

“Hospitals performance evaluation by using managerial KPIs”***Ghassan Mohamed**ghassan_mohaned@yahoo.com**ملخص:**

أصبح قياس جودة الأداء محل تركيز في مؤسسات الرعاية الصحية على المستويين الفردي والوطني حيث يتنافس مقدمو الرعاية الصحية بشكل مكثف مع بعضهم البعض بهدف تحسين الأداء المستمر وتقديم خدمة عالية الجودة الأمر الذي يترتب عليه اكتساب رضا المرضى وثقتهم وزيادة سمعة المؤسسة الأمر الذي يترتب عليه استمرارية الأعمال بمؤسسات الرعاية الصحية.

دراسة الحالة في هذا الدراسة (مجموعة مستشفيات) تنتشر في القاهرة وضواحيها وتتكون من ستة مستشفيات سوف يتم إجراء الدراسة على أربعة مستشفيات منهم وهم (مستشفى C, مستشفى L, مستشفى A, مستشفى N) الأمر الذي سيخلق نوعا من التنافسية فيما بينهم وخاصة بعد قيام إدارة المجموعة بربط حافز الإثابة بتحسين الأداء. هدف الدراسة: قياس مؤشرات الأداء الخاصة بالإدارة باستخدام لوحة المعلومات مثل أعداد دخول المرضى حيث تم تجميع البيانات خلال الفترة من يونيو 2017 الي أكتوبر 2020 وتم تطبيق مشروع تحسين عليها بمستشفى C بعنوان تحسين عمليات دخول وخروج مرضى الداخلي باستخدام منهجية تتبع المريض وأدوات السنة سيجما الرشيقة وذلك خلال شهري أبريل ومايو 2019 وكانت النتائج تتلخص في تقليص الوقت الذي يقضيه المريض للخروج من المستشفى من 7:10 ساعة الى 0:40 دقيقة وتحسين متوسط مكوث المرضى بالمستشفى من 2.9 يوم في يوليو 2017 الى 1.8 يوم في أكتوبر 2020 كما أمكن تحسين نسبه إشغال الأسرة من 41 % خلال شهر يونيو 2017 إلى 70 % خلال شهر فبراير 2020 قبل حدوث جائحة كورونا كما زادت أعداد المرضى من 577 مريض

* مدرس رياضيات واحصاء بالمعهد العالي للعلوم الاداريه

خلال شهر يونيو 2017 الى 1053 مريض خلال شهر ديسمبر 2019 كما قلت الشكاوى وزاد رضا المرضى.

الكلمات الدلالية:

تقييم أداء المستشفيات - مؤشرات الأداء الإدارية للمستشفيات - دخول المرضى
المستشفيات - العيادات الخارجية - سعة الأسرة - متوسط مدة الإقامة بالمستشفيات.

Abstract:

Measuring the quality of performance has become a focus in healthcare organizations at the individual and national levels, where healthcare providers compete intensively with each other in order to improve continuous performance and provide high quality service, which results in patient satisfaction, confidence and reputation of the organization, which results in business continuity of healthcare organizations. The case study in this Study was (group of hospitals) is spread in Cairo and its environs and consists of six hospitals will be conducted on four of them namely hospital (Hospital C, Hospital L, Hospital A, And Hospital N) which will create a kind of competitiveness among them, especially after the group management linked the incentive to the reward for improved performance. **Objectives:** To measuring performance indicators using the dashboard,. By using the set of performance indicators for management such as total number of inpatients' admission, where data was collected during the period from June 2017 to October 2020 and an improvement project was implemented at the Hospital C entitled Improving patients' admission and discharge processes using patients' tracer with lean six sigma methodology, this project occurred during the period between April 2019 to May 2019, **the results** were to reduce the patient's discharge time from 7:10 hours to 0:40 minutes and improved the average hospital length of stay (ALOS) from 2.9 days on July 2017 to 1.8 days in October 2020 and hospital occupancy rate improved from 41% in June 2017 to 70% in February 2020 before the pandemic of COVID-19, although patients' admission numbers increased from 577 Patients during June 2017 to 1053 Patients during December 2019, s patients' satisfaction increased and complaints decreased.

Keywords:

Hospital performance evaluation, Hospital managerial KPIs, Inpatients'

Introduction:

Measuring performance quality has become a focus in healthcare organizations both at the individual and the national levels as healthcare providers compete intensively with each other (Walker & Dunn, 2006). To compete with other competitors and improve performance quality, it is essential for hospitals to know the strengths and limitations of the organizational performance through performance measurement tools. (Ivo Hristov and Antonio Chirico 2019) identified the impact of key performance indicators on company performance in the framework of sustainable strategies and they arrived at the conclusion that existing literature does not provide ample evidence about how to address the crises from managerial perspective. Key Performance Indicators are quantifiable performance measurement that reflects the critical success factors of an organization and helps the organization measure its progress towards the goal achievement (Thanyaphut & Wattanapa, 2006). KPIs must be created in accordance with individual organizational mission, vision, or strategy. Mahdi Seifi (2010) claimed that Key Performance Indicator (KPI) is a quantitatively form and the measurement of critical success factors (CSFs). Hur Wonchang (2009) suggests that Key Performance Indicator (KPI) is an indicator which represents how goods or services, or finances are allocated to produce certain goods or services, as well as how fast and efficient an organization can deliver goods and services to the customer. The role of performance measurement has reflected the results of management actions or organizational and individual performance, rather than the cause of problems (Stefenson, 2004). Before implementing KPIs, the organizations must establish a template which is presented in a tabulation to record KPIs detailed information and present performance results (Decharin, 2002) and Parmenter (2007).

For performance Dashboard: Shadan Malik (2005) used the terminology “enterprise dashboard”, which is defined as an interface computer that presents information in the form of tables, reports, visual indicators, and alert mechanism dynamically and with relevance. Donabedian’s (2005) three components approach for evaluating the quality of care underpins measurement for improvement. The three components are structure, process, and outcomes. Measurement for improvement has an additional component – balancing measures. Donabedian believed that structure measures influence process measures, which in turn affect outcome measures. Performance dashboards give their users greater visibility and integration of information regarding the performance of the organization, by collecting relevant data in a timely fashion. Furthermore, because of the ease of access to information this is made more

readily available (Koopman et al., 2011; Clark et al., 2013; Tan et al., 2013; Pace and Buttigieg, 2017). The purpose of this research is to monitoring the performance of managerial KPIs such as Inpatients' admission, ALSO, BOR and OPD visits in four different hospitals and applying project improvement in one of the previous hospitals which had as issues in admission and discharge process which reflecting in ALOS, BOR, admission volume, patients' satisfaction and patients' complaints.

Literature review:

According to (Miguel Pestana1, 2020). Health information systems have been developed to help hospital managers steer daily operations, including key performance indicators (KPIs) for monitoring on a time-aggregated basis. Yet, current literature lacks in proposals of productivity dashboards to assist hospitals stakeholders. This research focuses on two related problems: (1) hospital organizations need access to productivity information to improve access to services; and (2) managers need productivity information to optimize resource allocation. This research consists in the development of dashboards to monitor information obtained from a hospital organization to support decision makers. To develop and evaluate the productivity dashboard, the Design Science Research (DSR) methodology was adopted. The dashboard was evaluated by stakeholders of a large Portuguese hospital who contributed to iteratively improving its design toward a useful decision support tool. A Gap in this Study using the same color in the dashboard instead to add color to each one from items to illustrate it, although using DSR only and I Think if he was used an improving methodology like six sigma or lean six sigma it will be plus and good addition.

According to (Ahmad Aviv Mahda1, Al Munawir and Zarah, 2020) his study aim to analyze and to know whether there is indirect effect of service quality on BOR through patient satisfaction, using a questionnaire and the instrument of patient satisfaction, this study is a quantitative study. Data was analyzed using path analysis with software Lisrel. Result: This study shows that service quality and patient satisfaction have had positive and direct effect on BOR and there are significant indirect effect of service quality on BOR through patient satisfaction. Conclusion: Each direct effects of service quality on BOR, service quality on patient satisfaction, and patient satisfaction on BOR are greater than the indirect effect itself. Balung General Hospital is expected to maintain and improve the quality of inpatient services so patient satisfaction and BOR will rise as well. A gap in this research was in depending in measuring of services quality by using questionnaire only and the data collected during the first semester of 2019 and

this considering short period to have a correct judgement although the researcher neglected other reasons which affecting on BOR.

