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ORIGINAL RESEARCH

IMPROVING THE TIME OF DISCHARGE BASED ON LEAN SIX SIGMA: AN ANALYSIS AND RECOMMENDATION

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ABSTRACT

The patient discharge process at Jemursari Islamic Hospital, Surabaya for the four types of patient insurance, namely BPJS, General, Institution, and Private Insurance, does not currently meet the standard operating procedures of a 2-hour discharge time. This study was observational using a quantitative analysis approach with the Six Sigma methodology. The study measured the time variation and sigma level of each process and sub-process. Qualitative analysis was conducted through a Focus Group Discussion to identify activities. The sample size was 100 respondents, including 70 patients with BPJS insurance, 10 patients with general insurance, 8 patients with institutional insurance, and 12 patients with private insurance. The findings showed that the average total time for the patient discharge process was 166.61 minutes for patients with BPJS insurance, 252.60 minutes for patients with general insurance, 258.16 minutes for patients with institutional insurance, and 229.69 minutes for patients with private insurance. The sigma level of the sub-processes for discharging inpatient patients guaranteed by BPJS was near the standard level in two sub-processes. The sigma level of the sub-processes for discharging inpatient patients with general and institutional insurance in inpatient care was near the standard level. The sigma level of the sub-processes for discharging inpatient patients with private insurance was near the standard level in one sub-process.

Keywords

Discharge Time of Inpatient Patients, Lean Six Sigma, Value-added, Non-value-added.

INTRODUCTION

Discharge planning for patients is incorporated into health systems around the world with the aim of improving service coordination between hospitals and communities, ensuring patients are discharged smoothly, and reducing the number of patients returning to hospital or experiencing relapses (Chen et al., 2021; Gonçalves-Bradley et al., 2022) One strategy to overcome inefficiencies that occur in the process of discharging patients from the inpatient room at the hospital is to implement Lean management that can

motivate health facilities to eliminate waste of time and costs or minimize them to provide value (Firman, 2021).

The Lean concept is designed to identify problems as soon as they arise or are anticipated, make continuous progress, and establish a constant and stable atmosphere (Mawlid, 2017). Lean management in healthcare has various models and strategies to implement. Some known models and strategies for implementing Lean management include Kaizen principles, 5S principles (Sort, Sweep, Simplify, Standardize, Sustain/Self Discipline), RPIW (Rapid Process Improvement Workshop), VSM (Value Stream Mapping), Kanban Cards, and Six Sigma DMAIC (Varela et al., 2019).

Several Lean management models, including the Lean Six Sigma (LSS) approach with the concept of DMAIC (Define, Measure, Analyze, Improve, Control) are often used to assess the quality of service to determine whether a hospital is qualified or not (Bhargava & Gaur, 2021; Celano et al., 2012; Monday, 2022). The Six Sigma method has continuous improvement efforts that attempt to eliminate process variance (customer values) (Okwu et al., 2021; Syah et al., 2019; Tampubolon & Purba, 2021). Based on the sigma value achieved, the effectiveness of Six Sigma implementation in an organization is evaluated (Varela et al., 2019).

A number of studies on optimizing the quality of hospital services are dominated by the application of LSS and Lean healthcare (Alfatiyah &; Bastuti, 2022; Trakulsunti et al., 2021; Yuganingsih et al., 2021). The dominant factor that became a source of patient dissatisfaction was the waiting time attribute of the examination with a weighted servqual gap value of -0.0575. A study using the Lean hospital method proved the results of the percentage of Process Cycle Efficiency (PCE) with activity time efficiency in drug services at outpatient pharmacies increased by 10.8% from the existing system (Alfatiyah &; Bastuti, 2022).

A study with the LSS method to reduce the duration of discharge time of inpatients is with simplified and standardized processes, better communication, and system-wide management are some of the proposed improvements, which reduce patient discharge time by 54% from 216 minutes (Arafeh et al., 2018). Another study revealed that after accounting for concurrent trends in the control group, the percentage of patient discharge released at 10:00 am increased by 21.3 points, and the percentage of patient discharge during the day increased by 7.5 points (Molla et al., 2018). There is no significant change in the 30-day read rate or length of stay.

