International Journal of Psychosocial Rehabilitation, Vol.24, Issue 01, 2020
ISSN: 1475-7192

Health Service Process: Lean Six Sigma Concept for Hospitals (Casemix Hospitals)

Sudarwan, Achmad Nurohim[1], Dominicus Sutrisno Hadi, Tantri Yanuar Rahmat Syah, Eka Angga laksana

Background-*National Health Insurance, whose implementation began in January 2014, made a change in the payment system from the Retrospective Payment System to the Prospective Payment System in INA-CBG rates. The difference in INA-CBG rates and hospital rates is a fundamental problem so hospitals must make efforts to achieve quality and cost control. The purpose of this study was to determine the efforts taken by hospitals related to differences in hospital outpatient service fees and inpatient service rates to INA-CBG's rates.*

Method-*The research method was carried out quantitatively. Lean consumption is used to analyze the manufacturing sector, namely lean manufacturing rather than industrial processes. In addition, the development of lean consumption in the hospital sector is the right choice to improve the quality of hospital services. Thus, this aims to test the Lean Hospital algorithm by defining, measuring,analyzing, improving, and controlling DMAIC (Define, Measure, Analyze, Improve, Control) and the LCM (Lean Consumption Map) method through hospital services. By using a comparison of the completion time of outpatient and inpatient operational activities. The results showed that the hospital Lean algorithm successfully assessed the comparison method with the Lean Consumption Map and Value-Added Assessment. In this study, we used qualitative research methods and interviews with internal and external correspondence, respectively.*

Result-*We found that the DMAIC application and the Lean Consumption Map in the Lean Hospital algorithm will increase document completion times and service processes at the Hospital.*

Keyword: *DMAIC, Lean Consumption Map.*

I. INTRODUCTION

The National Health Insurance Program (JKN) was launched by President Susilo Bambang Yudhoyono on January 1, 2014. The JKN is an assurance in the form of health protection so that participants receive health care benefits and protection to fulfill basic health needs provided to everyone who has paid their contributions or contributions paid by the government. This program is organized by the Social Insurance Administration Organization (BPJS) which is a change from PT ASKES.

Based on the 2014 BPJS regulations, JKN participants can be served in health facilities in Indonesia with a tiered system, which starts from the first level health facilities to the advanced level facilities. These health facilities can be owned by the government, local government and private property that meet BPJS requirements and work together with BPJS. The first level health facilities include: Puskesmas, Doctor's Practice, Dentist's Practice, Primary Clinic and Type D. Hospital. While the advanced level facilities are; Main Clinic, General Hospital and Special Hospital.

[1] (sudarwan@esaunggul.ac.id)
(achmad.nurohim@esaunggul.ac.id)
(dominicus.sutrisno@esaunggul.ac.id)
(tantri.yanuar@esaunggul.ac.id)
Universitas Esa Unggul, Jakarta[1,2,3] Widyatama University[4]

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019

Based on 2014 BPJS regulations, payment of health services by BPJS to advanced facilities using INA CBG's rates. INA CBG package rates are payment based diagnostic systems. In payments using the INA CBGs system, both hospitals and payers no longer specify bills based on details services provided, but only by submitting a patient out diagnosis and DRG (Disease Related Group) code. The amount of reimbursement of costs for the diagnosis has been mutually agreed between providers / insurance or determined by the previous government. Estimated length of stay (length of stay) that will be undertaken by patients has also been estimated beforehand adjusted to the type of diagnosis and cases of the disease.

Payment system with INA CBG's package rates on the JKN program is felt detrimental to the hospital. Chairperson of the Big Board (PB) of the Indonesian Doctors Association (IDI) Zainal Abidin said that beforehand the private hospital had made predictions in the implementation JKN suffered a lot of losses. Therefore, the National Casemix Center (NCC) Team The Ministry of Health (Kemkes) has revised the Indonesia *Case Based Group*'s rate payment system.

This research is important because this study analyzes the operational activities of the section casemix hospital with INA CBGs coding system established by the government. Data used is primary data on the INA CBG system. Some people said, system INA CBG's provide give loss to hospitals, so this study wants to analyze the level of quality, efficiency and effectiveness issued by the hospital in serving JKN patients for outpatient and inpatient services.

