±10.32
Gender	Male	57.1
	Female	42.9
Educational level	Bachelor	73.8
	Diploma	26.2
Duration of stay inside Outpatient department.	More than 2 Hours	66.7
	< 1 Hour	28.6
	1-2 hours	4.7
Previous visited Outpatient Department	Yes	35.7
	No	64.3

Table (3) Total mean scores and standard deviation of nurses' knowledge regarding queue management system thorough program phases (n= 40)

Items	Max Score	Pre- Program phase		Immediately Post- Program Phase		Follow- up Program phase		t_1	P- value	t_2	P - value
		$\bar{X}\pm SD$	Mean%	$\bar{X}\pm SD$	Mean%	$\bar{X}\pm SD$	Mean%				
Concepts toward using queue management system	9	3.64±1.94	40.4	6.76±0.48	75.1	6.00±0.48	66.7	14.917	0.000**	14.392	0.001**
Usefulness of queue management system	1	0.57±0.50	57	0.92±0.26	92	0.89±0.42	89	4.149	0.000**	3.882	0.002**
Vital signs	7	4.84±1.29	69.1	5.48±1.01	78.3	5.20±1.01	74.3	7.571	0.000**	6.491	0.001**
Reduce the risk of patient harm resulting from fall	4	6±0.79 ^{∇1.}	44.0	4±0.44 ^{∇3.}	93.5	3.30±0.44	82.5	20.105	0.000**	15.792	0.001**
Steps of queue management system	4	1.52±1.44	38.0	3.15±1.19	78.8	3.01±1.03	75.3	6.085	0.000**	5.481	0.001**
Total knowledge	25	10±2.5 ^{∇11}		19.22±1.62		19.0±1.7 ^{∇1}		30.670	0.000**	29.350	0.001**

(** A highly statistical significant difference $P \leq 0.001$) t_1 between pre and post program t_2 between pre and follow up program

Table (4) Total mean and standard deviation of nurses' practice regarding queue management system through program phases (n= 40)

Total practice domains	Max Score	Pre- Program phase		Immediately Post-Program Phase		Follow- up Program phase		paired t_1	P- value	paired t_2	P - value
		$\bar{X}\pm SD$	Mean%	$\bar{X}\pm SD$	Mean%	$\bar{X}\pm SD$	Mean%				
The communication skills	7	4.30±1.57	61.4	6.47±1.46	92.4	207±1.36	91.0	7.019	0.000**	6.714	0.000**
Hand washing	12	7.15±1.90	59.6	11.30±1.97	94.2	33.2±12.1	88.5	8.928	0.000**	7.985	0.000**
Automatized vital signs measurement	23	13.50±3.09	58.7	91.2±9.21	95.2	21.35±1.99	92.8	14.377	0.000**	214.30	0.000**
Risk for fall assessment and management	4	2.77±1.57	69.3	3.75±0.89	93.7	915±0.63	91.3	3.391	0.002**	3.221	0.002**
Total practice	46	27.72±5.73		42.87±5.03		19.1±0.42		13.206	0.000**	1113	0.000**

(**, A highly statistical significant difference $P \leq 0.001$) t_1 between pre and post program t_2 between pre and follow up program

Table (5) Total mean and standard deviation of nurses' attitude toward queue management system through program phases (n= 40)

Attitude domains	Max Score	Pre- Program phase		Post-Program Phase		Follow- up Program phase		paire d t_1	P- value	paire d t_1	P - value
		$\bar{X}\pm SD$	Mean %	$\bar{X}\pm SD$	Mean %	$\bar{X}\pm SD$	Mean %				
Confidence	15	6.60±1.08	44.0	14.72±0.93	98.1	14.50±1.47	96.6	41.30	0.000*	36.72	0.000*
Usefulness of queue management system	24	11.10±2.21	46.3	23.0±2.17	95.8	21.35±1.85	79.1	22.62	0.000*	21.25	0.000*
Work motivation	9	4.40±1.12	48.9	8.62±0.74	95.8	7.15±0.97	79.4	18.32	0.000*	10.88	0.000*
Satisfaction	12	6.05±0.81	50.4	11.67±0.61	97.2	10.05±0.50	83.7	31.61	0.000*	28.50	0.000*
Total Attitude	60	28.15±3.30		58.02±3.26		53.05±2.90		38.438	0.000*	39.133	0.000*