This study aims to compile recommendations for improving the discharge time of inpatients based on observations in one of the hospitals with the Lean Six Sigma method.

METHOD

Observational studies with a lean six sigma approach were used to develop recommendations for improving discharge strategy planning. The study was conducted at a hospital in Surabaya by observing seven inpatient rooms. The duration of the study is four months from January 2023 – April 2023.

Unit Analysis

Data collection is focused on identifying the process of discharge services from inpatient to BPJS patients, General and Insurance which is realized in the form of

value assessment. The sampling technique used is stratified random sampling with strata of BPJS patient groups, General, Agencies and Insurance. The selection of patients was carried out on that day also based on the information of patients returning from the inpatient room.

Resources

Information was gathered in several ways, including: direct observation of the discharge process and timing, in-depth interviews and group discussions with health services in the inpatient room. The second sources included in this study are standard operating procedures for discharge times, pharmaceutical services, assurance services, observation reports for the discharge process, discussion reports with staff, journals, and other manuals for the discharge process.

Inclusion and exclusion criteria

The inclusion criteria in this study include the process of discharging patients on the orders of DPJP on the same day and the process of discharging patients carried out in shift 1 at 08.00-15.00 WIB. Meanwhile, the exclusion criteria used include patients going home at their own request; the patient dies; the patient is referred; The administrative and financial process does not include waiting for confirmation from the guarantor to the patient, the institution and insurance.

Data Analysis

Data analysis was carried out with quantitative and qualitative approaches to the process of discharging inpatients with four guarantors, and each at the process stage in the inpatient, pharmacy, administrative and financial rooms. Furthermore, an analysis of causal factors was carried out to focus on solving problems in this study. Quantitative analysis is carried out through the Six Sigma approach by measuring variations in time and sigma levels in each process and sub-process, while qualitative analysis is carried out by identifying non-value-added activities and identifying waste. Furthermore, the garbage found has been searched for the cause with a fishbone diagram.

RESULTS

Inpatient Return Flow (Define)

The process of discharging patients from inpatient at RSI Surabaya Jemursari starts from the moment the patient is declared discharged by DPJP, the process in the inpatient room, the pharmaceutical inpatient process as well as administrative and financial processes. In this study, the observed processes include these three processes from each guarantor, BPJS, general, Agency and Insurance.

For BPJS patients, after completing the process in the inpatient room and pharmacy, patients are directed to the Central BPJS to apply for a waiting fee, get back their ID card and BPJS participant card. If there are benefits from actions during hospitalization, the patient before getting back the ID card and BPJS participant card, is directed to the finance department for payment settlement. Then the patient returns to the Central BPJS to get back the KTP and BPJS participant card. In general, patients after completing the process in the inpatient room and pharmacy, patients can be directly directed to the cashier who is part of the administration and finance. For Agency patients, after processing from the inpatient room and pharmacy, and waiting for verification from the guaranteed department, the patient is directed to the finance department for administrative proceedings and if something is not insured, payment is made.

For Insurance patients, after being processed from the inpatient room and pharmacy, and waiting for insurance verification from customer care, patients are directed to the finance department for the insurance guarantee process and if there is an insured then payment is paid. The process of discharging insurance patients depends on the type of insurance so that administrative and financial processes can be repeated to coordinate with hospitalization, pharmacies, and customer care. For administrative and financial processes, including customer service, insurance, and hospital finance (cashier) (Table 1).

Table 1. Different Patient Discharges Process Flow based on Guarantors.