Acceding to (Diego A. Martinez, 2018), Using the Donabedian model to prioritize patient flow metrics and build an electronic dashboard for enabling communication. Ten metrics were identified as key indicators including outcome (length of stay, 30-day readmission, operating room exit delays, capacity related diversions), process (timely inpatient unit discharge, emergency department disposition), and structural metrics (occupancy, discharge volume, boarding, bed assignation duration). Dashboard users provided real-life examples of how the tool is assisting capacity improvement efforts, and user traffic data revealed an uptrend in dashboard utilization from May to October 2017 (26 to 148 views per month, respectively). A gap in this Study was in the period of data collected was too short to depend on it (May 2017- Oct 2017) instead of getting more than a year to judge on patient flow correctly, For example the seasonal disease like common cold and nosocomial infection disease increased, So we can't create a Study based on short period like this. Another Gap in this research represented in not added more KPIs to illustrate the patient flow clearly According to (Ioana Bradea and Virginia Mărăcine, 2015). Using the grey systems theory to impact of seven selected KPIs (the beds utilization rate, the average length of hospitalization, the average cost of hospitalization/day, the proportion of physicians in total staff, the nosocomial infection rate, the death rate and the diagnostic concordance) on the hospital's turnover is determined, By analyzing the grey incidence between turnover and several KPIs, for a period of six years, it has been concluded that the greatest impact on performance has the diagnostic concordance and the percent of the physicians in the total staff, followed by the nosocomial infection rate, the average bed utilization rate and the death rate. A Gap in literature was considered case study should be extended by including a greater number of hospitals into the analysis. The study was taking about a lot of hospitals uses performance dashboard. By applying it, hospitals can identify the strengths and weaknesses pertaining to the them, and eventually, use such information to improve the performance. By an increase in performance, the loyalty of patients will be maintained, and the hospital's competitiveness will also increase. (Andre M. R. Wajong, 2015). A Gap in the literature (this Study focused on the theoretically studies about the uses of Dashboard and the impact of using it on the improvement of hospitals performance, but this Study was poor in how to use the Dashboard although the author results were not clear). The Royal College of Obstetricians and Gynecologists recommended the use of dashboards for all maternity units This had a cascading effect, as many hospitals

have followed their recommendations and implemented dashboards to improve performance and quality of care within Obstetrics and Gynecology departments (Guha et al., 2013; Simms et al., 2013; Crofts et al., 2014). A gap in the literature has been identified as there is less available research concerning other departments, such as orthopedics and cardiology. The lack of promotion by important institutions in other departments, could explain the gap, which was found in the literature, where less KPIs have been identified.

Methodology:

Data were collected by using key performance indicators (Managerial KPIs) for a group of hospitals, Consist of four different hospitals (Hospital C, Hospital L, Hospital A and Hospital N). Data were collected From May 2017 to Oct 2020 (Data collected monthly) and analysis using individual control chart and run chart.

Table 1 study design

Category	Key Performance Indicators	Target
Managerial KPIs	Total number of inpatient admissions per month	Increasing
	Total number of outpatient visits	Increasing
	Total patients' average length of stay	Less than 3 days
	Hospital Bed occupancy	Increasing
Project improvement		

A- Total number of inpatient admissions per month

The target for this KPI is to be increasing the number of inpatient admissions which reflecting on the revenue and outcome of the hospital, the number of patient's admission increase as a result of high quality of services provided with patient's trust and good reputations. Will comparing between our hospitals group which the best situation and which need to improve.

In Hospital (C), the numbers of inpatient's admission were decreasing specially during the pandemic of COVID-19 and working with 50% of available beds to reducing any chance for infection and beginning to raise again after the number of COVID-19 infected decrease in Egypt and returning to working with 100 % of hospital power, Although the renovation in inpatient wards after complete predicting that the number of inpatient admission will increase again.

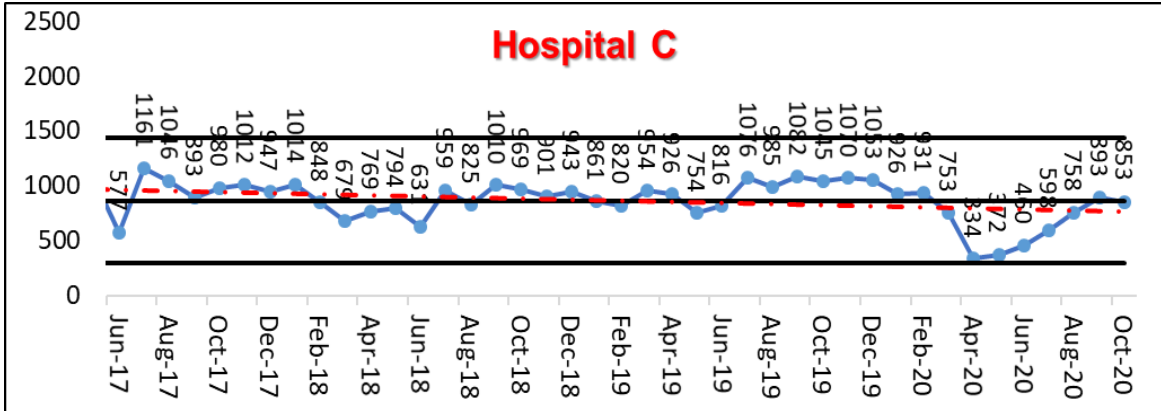


Figure 1 Total number of inpatients' admission in hospital (C)

In Hospital (L), the target was achieved as increasing the number of inpatient admissions, but a deterioration occurred due to pandemic of COVID-19, trying to return to the normal situation.

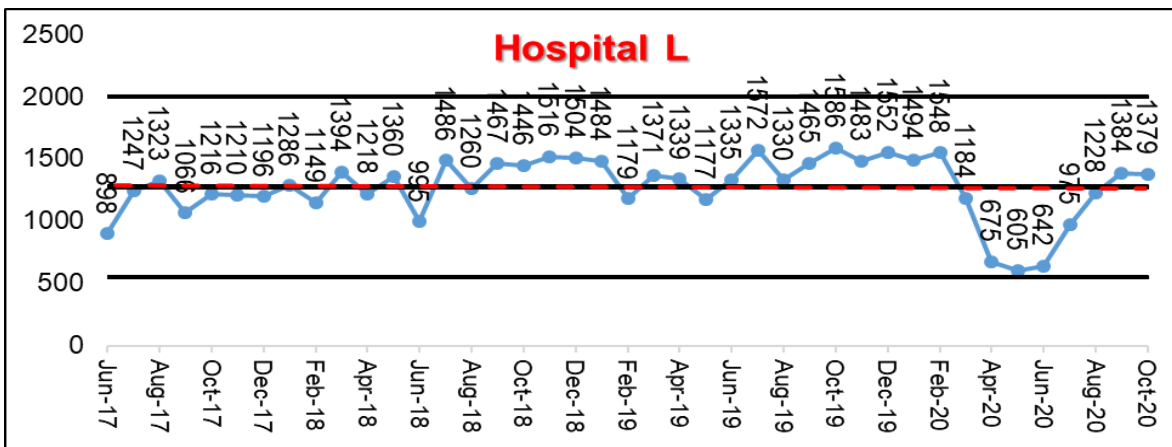


Figure 2 Total number of inpatients' admission in hospital (L)

In Hospital (A), the target was achieved too, but a deterioration occurred due to the pandemic of COVID-19, return to the normal situation.

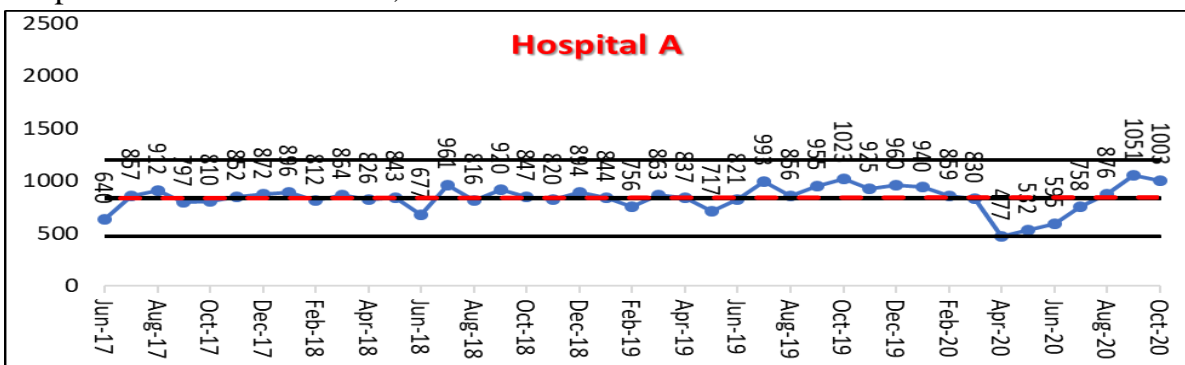


Figure 3 Total number of inpatients' admission in hospital (A)

In Hospital (N), The number of inpatient admissions was sustained before the pandemic of COVID-19 because of renovation in all sections, need to take an action to finishing all renovation quickly or working on sectors having renovation separately (each floor must be completed before beginning on the others' floors).