With the adoption of new systems and demands for quality improvement, hospitals are as one providers of health care facilities (fasyankes), then all hospitals in Indonesia are sued clean up and make improvements in the service system. To implement improvements, it is required methods for making these improvements possible. One method that is developing at this time in system improvement and process efficiency is the Lean Six Sigma method which was first introduced by Toyota in 1956.

Lean Six Sigma was originally a concept that is commonly used in the business world and the private sector, especially in the manufacturing sector as a means of improving product quality through process improvement. The implementation of Lean Six Sigma in various business and private worlds this company has pushed for increased effectiveness and efficiency in the company's performance. Over time, Lean Six Sigma began to be used in other sectors such as in the service sector / service, health sector, financial sector, and human resources sector.

The application of the Lean Six Sigma concept outside the manufacturing sector is, in the health service sector known as Lean Hospital or Lean Healthcare has proven to be able to improve the system exist, increase the effectiveness of the process, and reduce waste (waste) in various countries. Some examples of the application of Lean Hospital or Lean Healthcare are examined by (Papadopoulos, 2012), (Chen and Thota, 2012), (Lighter, 2014). However, other studies mention that Lean Six Sigma can not be used or can not be used fully in the health service sector as expressed by (Siu, et al., 2015), (D'Andreamatteo, et al., 2015), (Moraros, et al., 2016).

Meanwhile in Indonesia, there is not much research on Lean Hospital but similar research about Lean Six Sigma in the service sector and in other public sectors has also shown that the program provides positive results with proven through previous studies, between others: Artadi and Shah, (2019); Ginanjar and Shah, (2019); and Sunaryanto and Syah, (2019). However, there are also some who reject that Lean Six Sigma can only be applied in the manufacturing world and not recommend the implementation of Lean Six Sigma in the public service sector by stating that Lean Six Sigma has no significant impact on processes in the service sector (Secchi and Camuffo, 2019). There are still many who say that Lean Six Sigma is only suitable in the industry manufacturing or service industry (Arfmann and Barbe, 2014; Saudi, 2018). Moreover, based on the journals that have been described earlier it was found that the Lean Consumption Mapping (LCM) method has not been used in showing improvements to the Current State and Future

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019

State conditions. Researchers also have never been get a journal that uses Lean Consumption Mapping (LCM) which is very suitable for describe the current state and future state for public services or services. Lots of research Lean Six Sigma in the service or service that forces to use Value Stream Map (VSM) as a tool for help (Kumar and Bauer, 2010). Therefore, Lean's research in the outside sector manufacturing needs to be done in this case Lean Hospital in Indonesia to assess the above gap with Lean Six Sigma's focus on implementing the Universal Health Insurance system which has never been in scrutiny.

By seeing the successful implementation of Lean Hospital in several health service organizations in various countries, one of the hospitals in Indonesia that is improving service governance health lately namely Harapan Mulia Mother and Child Hospital also has the same potential in implementing Lean Hospital. Lean Hospital is believed to be able to improve service business processes and BPJS patient administration which is one of the most numerous health service processes handled at this time. For this reason, this research discusses the concept of Lean Hospital, namely with use the DMAIC and Lean Consumption Map (LCM) methods to improve performance BPJS patient administration and services at the Hospital.

The researcher makes a list of processes that fall into the following waste categories:

1. Transport: transfer of documents and files from the inspection poly to the pharmacy, the document returner and a claim invoice file with pending status and is not feasible from BPJS verifiers to hospitals.

2. Movement: looking for procedural medical record data and accurate diagnosis data from doctors.

3. Overprocessing: check membership data in the registration section for advanced health facilities, make a photocopy document social data and photocopy the hospital claim invoice document to the verifier.

4. Defect: there is an input coding error in INA-CBG's so the claim invoice after analysis by BPJS verificator becomes pending claim invoice status or invoice is not feasible.