Sub Process	Guarantor	Differences				
		ID	Member Card	Insurance & Agency Documents	Cost	Note
Administration & Financial Process	BPJS	+	+	-	+/-	If there is any benefit from the action during hospitalization, the patient before getting back the ID card and BPJS participant card, is directed to the finance department for payment repayment
	General	+	-	-	-	
	Agency	+	+	+	+/-	
	Insurance	+	+	+	+/-	

Sigma Time and Level in the Process of Dispensing Patients from the Inpatient Room (Measure)

all sub-processes in the process of discharging inpatients with BPJS guarantors are close to the standard sigma level (standard sigma level = 3). In the sub-process, the discharge of the inpatient approached the standard level of 2.91 and there was no NVA. In the sub-process of returning drug services at pharmacies exceeds the standard level 3.12 and there is one NVA activity so that it still requires improvement efforts because the possibility of value-added activities is still not standardized. The process in the financial administration department is close to the sigma level of 2.90 with 4 NVA activities so that standardization of procedures is needed as an effort to improve (table 2).

Table 2 Average Sub-Process Time and Sigma Level in the Dischargeable Process of BPJS Inpatients

Patient Guarantor	Sub Process	n	Average time (minutes)	SD	Minimum Time (minutes)	Maximum Time (minutes)	Defect (%)	Number of activities			Level Sigma
								VA	NVA	NNVA	
BPJS	Patient Discharges Process	70	35.13	38.80	6	197	31%	2	0	2	2.91
	Pharmacy Services	70	110.16	112.43	0	525	31%	5	1	1	3.12
	Process in Administration &; Finance	70	17.31	11.86	0	47	24%	3	4	0	2.90

In general guarantors, the sigma level has approached the standard level: in the sub-process the patient discharge reached 2.97 and there was no NVA activity. While the process of returning drug services at pharmacies is almost the same, which is 2.92 and there is 1 NVA activity. The process in the financial administration department reached a value of 2.78 and there was no NVA activity. This means that 3 sub-processes need to be standardized (table 3).

Table 3. Average Sub-Process Time and Sigma Level in the Dischargeable Process of General Insurer Inpatients

Patient Guarantor	Sub Process	n	Average time (minutes)	SD	Minimum Time (minutes)	Maximum Time (minutes)	Defect (%)	Number of activities			Level Sigma
								VA	NVA	NNVA	
General	Patient Discharges Process	10	49.40	35.49	10	120	50%	2	0	2	2.97
	Pharmacy Services	10	191.80	101.37	52	366	70%	5	1	1	2.92
	Process in Administration &; Finance	10	9.40	6.64	0	21	10%	1	0	0	2.78

In guarantors, the Agency approaches sigma level standards. In the sub-process, the hospitalization approached the standard level of 2.97 and there was no NVA activity. In the sub-process of returning drug service at pharmacies is close to the standard level of 2.98 and there is 1 NVA activity. The process in the financial administration department is close to the standard level of 2.82 and there is no NVA activity. This means that 3 sub-processes need to be standardized (table 4).

Table 4 Average Sub-Process Time and Sigma Level in the Dischargeable Process of Agency Inpatients

Patient Guarantor	Sub Process	n	Average time (minutes)	SD	Minimum Time (minutes)	Maximum Time (minutes)	Defect (%)	Number of activities			Level Sigma
								VA	NVA	NNVA	
Agency	Patient Discharges Process	8	32.50	21.87	4	57	50%	2	0	2	2.97
	Pharmacy Services	8	149.88	90.48	42	283	62,5 %	5	1	1	2.98
	Process in Administration &; Finance	8	71.75	78.17	0	215	37.5 %	5	0	0	2.82

In the sub-process, the hospitalized was close to the standard level of 2.74 and there was no NVA activity. The sub-process of returning drug services in pharmacies exceeds the standard level of 3.09 and there is 1 NVA activity. Sub-processes in the financial administration department exceeded the standard level of 3.33 and there was no NVA activity. In the administrative and financial part, it still exceeds the sigma level because the external process for verification of insurance requires a very variable time from insurance to insurance and this factor cannot be fully controlled by the hospital. In this section, there are also no NVA activities but value-added activities exceed the established time standard (table 5).