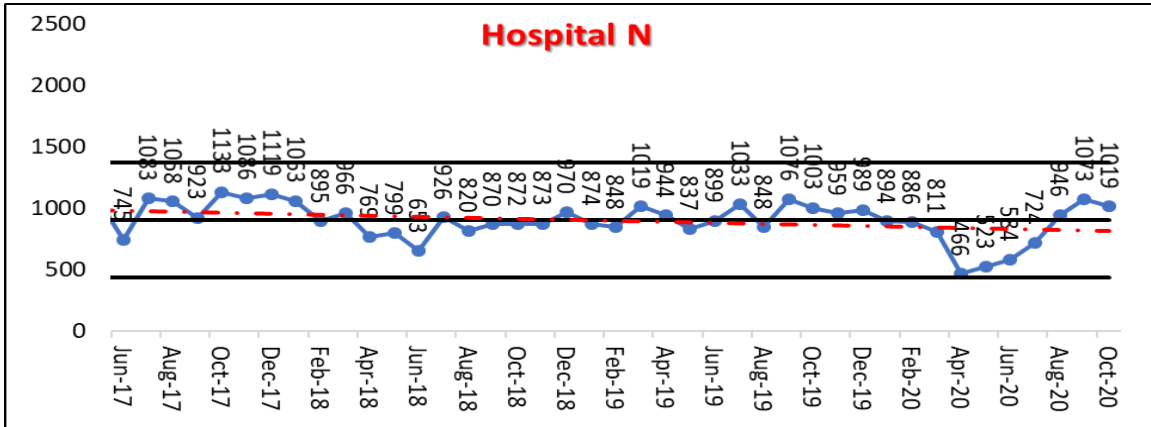


Figure 4 Total number of inpatients' admission in hospital (N)

B- Total number of Outpatient Visits per month

The target for this KPI is to be increasing the number of Outpatient visits which reflecting on the revenue and outcome of the hospital, the number of outpatient's visits increase as a result of high quality of services provided with patient's trust and good reputations.

In Hospital (C) the numbers of Outpatient's visits were increased and met the target but as seen during the pandemic of COVID-19 from March 2020 many patients were afraid to went to any hospital, So the volume of OPD visits were decrease and increasing gradually but still not reached to the normal patients' flow.

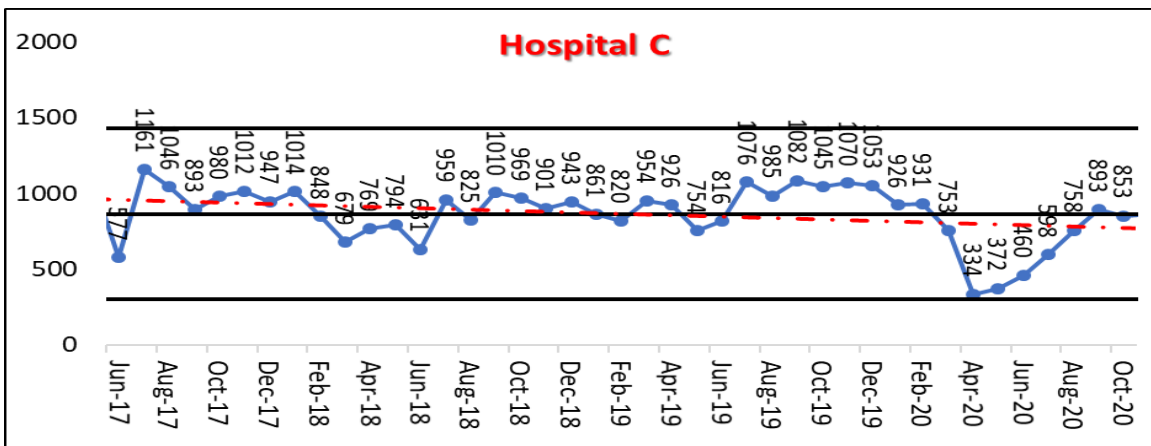


Figure 5 Total number of outpatients' visits in hospital (C)

In Hospital (L) the numbers of Outpatient's visits were sustained due to the limitation of hospital space till Feb 2020 during the pandemic of COVID-19 many patients were afraid to went to any hospital because of afraid from infection, So the volume of OPD visits were degreased and increasing gradually again till reached to the normal flow.

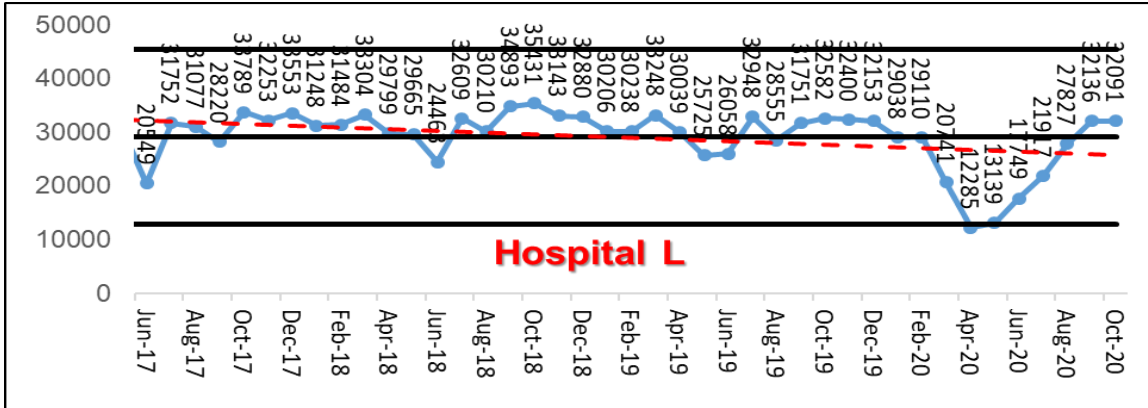


Figure 6 Total number of outpatients' visits in hospital (L)

In Hospital (A) the numbers of Outpatient's visits were increasing as target till Feb 2020 during the pandemic of COVID-19 many patients were afraid to went to any hospital because of afraid from infection, So the volume of OPD visits were degrease and increasing gradually again till reached to the normal patients' flow.

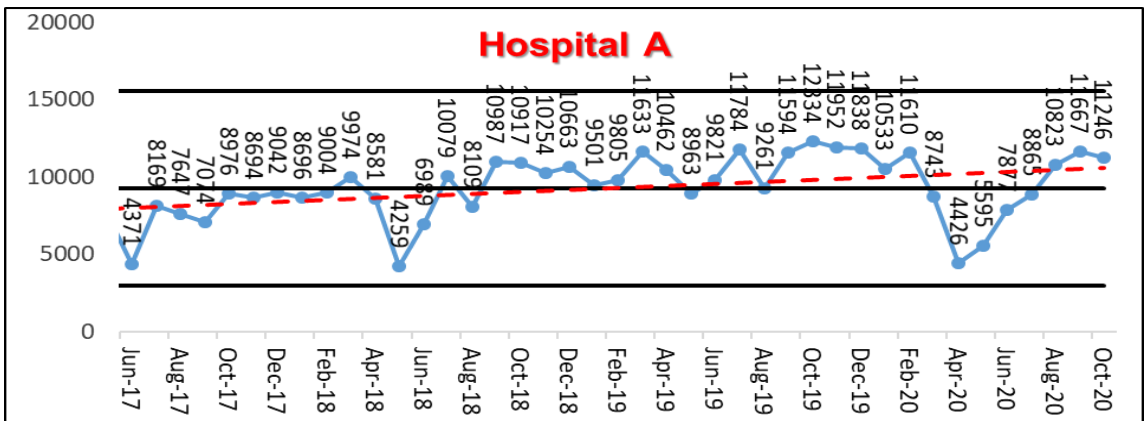


Figure 7 Total number of outpatients' visits in hospital (A)

In Hospital (N) the numbers of Outpatient's visits were not stable due to the renovations in hospitals till Feb 2020 during the pandemic of COVID-19 many

patients were afraid to went to any hospital because of afraid from infection, So the volume of OPD visits were degeased and increasing gradually again when all renovation in outpatients' clinic ended.

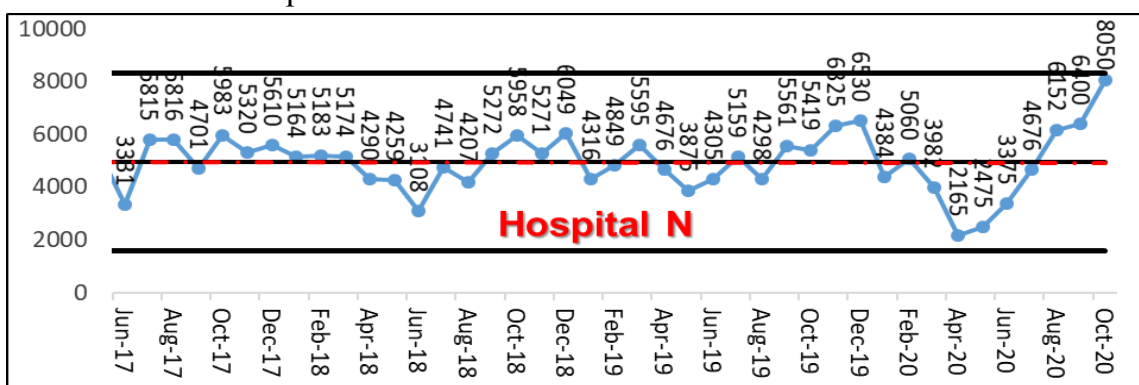


Figure 8 Total number of outpatients' visits in hospital (N)

C- Patients' average length of stay:

In hospital (C) Started ALOS at 2.9 days this considered high but still below target 3 days, After that it decreases and increases periodically according to the seasons (summer and winter) (Ramadan and holidays) reached its highest during March 2019 till Jun 2019 reached to the best ALOS ever = 1.8 Days.