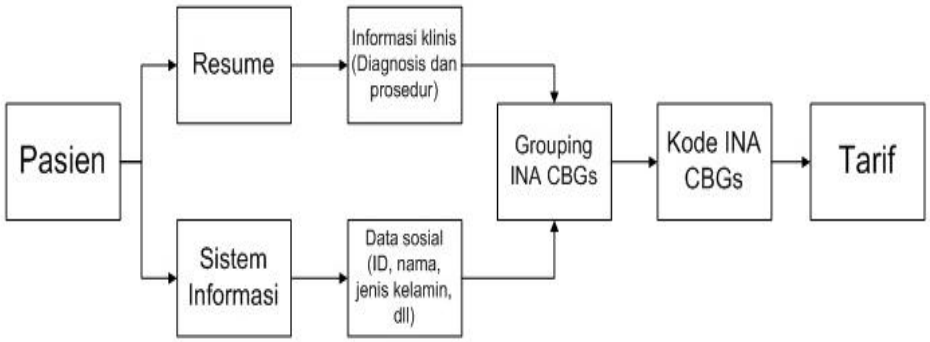
Researchers interviewed several patients and community participants of BPJS users of health services at the hospital and make direct observations of the service process and patient administration BPJS related to the accuracy and speed of service and administration found that there was still a lot of waste and ineffective process. In accordance with the description, the research objectives are determined, namely making the concept of Lean Six Sigma in the process of health care in the Era of Universal Health Coverage BPJS.

II. REFERENCES REVIEW

2.1. The flow of INA-CBG patients in the hospital

The INA-CBG system in each hospital has 2 episodes, namely outpatient episodes an inpatient episodes. For outpatient episodes, a series of consultation meetings between patients and doctors and supporting examinations according to medical indications and drugs given on the day same service. While inpatient episodes are a series of services if the patient has get treatment more than 6 hours at the hospital or if the patient has received inpatient facilities. The flow of patients in the application of INA CBGs is done when patients come receive services at hospital to go home from hospital. The required data comes from medical resumes

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019



Picture 1 : Patient's Flow INA-CBG's

2.2. INA-CBG's rates

Calculation of INA-CBG rates based on costing data and hospital coding data. Costing data obtained from selected hospitals (sample hospitals) representations of hospital classes, types of hospitals and hospital ownership (number of private and government hospitals) include all data costs incurred by hospitals excluding drugs whose funding sources are from the program government (HIV, TB and others).

Coding data obtained from PPK Jamkesas hospital coding data for the preparation of JKN tariffs is used costing data for 137 public and private hospitals and 6 million coding data (cases). In Presidential Regulation No. 12 of 2013 concerning Health Insurance, Indonesian Case Based Groups Tariffs, hereinafter referred to as INA-CBG's rates, are the amount of claims paid by BPJS to advanced health facilities for servant packages based on grouping of disease diagnoses, the amount of which is determined in PMK No. 59 of 2014 and perfected in PMK No. 52 of 2016 {Hospital Service Tariff Standards}

Identification and reporting of the difference is the first step towards controlling the difference and improving the operation. An efficient standard cost system requires that management react appropriately to selish because uncorrected differences can affect the company for several periods.

The magnitude of the difference and its impact on future operations affect the company's reaction to the difference. Minor disputes are common and most do not require special management attention unless there is a certain pattern. The incremental unfavorable difference may still require management attention because its cumulative effect on operations can be substantial and can reflect a backward operation.

2.3 Lean Six Sigma

The development of the Lean concept originated from the Toyota Production System (TPS), which originated in Japan after the Second World War developed by Taiichi Ohno and assisted by Shigeo Shingo in 1956. At this point, Toyota operates in an environment that has limited resources when it comes to needs land as well as technology, iron investment and finance. These special circumstances make Toyota change efficiency in their own way in improving performance in terms of QCD (Quality, Cost, Delivery) and put forward new basic principles to overcome scarce resources. Lean's basic idea is to focus on stream efficiency rather than resource efficiency and to focus on customers, only produce what customers want, according to customer wants, and when customers want it (Larsson, 2008).