Table 5 Sub-Process Average Time and Sigma Level in the Insurer Inpatient discharge Process at the Installation

Patient Guarantor	Sub Process	n	Average time (minutes)	SD	Minimum Time (minutes)	Maximum Time (minutes)	Defect (%)	Number of activities			Level Sigma
								VA	NVA	NNVA	
Insurance	Patient Discharges Process	12	56.83	24.79	21	86	75%	2	0	2	2.74
	Pharmacy Services	12	12.00	81.13	22	240	50%	5	1	1	3,09
	Process in Administration &; Finance	12	42.83	41.28	0	125	16%	5	0	0	3,33

Factors Causing Waste in Inpatient, Pharmacy, Administration and Finance Rooms with CARL

Prioritization of the causes of problems with the CARL method is carried out by filling out an assessment form by the Head of Nursing, Head of Medical Services, Head of Inpatient Pharmacy, Head of Guarantee Installation and Public Relations The results are then analyzed and submitted to management through FGD at that time to determine the root cause of the problem that is a priority to be resolved. The results found 5 (five) priority causes of problems, namely

the causes of problems with the largest multiplication results, namely: Doctor visits are not on schedule; Lack of human resources of pharmacists and pharmaceutical technical personnel; Lack of compliance of specialist doctors in filling out the E-Medical Record; There is no flow of discharge of inpatients; There is no SPM for the discharge process of patients in the treatment room, pharmacy, administration and finance (table 6).

Table 6. Prioritization of Causes of Problems with the CARL Method

No.	Causes of the problem	C	A	R	L	Value	Ranking
1	Doctor does not visit according to schedule	9.2	8.6	9.0	9.4	6.693	1
2.	Lack of human resources for pharmacists and pharmaceutical technical personnel	8.6	8.8	8.8	9.8	6.526	2
3.	Lack of compliance of specialist doctors in filling out E-Medical Records	9.0	8.6	8.8	8.8	5.993	3
4.	There is no flow of discharge of inpatients	8.8	8.6	8.8	8.8	5.860	4
5.	There is no SPM for the discharge of patients in the treatment room, pharmacy, administration and finance	7.6	8.2	8.6	9.0	4.823	5
6.	Specialists have other duties (education, outpatient services, surgery)	8.2	8.2	7.8	8.6	4.510	6
7.	Number of doctors treating inpatients	8.0	7.6	7.8	9.4	4.457	7
8.	SPO discharge of inpatients has not been socialized	8.0	8.4	8.0	8.0	4.300	8
9.	Medical education is carried out after the administration process is complete	8.4	8.0	7.6	8.2	4.187	9
10.	Lack of information on the discharge process from hospitalization	8.0	7.8	7.4	8.2	3.786	10
11.	E-Medical Record 43 has not been fully filled in since the beginning	8.0	7.6	7.6	8.0	3.696	11
12.	There is no information media related to the flow of repatriation patient	7.6	7.4	7.8	7.8	3.421	12
13.	Limited number of devices in the inpatient room	7.4	7.2	6.6	7.8	2.742	13
14.	The internet network is sometimes unstable	7.0	6.6	7.0	7.6	2.457	14
15.	Transit Room for patients who have completed the discharge process does not exist	6.2	6.6	7.0	7.8	2.234	15

DISCUSSION

Factors leading to the discharge time of patients with four guarantors are the number of patients discharged on the same day, the type of medicine discharged, the return of the drug (Cook et al., 2022). There are other activities that are not related to the discharge process such as the patient's family asking for information, concurrent doctor visits, simultaneous use of devices between officers, the presence of patients who experience a sudden decline in condition (Asriyati et al., 2021; Zanetoni et al., 2023).