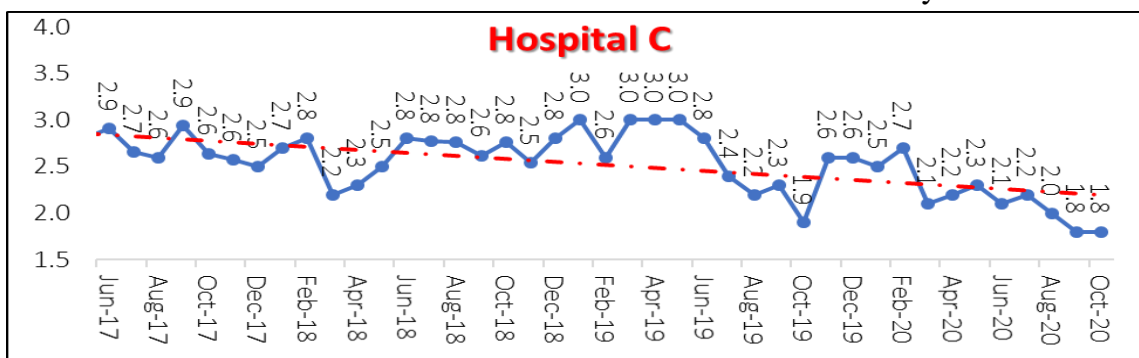


Figure 9 ALOS in hospital (C)

For hospital (L) all ALOS within target and the process was sustained a little rise appeared during the pandemic of COVID-19 finally decreased again with improve.

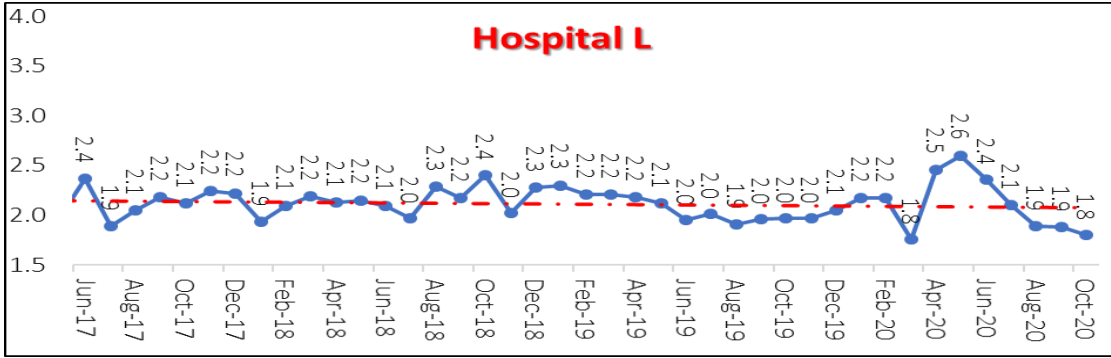


Figure 10 ALOS in hospital (L)

For hospital (A) having a huge improving started from 3.8 days upper the target = 3 days till ended at 2.3 punctuated with two high peaks first one in Jun 2018 and the other during the highest beak of the pandemic of COVID-19.

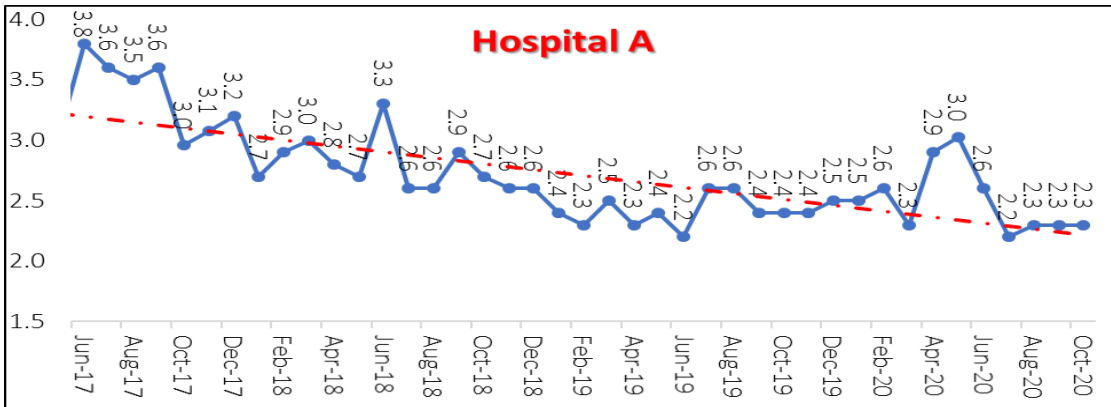


Figure 11 ALOS in hospital (L)

For hospital (N) was the worst case in ALOS started with 2.9 and ended with 3 days in ALOS but kept within target during the last year, need more improving in hospital (N) especially they need less ALOS because of the renovations were closing and decreasing no of hospital beds.

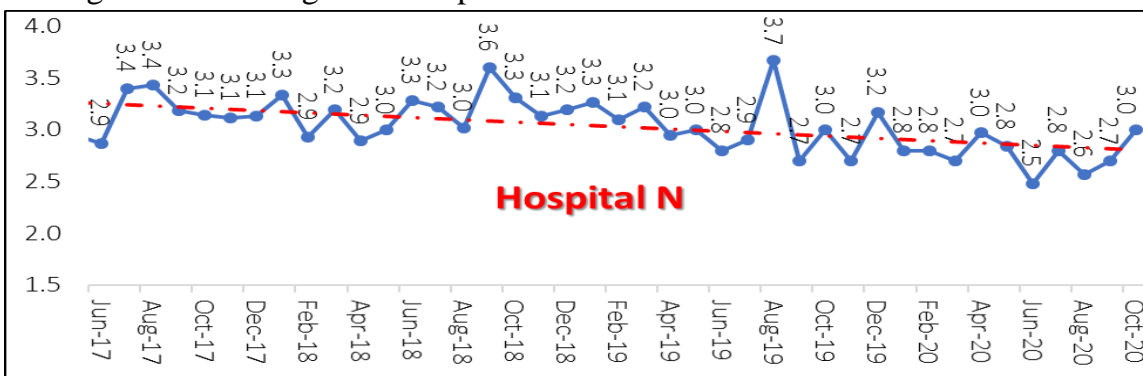


Figure 12 ALOS in hospital (N)

D- Hospital Bed occupancy:

The target of this KPI is increasing. In Hospital (C) started with 41% and beginning to increase till reducing in March 2018 due to renovation then try to solve this issue gradually till March 2020 when working with 50 % of beds capacity by infection control precautions with hospital policy due to pandemic of COVID-19.

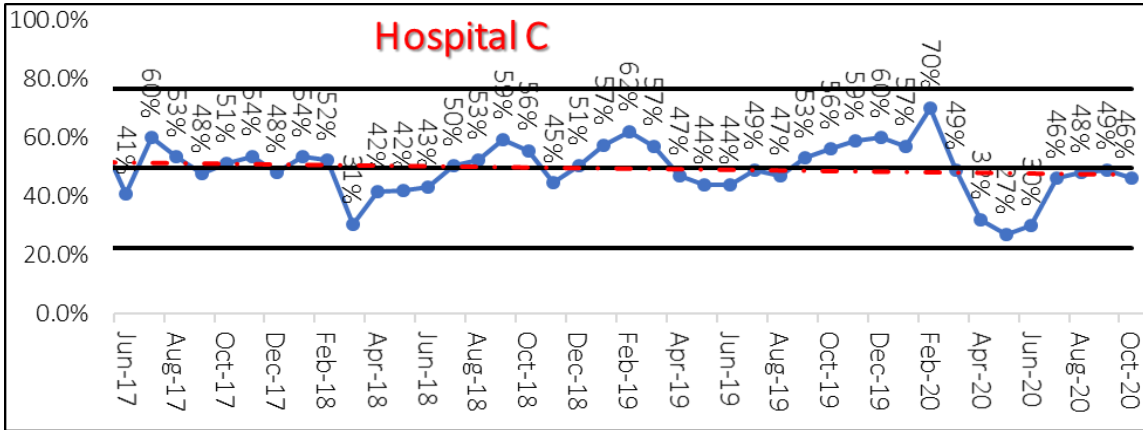


Figure 13 Bed occupancy in hospital (C)

In hospital (L) was increasing gradually except the only decreased in June 2018 because of some maintenance with small renovation, the renovation was less than in Hospital C, So bed occupancy started to gradually rise again till COVID-19 spread and working with 50 % of Beds but beginning to dramatically increased during last months.