(** A highly statistical significant difference $P \leq 0.001$) t_1 between pre and post program t_2 between pre and follow up program

Table (6) Total mean and standard deviation of quality of nursing care as reported by patients' thorough program phases (n= 47)

Quality of nursing care dimension	Max Score	Pre- Program phase		Immediately Post-Program Phase		Follow- up Program phase		paired t_1	P- value	paired t_2	P - value
		$\bar{X} \pm SD$	Mean %	$\bar{X} \pm SD$	Mean %	$\bar{X} \pm SD$	Mean %				
The art of treating	15	9.23±2.23	61.5	13.33±2.01	88.9	12.28±1.95	81.8	10.127	0.000**	9.821	0.000**
Regulating of nursing care quality	21	8.77±2.74	70.1	18.11±3.04	86.2	16.56±2.85	78.8	6.68	0.000**	4.962	0.002**
Health education	12	7.78±1.95	56.5	8.21±2.54	68.4	7.36±1.92	61.3	4.653	0.000**	3.235	0.004**
Total quality of nursing care	48	30.76±3.85		39.66±6.46		36.21±5.25		10.227	0.000**	8.974	0.000**

(**, A highly statistical significant difference $P \leq 0.001$) t_1 between pre and post program t_2 between pre and follow up program

Table (7) Total mean and standard deviation of patients' satisfaction regarding queue management system thorough program phases (n= 47)

Patient satisfaction domains	Max Score	Pre- Program phase		Post-Program Phase		Follow- up Program phase		paired t_1	p- value	paired t_2	p- value
		$\bar{X}\pm SD$	Mean%	$\bar{X}\pm SD$	Mean%	$\bar{X}\pm SD$	Mean%				
Direct nursing care	24	14.97±3.20	26.1	20.04±3.56	85.6	18.78±2.88	78.2	8.851	0.000**	2.683	0.001**
Direct Physical care	39	21.66±3.55	55.3	35.01±5.17	89.8	32.41±5.30	83.1	12.50	0.000**	7.948	0.000**
Provide educational guidance to patients	12	6.76±1.99	56.3	9.33±2.62	77.7	8.34±2.18	69.5	6.325	0.000**	2.993	0.003**
Total Patient satisfaction	75	43.34±5.94		64.88±9.31		59.04±7.04		13.039	0.000**	11.976	0.001**

(**, A highly statistical significant difference $P \leq 0.001$) t_1 between pre and post program t_2 between pre and follow up program

Table (8) Correlation among nurses` knowledge, practice, attitude quality of nursing care and

Variables	Immediately post program phase									
	Nurses Knowledge		Nurses' practice		Nurses' attitude		Patient satisfaction		Quality of nursing care	
	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>
Nurses' knowledge regarding QMS	1	-	0.567	0.000*	0.383	0.000*	0.332	0.003*	0.736	0.000*
Nurses' practice regarding QMS	0.567	0.000**	1	-	0.285	0.001*	0.184	0.000*	0.985	0.001*
Nurses' attitude regarding QMS	0.383	0.000**	0.285	0.001*	1	-	0.770	0.000*	0.680	0.000*
Patient satisfaction regarding QMS	0.332	0.003**	0.184	0.000*	0.770	0.000*	1	-	0.661	0.000*
Quality of nursing care regarding QMS	0.736	0.000**	0.985	0.001*	0.680	0.000*	0.661	0.000*	1	-

patients` satisfaction regarding queue management system thorough program phases

4. Discussion

The results of current study indicate that, there was highly statistical significant difference improvement of nurses' knowledge scores regarding queue management system at post and follow up program phases.

From the investigator's point of view, the nurse recognized new knowledge during the program, that enhance their information regarding Queue Management System

In the same line, these findings are consistent with a study done at El Minia, Mohamed et al. (2018), teaching hospital which examine the effect of educational program on nurse's knowledge data showed that, about one third of studied sample had satisfactory knowledge pre-program while post-program improved to majority of them with highly statistically significance differences [7].

As regards to nurses practice levels about queue management system thorough the program phases, the study results indicate that, there was highly statistical significant difference improvement of nurses practice scores regarding queue management system throughout post and follow up program phases.