Liker et al. (2006) suggested that Lean briefly means eliminating waste (waste / youth) in the entire process flow. Another term is NVA Time (Non Value Add Time) or time that has no added value. There are seven types of waste that are introduced with the term TIMWOOD. "T" stands for Transportation, which is a type of waste due to the activity of moving goods, raw materials, products and others from one place to another, even though they are in close proximity throughout the process. "I" stands for Inventory, which is a type of waste due to excess raw materials, semi-finished

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019

products, or finished goods which causes long lead times, obsolescence, damage, transportation costs and storage costs. "M" stands for Movement, which is a type of waste due to excessive movement of employees during the process and does not provide added value (Value Add) to the product / service such as the activities of searching, piling up raw materials, taking, turning the body, stacking equipment and others etc. Walking around is also considered wasteful. Then "W" stands for Waiting, which is a type of waste due to workers waiting or not doing productive activities that can be caused by waiting for the next processing step, raw materials run out, machinery or equipment is damaged, excess machine capacity or there is a process that is not balanced. Then the first "O" stands for Overproduction, which is a type of waste due to producing goods / products earlier or in quantities more than what is needed by the customer. Producing earlier or more than needed produces other wastes, such as excess supply, storage, and transportation costs due to excess inventory. Supplies can be physical inventory or information queues. Then the next "O" is a continuation of Overprocessing, which is a type of waste due to the process steps that are not needed in the process ideally. This inefficient processing is caused by several things such as partially damaged equipment, poor product design and so on. "D" stands for Defect, which is a type of waste due to the process carried out resulting in damaged / defective / failed products, reprocessing, replacing defective production, destruction of defective goods along with the time, costs and effort that must be incurred by the company.

Lean developed into a set of principles, practices, tools and techniques that focus on reducing waste, coordinating workflows and handling .Lean as a business philosophy based on minimizing the use of resources (including time) in various company activities. Lean focuses on identifying and eliminating non-value-adding activities in design, production (for manufacturing) or operations (for services), and supply chain management, which is directly related to customers. There are five principles of the Lean Process, the first of which is identifying the value of products (goods and / or services) based on the customer's perspective. The second principle is to identify the value stream process mapping for each product. The third principle is to eliminate waste that does not add value from all activities throughout the value stream process. The fourth principle is to organize so that material, information and products flow smoothly and efficiently throughout the value stream process. The fifth principle is to continually look for various techniques and tools for improvement (improvement tools and techniques) to achieve excellence and increase in a sustainable manner.

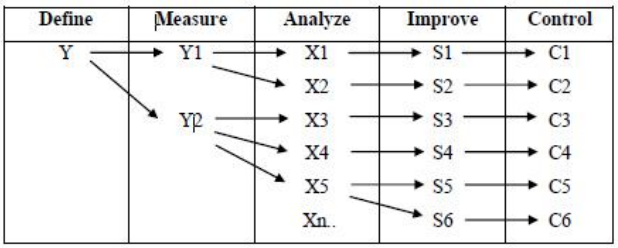
Six Sigma was developed for the first time by employees at Motorolla, Bill Smith, assisted by Mikel J. Harry in 1987 in the United States. Motorolla runs the program as a strategic initiative as a global company. This initiative is specifically designed to deal with any problems that arise from variations both by reducing variation and by improving the average value, and also useful for ongoing improvements and breakthrough improvements.

According to Pojasek (2003), Six Sigma is a means to reduce variations in processes, while maintaining the basic processes as they are. The focus on reducing variation is motivated by cost overruns, because variation is described as a major cause of dissatisfied customers, unsatisfactory margins, various delays, and poor supply chain performance, among others. Variations are often divided into two types; Variations in common causes, namely natural variations connected to the system, and variations in specific causes, which are related to certain special conditions. Both types of variation must be handled to achieve a real breakthrough increase (Magnusson et al., 2003). Sigma Sigma is a formidable method , focused and very effective which is based on prinsic and quality techniques. From quality pioneers, Six Sigma aims to almost completely eliminate errors in business performance (Pyzdek, 2003).