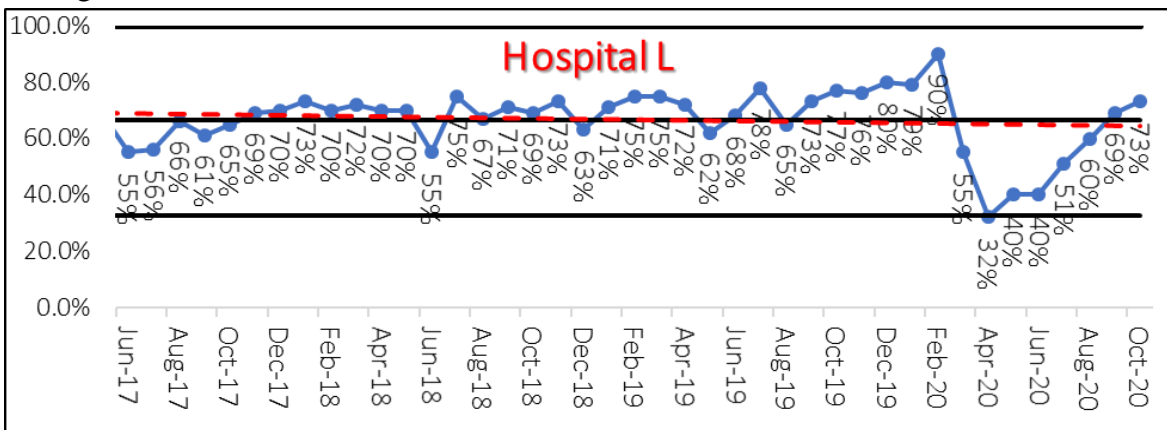


Figure 14 Bed occupancy in hospital (L)

In hospital (A) at the beginning bed occupancy was decreased then sustained from March 2018 till March 2020 when the pandemic of COVID-19 occurred and working with 50 % of working beds.

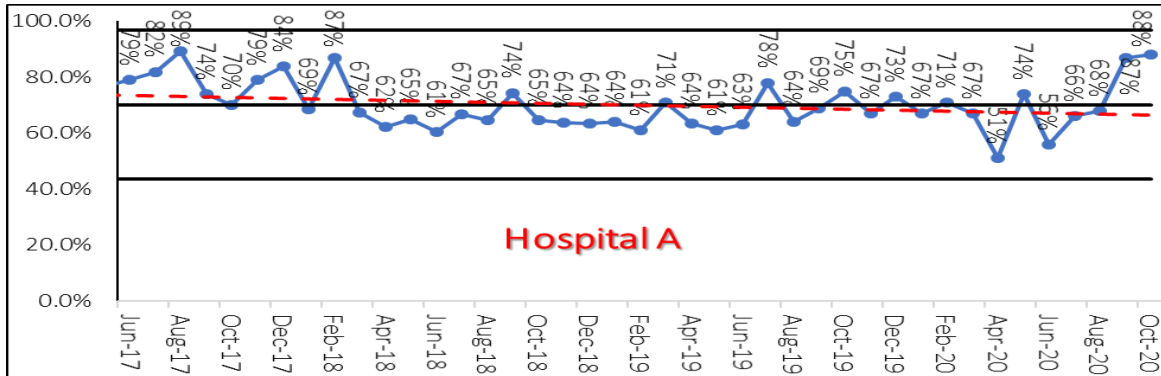


Figure 15 Bed occupancy in hospital (C)

In Hospital (N) was the same but the only different was in the way of renovation management it was by closing floor that being renewed, In March 2020 bed occupancy decreased when the pandemic of COVID-19 occurred and working with 50 % of working beds.

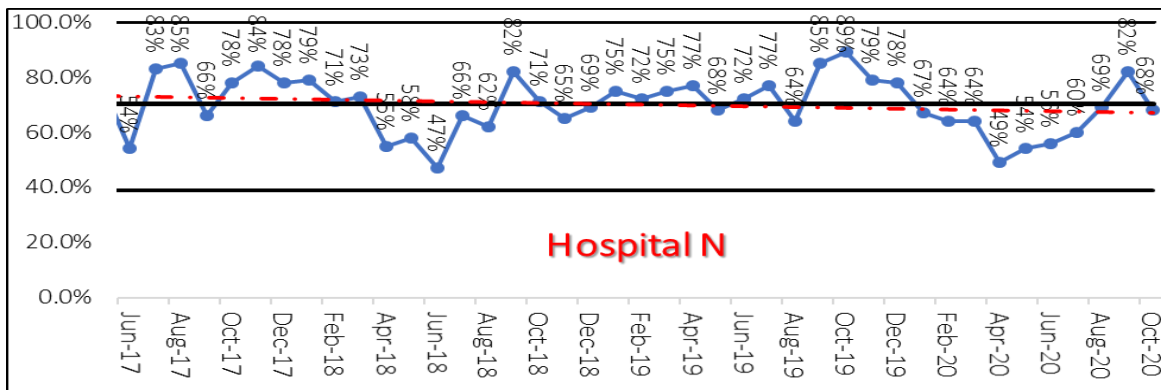


Figure 16 Bed occupancy in hospital (N)

E- Project improvement for Patient’s flow (Admission & Discharge):

By applying project improvement in patients’ admission and patient’s discharge processes in hospital (C) using patient’ tracer methodology with applying lean six sigma methodology during April and May 2019 with lean improvement methodology. **First:** find an opportunity for improve according to JCI standard:

Standard ACC.4.3: The complete discharge summary is prepared for all inpatients

Standard ACC.4.3 ME 1: The discharge summary contains the reason(s) for admission, diagnoses, and comorbidities

Standard ACC.4.3 ME 2: The discharge summary contains significant physical and other findings

Standard ACC.4.3 ME 3: The discharge summary contains diagnostic and therapeutic procedures performed.

Standard ACC.4.3 ME 4: The discharge summary contains significant medications, including all discharge medications.

Standard ACC.4.3 ME 5: The discharge summary contains the patient's condition/status at the time of discharge.

Standard ACC.4.3 ME 6: The discharge summary contains follow-up instructions.

Standard ACC.4.3.2: The medical records of inpatients contain a copy of the discharge summary.

Standard ACC.4.3 ME 3: A copy of the discharge summary is provided to the patient in cases in which information regarding the practitioner responsible for the patient's continuing or follow-up care is unknown.

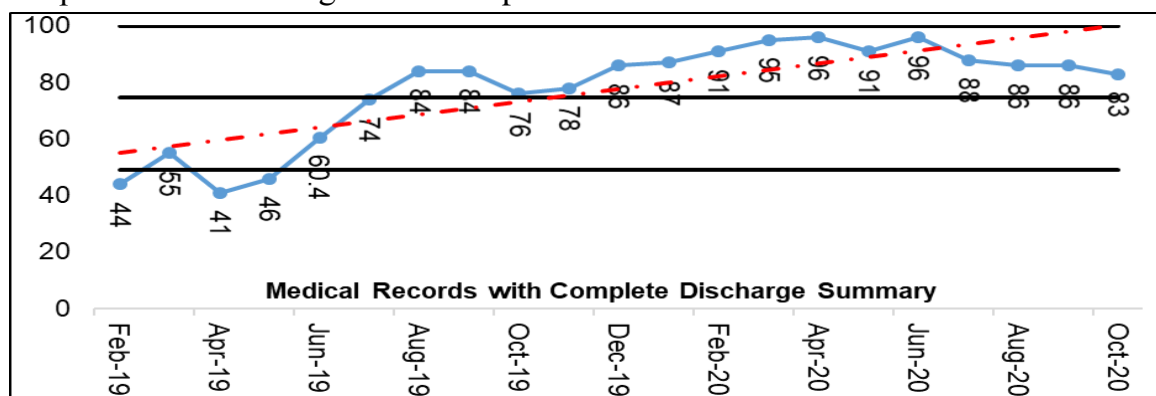


Figure 17 % MR with Complete Discharge Summary in hospital (C)

After seeing the improvement in medical record especially in completed of discharge summary in Fig (17) from (44%) in Feb 2019 to (83%) in Oct 2020, this improvements affected positively in the admission and discharge processes, first of this project must know the situation of the team and organized them by using ARMI tool as seen in table (16)

Table 2 ARMI tool in hospital (C)

Job title	Approver	Resource	Member	interested or need to be informed
CEO				✓

Chief Medical Officer	✓			
Quality Manager		✓		
Quality Specialist			✓	
Public Relation Manager			✓	
Admission clerk			✓	
Hospitality Manager			✓	
Medical director			✓	
ER manager			✓	
Representative from Medical Record			✓	
Representative from Contract office			✓	
IT Manager			✓	
Accounting			✓	
Director of Nursing			✓	