In the administrative (Rodgers & Antony, 2019) and financial sub-process at BPJS Pusat can be done in less than 10 minutes, but also depending on the number

of patients who go home on that day, there is pocket money or not and BPJS Pusat also serves poly services for control approval and internal counseling. In the administrative and financial sub-process of general patients, it is also influenced by the readiness of costs from patients and families even though they have been informed by the financial officer every day and there is a security deposit at the beginning of the patient's admission to the hospital for hospitalization. In the administrative and financial sub-process of Agency and Insurance patients, related to the age of patients in the study sample, most of whom are 60 years old and are often handled by more than 1 doctor and the provision of multi-pharmaceutical therapy, so it needs repeated confirmation related to drugs, diagnosis, supporting examinations and actions by agencies and insurance. These are external factors that can affect the discharge process of the patient.

Based on the study, the recommendation for additional pharmaceutical personnel was made after the hospital conducted a workload analysis at the Pharmaceutical Installation by comparing the increase in the number of prescriptions with the total working hours and found that of the total need for pharmaceutical technical personnel for inpatient services amounted to 16 people, while the available personnel currently still amounted to 10 people, thus it was necessary to add 6 people.

Other considerations came from input and suggestions from employees and inpatients as well as the results of observational studies where patient discharge times were largely due to the process at pharmacies taking more than 90 minutes as the standard time. The process starting from checking drugs, returning drugs, mixing drugs according to the type of prescription, education on how to take drugs, drug reconciliation, monitoring allergic reactions due to drugs given, and delivering drugs back to the room requires fast coordination between doctors, where the schedule of doctor visits must be tried on time. This is because if the visit schedule does not have certainty every day, the variation of therapy changes is very high when drug therapy has been carried out in hospital. Coordination is also required between nurses, pharmacists, pharmacist assistants and employees. The addition of manpower is also in line with the unit dose dispensing system that must be carried out in inpatient services according to accreditation standards. Currently, in hospitals, the distribution of drugs per unit dose is expenditure only for drinking drug preparations, while injections, infusions, consumables, medical devices still use one daily dose, which is preparation for one day's needs (Rakasiwi & Latifah Amin, 2021).

Other recommendations related to doctor compliance in filling out the E-Medical Record (Indarti & Agustia, 2022). This is indispensable for monitoring, evaluating, and improving communication between PPAs. Medical records that need to be completed include initial inpatient medical assessment, integrated patient progress record, consultation sheet if needed, clinical path in cases predetermined by the hospital, discharge planning, integrated patient and family education and discharge summary.

The recommendations given for SPM and the flow of the inpatient discharge process from the results of the discussion are improving the flow related to the inpatient discharge process, socializing the flow of the inpatient discharge process, compiling and setting standards for the inpatient discharge process time. The process of discharging inpatients begins

with discharge instructions from DPJP and ends when the patient leaves the inpatient room. After the DPJP visits and gives instructions to go home, the nurse prepares a prescription for the patient to take home, medicines and medical devices to be returned and the patient's bill file. The return of prescription patients and the return of drugs/medical devices are delivered by the nurse to the pharmacy installation, while the patient's bill file is delivered to the finance or administration department of BPJS so this is very important in determining the flow related to patients who will go home.

CONCLUSIONS

The flow of discharge of inpatients based on guarantors has similarities in the sub-process in the inpatient room and the sub-process of pharmaceutical services. The difference in flow lies in the administrative and financial sub-processes in patients with BPJS, General, Agency and Insurance Underwriter. The factors causing waste activity in the process of removing patients from the four guarantors are the same, namely extra-processing in the pharmaceutical service sub-process. In patients with BPJS guarantors, waste of untapped talent, extra processing and motion is gained in administration and finance.

Recommendations that can be offered from the results of this study include monitoring and evaluation, adding pharmacists and pharmaceutical technical personnel, preparing, determining and socializing the flow of the patient discharge process, setting standards for discharge time, re-evaluating cooperation agreements related to administrative completion and cost confirmation flow, setting deadlines for confirming costs to hospitals, and periodic coordination with agencies and insurance related to the patient release process and Submission of information from the guarantor to the patient.

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