From the investigator's point of view, the improvement of nurses' knowledge may be due to

demonstration and re-demonstration of the identified practices within the program implementation

This current finding is similar to previous study by Mohamed et al. (2018), who assess the effectiveness of educational program on nurse's practice, data showed that, minority of the studied sample had competent level of practice pre-program while post-program majority of them improved with highly statistically significance differences [7].

Moreover, the current data indicates that, there was highly statistical significant difference improvement of nurses' attitude scores regarding queue management system throughout post and follow up program phases.

From investigator's point of view, adequate learning and training program enhance and prepare the nurses when adopt new management system for change and facilitate technology acceptance, thus of course alter the nurses' perception toward the constructive direction in usefulness and ease to use, then improve the attitude, and behavior of nurses.

This finding is in the same line with Mohamed et al. (2019), who assessed the effect of educational program on nurse's attitude, data revealed that the attitude level of pre-program was low, comparable with post-program which improved with highly statistically significance differences [7].

This finding consistent with Garner et al. (2018), who test self-efficacy before and after an orientation educational program for new nurse educators. The orientation was designed to improve new nurse educator confidence using new technology and teaching methods, data revealed there were significant improvements in total self-efficacy and subscale scores among nurse educators after the workshop intervention when compared to pre-intervention results [8].

The finding of the current study is congruent with Aziati and Hamdan (2018) who reported on their a descriptive-analytical study which was carried out at one of the Public Health Clinic located at southern Malaysia [9].

The current finding shows that, there was highly statistical significant difference improvement of quality of nursing care scores throughout post and follow up program phases, which indicated that the program had a positive effect on improvement of quality of nursing care after program implementation compared with preprogram phase.

From the investigator's point of view, the previous finding could be explained the importance of the queue management system has a clear impact on the quality of nursing care, that have directly and effectively contributed to improving the quality of nursing care and increase the level of the patient satisfaction, where each hospital must establish an appropriate system for managing the queues that guarantee the smooth flow, reduce waiting time, enhance nurses care due to plenty of time for patient care and lessening nurse workload.

Similarly, this finding is supported by Habbache and Maiza (2021), who illustrate the relationship between queue Management System and quality of nursing service, this research revealed there is a clear and significant relationship between the queue management system and the quality of nursing service, as the queue management system allows the hospital to reduce the waiting time, in addition to reducing the frustration rate, and all this leads to an improvement in the patient satisfaction rate [10].

As regards the patients' satisfaction levels regarding queue management system thorough program phases, study finding shows that, there was highly statistical significant difference improvement of patient satisfaction scores throughout post and follow up program phases, which indicated that the program had a positive effect on improvement of patient satisfaction after program implementation compared with preprogram phase.

From the researcher point of view, this may be due to the application of the program which proved that it had a positive effect on improvement of patient satisfaction which may be came from decreasing patient waiting time and improvement of quality of nursing care

The findings of the present study are in agreement with those in a study done by Luo et al.

(2020), who study the applying queuing theory and mixed integer programming in a large hospital in China, they considered an important outpatient services, has been unable to satisfy the increasing demand since the increasing number of patients, that resulting in long queues and affects patient satisfaction. Also, the data revealed that positive patient satisfaction by applying queuing theory and mixed nursing integer programming [11].

Conclusion

Based on the findings of the current study, there was a highly statistical difference improvement of staff nurse' knowledge and skills regarding queue management system. Also, the study finding revealed that, most of nurses had positive attitude toward queue management system at post program and follow up phases compared with preprogram phase. Concerning the quality of nursing care levels as reported by patients' thorough program phases, the most of patients reported that there was high quality of nursing care level during immediately post program and follow up compared with preprogram phase. In addition, the most of patients had high satisfaction level during immediately post program and follow up phases compared with preprogram phase. So, based on the findings of the current study it can be concluded that implementing Queue Management System have a positive effect on the quality of nursing care and patient satisfaction.

5. Recommendations:

In the light of results of this study, the following points are recommended:

For Hospital Administration:

- Applying Queuing Management System in health care settings that exposed to high ratio of patients
- Providing a detailed orientation for allied disciplines about Queue Management System.
- Continuous evaluation for patient satisfaction about quality of care to increase efficiency of patient care.

For Nurses:

- Attending continuous educational programs which can increase staff competencies, job satisfaction and engagement.
- Building a supportive work of team spirit and communicating effectively that help to create a positive attitude toward job responsibilities.

For Patients

- Provide feedback about their experience in the system and level of quality of nursing care provided for them.

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