Stakeholder analysis is the first step in stakeholder management, an important process that it used to win support from each other's. by using an effective three-step process for identifying, prioritizing, and understanding your stakeholders

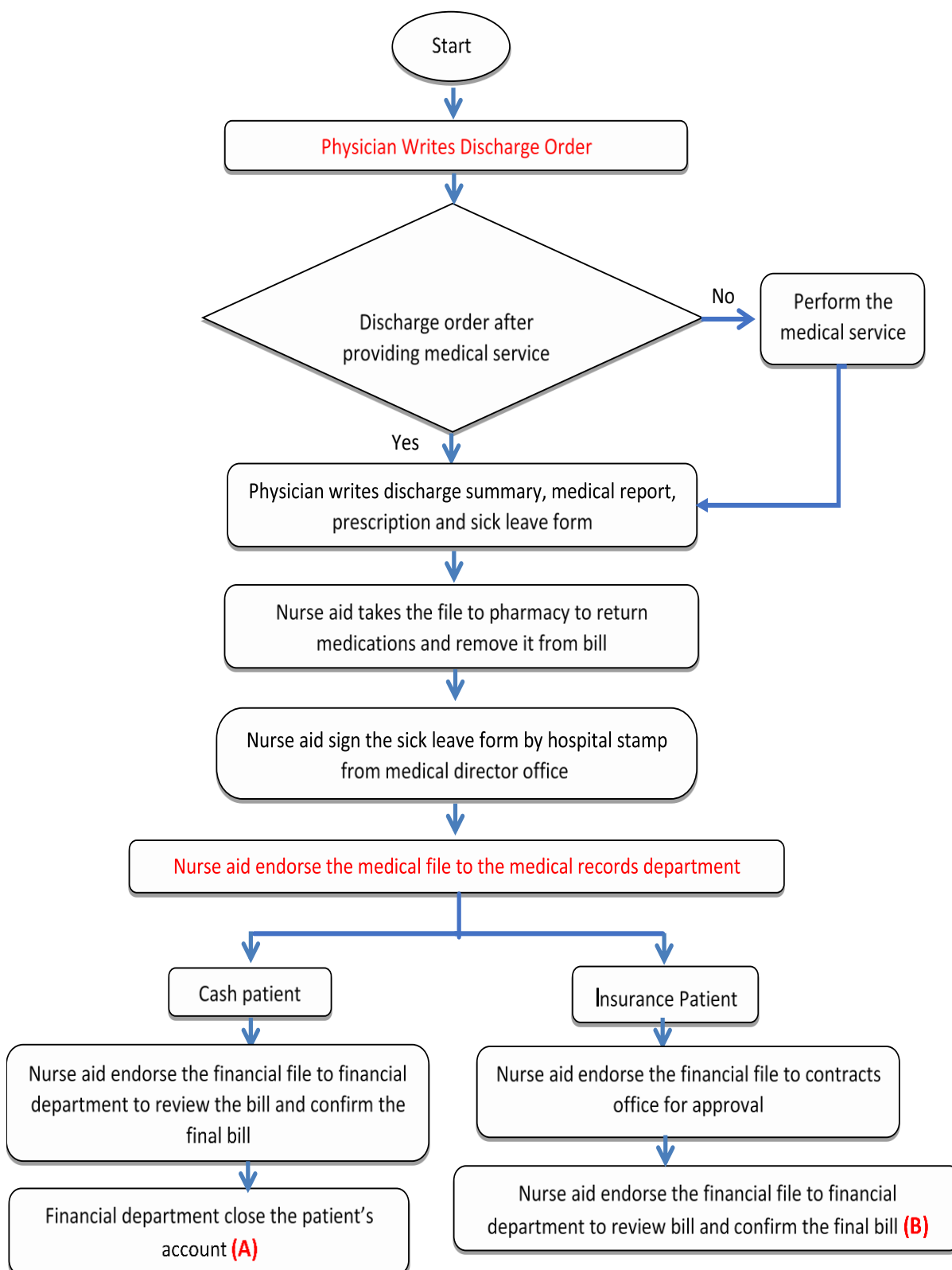
Table 3 Stakeholders Analysis

Stakeholder Name	Resistant	Skeptical	Neutral	Supportive	Enthusiastic	Issues or Concerns	"Wins"	Action Items/ Strategy to Influence
1.Top management				✓		Legal responsibility	Good hospital reputation Increase hospital Revenue	Commitment to JCI standards and excellence admission and

								discharge processes
2. Nursing			✓			Unaffected workflow	Good Nursing Practice Incentives due to increasing patient flow	Facilitate Admission and discharge process
3. Patients				✓		Proper decision making concerning their condition	Good patient outcome Patient satisfaction	Patient involvement
4-Admin & legal affairs manager				✓		Legal responsibility	Less patient claims and compensations	Application of legal requirements
QMD					✓	Quality of services Patient safety Minimize the risk	High Quality of Services More adherence to JCI standards	JCI Standards training Process monitoring

Clarify – The Current Process:

By using flow chart which represented a process of discharge in hospital (C) from start of discharge order till discharge physically from hospital as see in Fig (18) will see three main problems which consumed time in admission /discharge process and lead to decreasing satisfaction. The first problem was during (Physician Writes Discharge Order) was written manually this consuming time to endorse to interested parties. Second problem was during (Nurse aid endorse the medical file to the medical records department manually) consumed more time. The third problem was (Patients' accounting office discharge the patient from the system the room appears empty in the admission) this step was occurred at the end of discharge which lead to big problem that the hospital system still consider patient's room appear full till the system discharge patient.



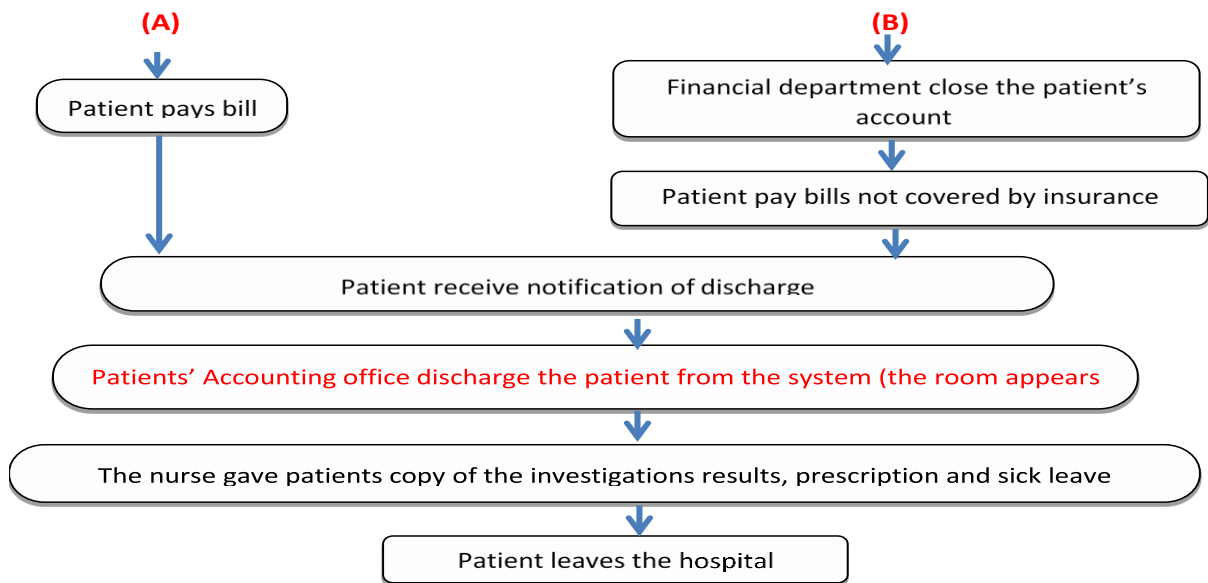


Figure 18 Flow chart for discharge process in hospital (C) (Before)

Understand – The sources of the problem by using (Fishbone diagram):

1. Agree on a problem statement (Improper Admission and discharge Process)
2. Brainstorm the major categories of causes of the problem.
 - Methods
 - Machines (equipment)
 - People (manpower)
 - Materials
 - Measurement
 - Environment
3. By brainstorm all the possible causes of the problems (founded that
4. Again ask "Why does this happen?" about each cause. Write sub-causes branching off the causes. Continue to ask "Why?" and generate deeper levels of causes. Layers of branches indicate causal relationships.
5. When the group runs out of ideas, focus attention to places on the chart where ideas are few.

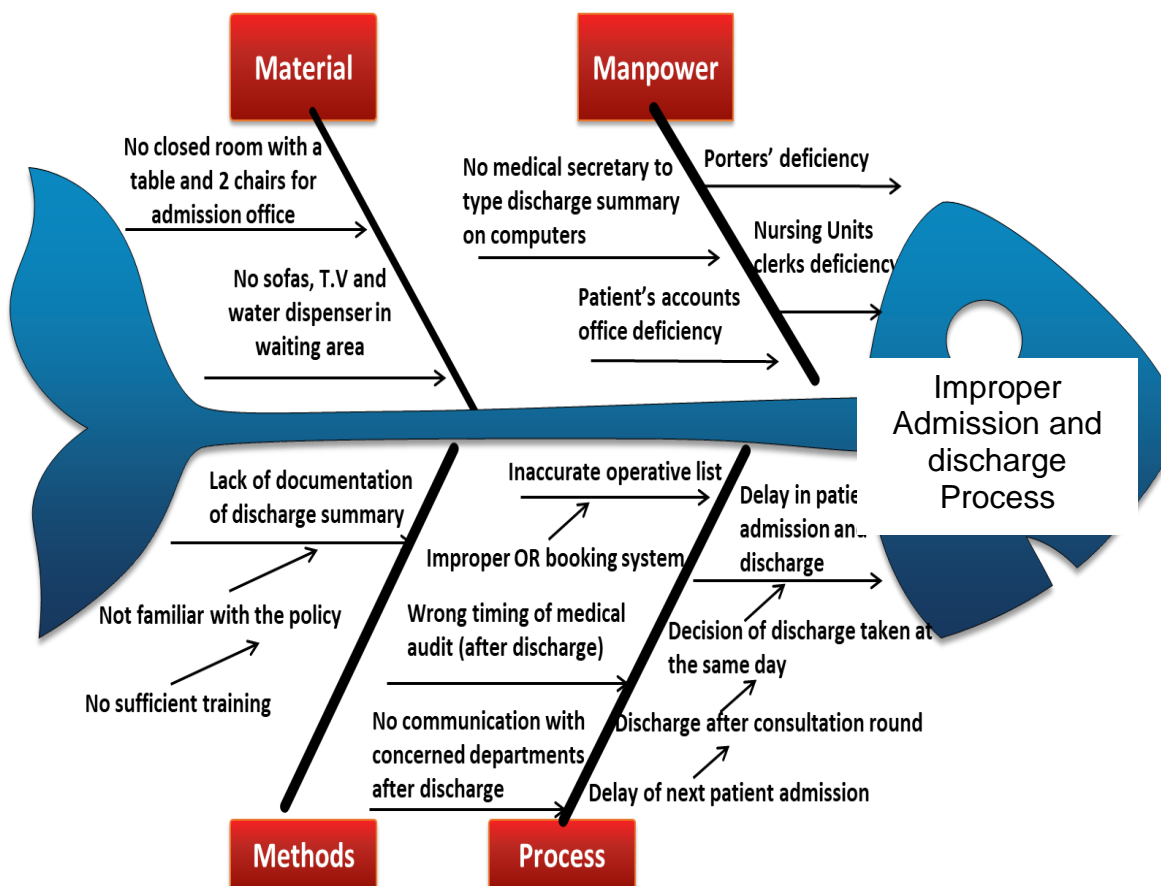


Figure 19 Fishbone diagram for discharge process

Then using pareto chart to select vital few and treat it then can improvement done, the left vertical axis is the frequency of occurrence, the right vertical axis is the cumulative percentage of the total number of occurrences. Because the values are in decreasing order, the cumulative function is a concave function. This technique helps to identify the top portion of causes that need to be addressed to resolve the most occurrence problems. While it is common to refer to pareto as "80/20" rule, under the assumption that 20% of causes determine 80% of problems. As seen in Fig (20).

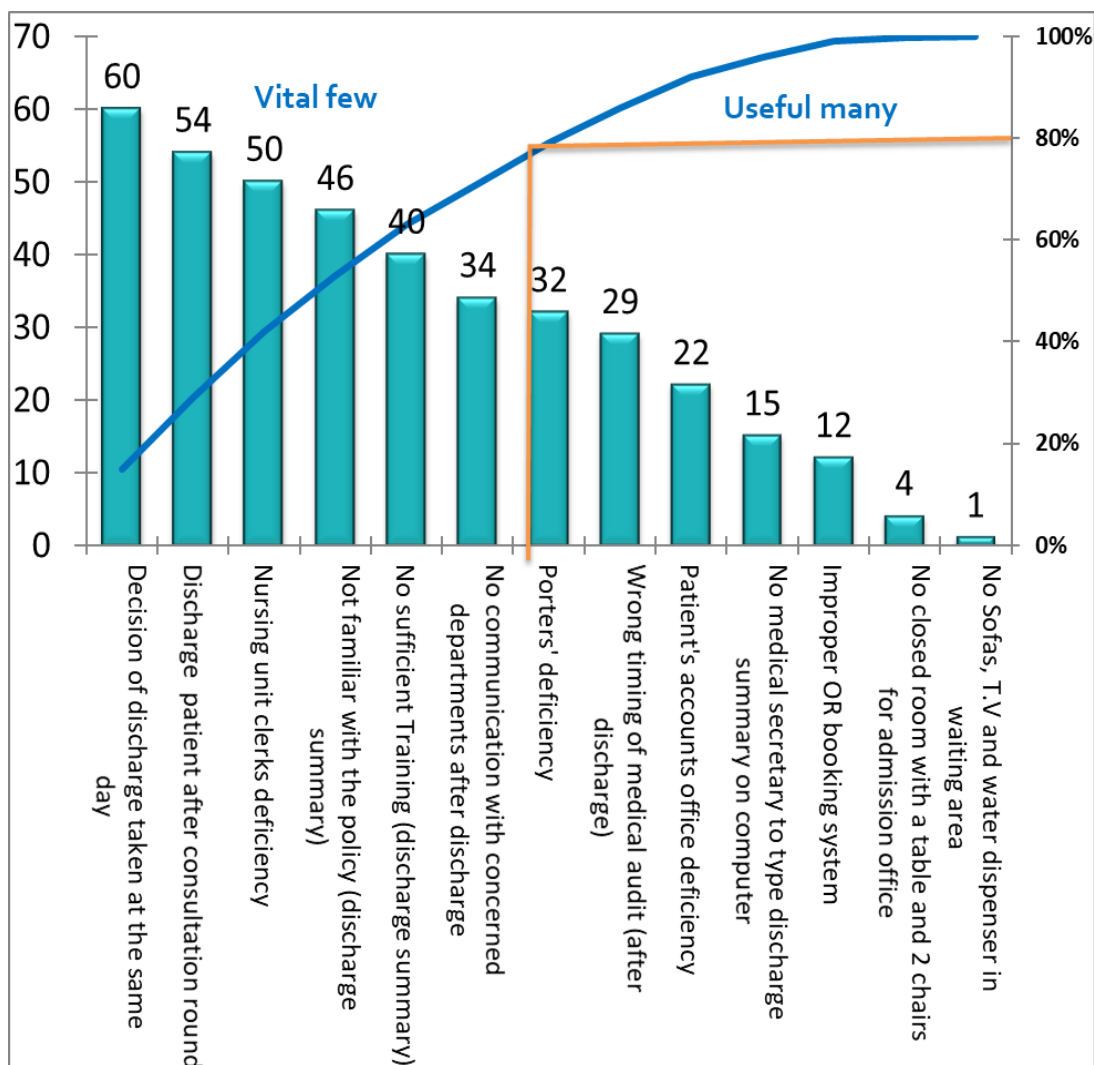


Figure 20 Pareto chart for common problem in discharge process

By analysis of the vital few problems and solving it as follow:

1- No package for common diseases & common procedures with inclusions and exclusions which may lead to:

- High cost service.
- Patient complaint and patient dissatisfaction.

So, developing packages for common diseases and procedures would enhance the cost of service and increase patient satisfaction.

1- Porters deficiency which may lead to:

- Delay in patient admission
- Patient complaint and patient dissatisfaction.

So, adjusting number of porters in admission office would enhance the admission process and increase patient satisfaction.

2- Nursing units' clerk's deficiency which may lead to:

- Nursing over duties
- unit clerks' overload
- Internal customer dissatisfaction

So, adjusting number of nursing units' clerks would enhance

The admission and discharge process, decrease nursing burden, decrease unit clerks' burden, Increase internal customer satisfaction.

3- Missing patients in operative list received by admission office which may lead to:

- Delay and shifting of some procedures
- Unorganized OR schedule
- OR Staff will be over-burdened
- Internal customer dissatisfaction

So, Improving of OR booking system to have an accurate operative list would enhance the scheduling of OR, decrease, OR staff burden and increase internal customer satisfaction.

4- consultants following the patient decides patient discharge at the same day not the day before which may lead to:

- Delay patient discharge
- Patient extra-payment
- Delay next patient admission
- Patient dissatisfaction and patient complaint

So, Improving the time of discharge order would enhance the process of patient discharge and the next patient admission and increase patient satisfaction.

5- Lack of documentation of discharge summary & no copy provided to patient which may lead to:

- No continuity of care

So, Improving the documentation of discharge summary & providing a copy to the patient would enhance the continuity of care.

6- For contracted services, revising the discharge summary and the charges after patient discharge may lead to:

- Healthcare services needed but not done
- Healthcare services not needed but done
- Medical Claims & deductions

So, Improving the revise process of discharge summary and the charges would ensure delivering of required healthcare services for patient's condition and prevent medical claims and deductions.

7- Inappropriate communication with concerned departments after patient discharge which may lead to:

- No fixation of broken-down room contents
- Improper cleaning process of rooms
- Increase waiting time for next patient admission
- Patient dissatisfaction and patient complaint

So, improving communication with concerned departments after patient discharge would ensure proper fixation needed and proper cleaning of patients' rooms.

8- Improper place for admission office which may lead to:

- Loss of patient confidentiality
- Patient discomfort

So, admission office renovation would keep patient privacy and confidentiality and increase patient satisfaction.

9- Waiting area without comfortable sofas, T.V and water dispenser which may lead to:

- Patient discomfort
- Patient dissatisfaction and patient compliant

So, waiting area renovation would increase patient satisfaction and decrease patient compliant.

After resolving mean problems,

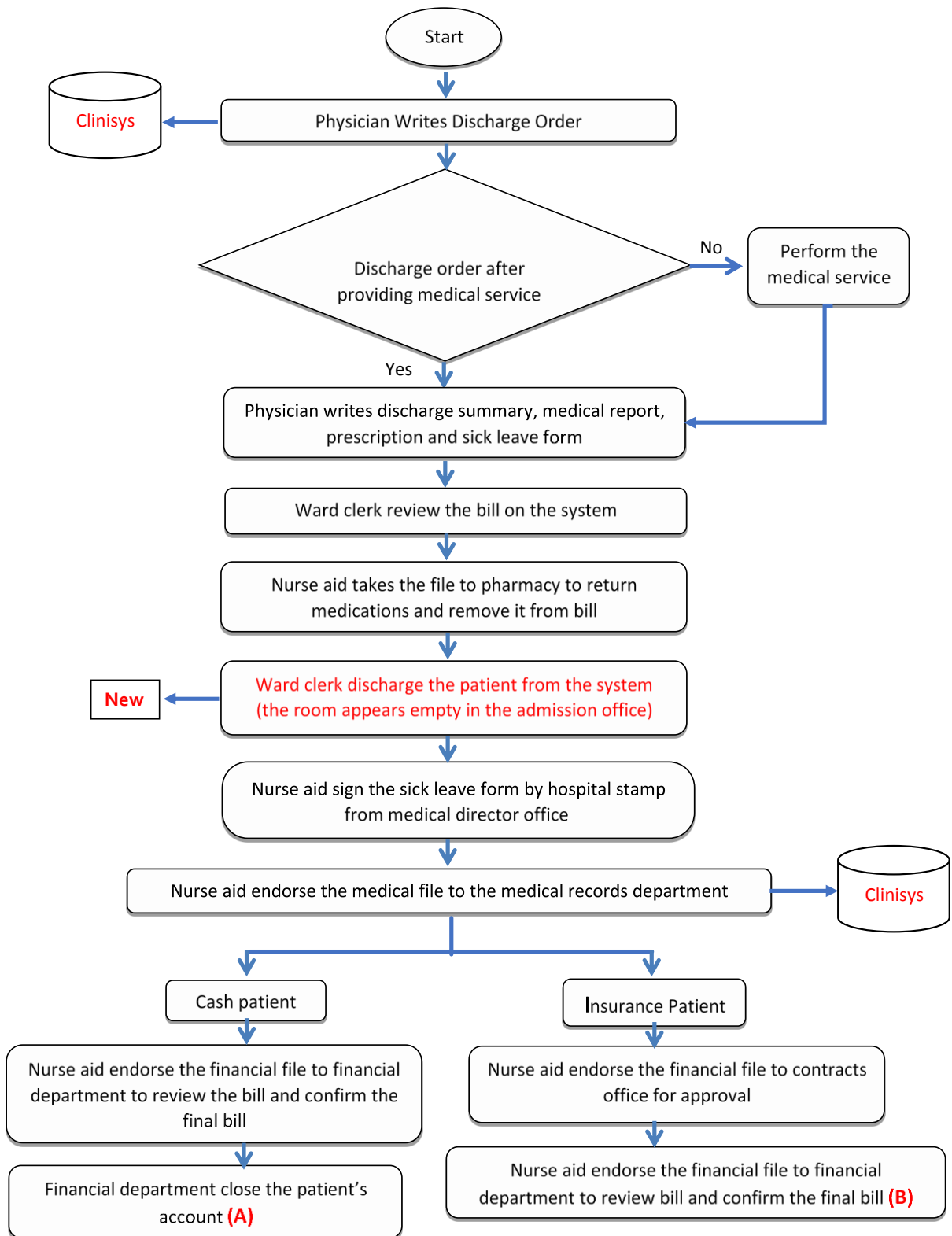
The results of the project improvement were:

- Reducing patients' admission/discharge time.

Table 4 Improving discharge/ admission process

Discharge process	Before	After
Time from start of discharge till discharge time from HIS	07:10	0:40
Time from start of discharge till release of final bill	07:10	0:40
Difference between time from start of discharge till release final bill and time from start of discharge till patient actual leave	0:19	0:35
Time from start of discharge till actual leave	07:29	1:15

According to table (4) apply all improvement with solving the main problems, the new flow chart for discharge process will be:



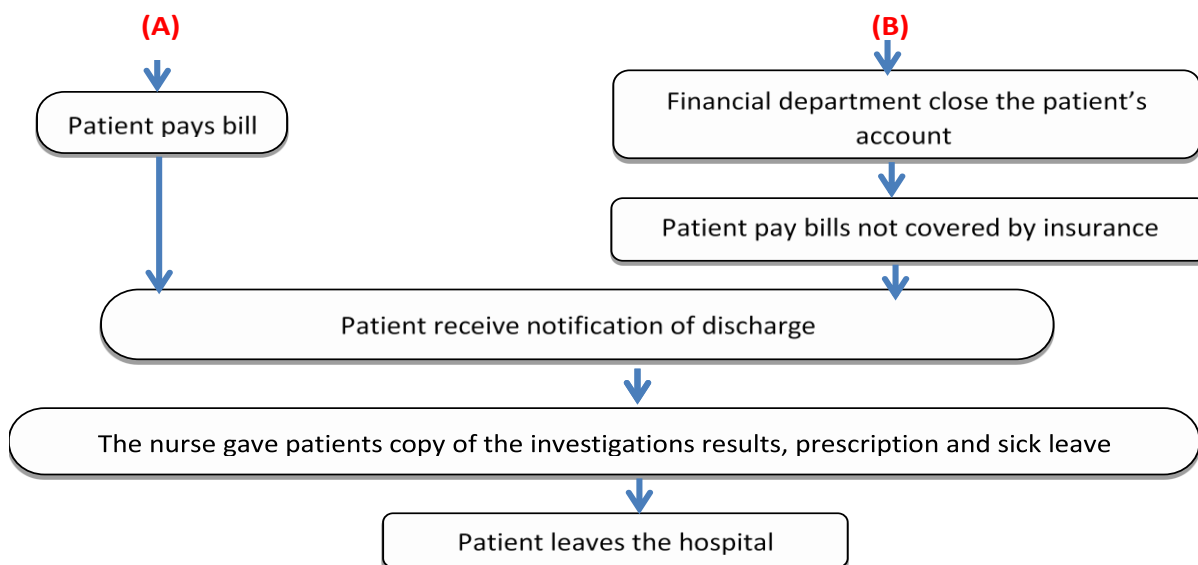


Figure 21 Flow chart for discharge process in hospital (C) (After)

Conclusions:

The purpose of this project was to use a specific KPIs to monitoring, evaluating and improving performance in hospitals especially in managerial sectors such as admission and discharge areas which reflected also on other KPIs such as ALOS, BOR and all previous will affecting on patients' satisfaction and patients' complaints which will affected too on hospitals outcome and revenues. The result of this article were:

- Improving ALOS from 2.9 days in June 2017 to 1.8 days in Oct 2020.
- Improving bed occupancy from 41 % in June 2017 to 70 % in Feb 2020 before spread of COVID-19.
- Reducing patients' complaints from admission and discharge processes.
- Improving the chance to increasing admission volume from 577 patients in June 2017 to 1053 patients in Dec 2019. So, we recommended the next point for future researches:
- Deep analysis for patients' satisfaction and patients' complaints from admission and discharge process including all processes in the discharge processes.
- Deep analysis of discharge summary depending on the classification of the patients' discharge time (Before 11 AM/ day, After 11 AM till 2 PM/ day and After 2 PM/ day till 11 AM/ day).

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