The improvement methodology in Six Sigma for existing processes is called DMAIC and consists of five phases (Andersson et al., 2006). The first phase is "D" which is a continuation of Define, which is identifying the process or product that needs to be improved, preparing the project structure, and identifying the target desired by the customer. The second phase is "M" which stands for Measure, which identifies the most influential patterns, understands the

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019

process map and determines how to measure it. The third phase is "A" which stands for Analyze, which is to identify and determine the root cause of the problem and the corrective steps to be taken. The fourth phase is "I" which stands for Improve, which is designing and testing the implementation of the most effective solutions. The fifth phase is "C" which is a continuation of Control, which confirms that the solution is effective and ensures that it lasts long by setting new standards.



Picture 2.DMAIC Method

Six Sigma, which was initially applied in the manufacturing industry, is now developing in the service industry. For example in hospitals, many mistakes can be helped by implementing Six Sigma, for example errors in calculating doses, errors in drug administration, errors in interpreting prescriptions, confusion about drug names, poor labeling, wrong drug administration, administration of patient payments wrong and others (Syukron et al., 2013).

Lean and Six Sigma are ultimately initiatives to improve business processes. The ultimate goal of better process improvement is the same for the methodology, but the focus is on the different process elements and therefore complement each other. Six Sigma is described as a systematic methodology with the DMAIC concept to find the essential elements for the performance of a process and set it to the best level, while Lean is described as a systematic methodology for eliminating waste / waste and reducing the complexity of a process.

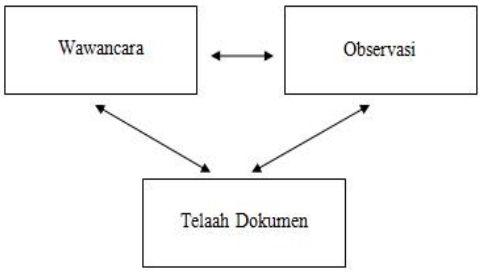
III. METHODOLOGY

3.1. Data analysis

This study uses qualitative research methods with data obtained based on observations or observations, results of interviews, results of shooting in the field, analysis of documents and notes or reports. Qualitative research is inductive because it starts from the data in the field that is empirical data. Researchers go into the field, study the process or findings that occur in the field, record, analyze, interpret and report and draw conclusions from the process (Sugiyono, 2005).

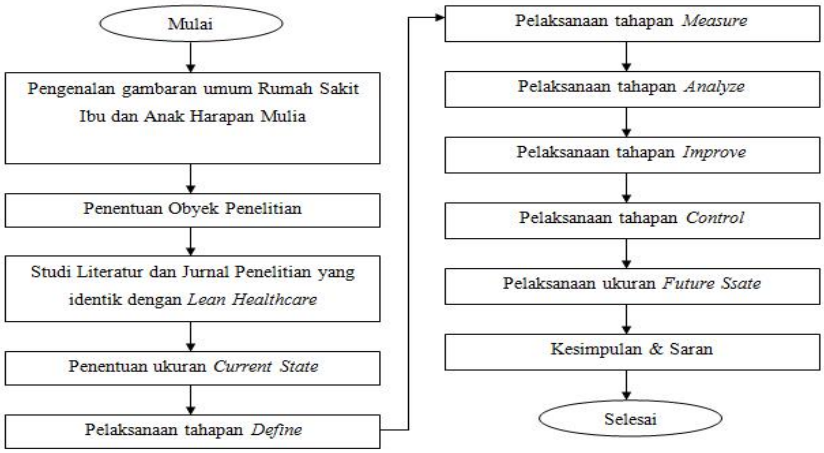
Based on these methods, this study obtained data from observations and, examined data from March to September 2019 from Harapan Mulia Mother and Child Hospital and the process of service and interviews with employees of Harapan Mulia Mother and Child Hospital, Kab. Tangerang and the community as patients or customers of BPJS services. While data analysis and simulation was conducted in September 2019. This study was conducted to improve service quality so that researchers tried to understand more deeply about the problems felt by the service users and informants using the Lean Six Sigma concept, then the performance measurement of service quality improvement is customer-oriented service, in this case from the point of view of the service user community.

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019



Picture 3. Triangulation Model for Data Collection

The researcher tries to compare the measure of service quality in the (Current State) with the measure of service quality in the (Future State) beginning with the observation step in the research object, followed by determining the right problem patterns to be developed into a research proposition, then by applying an action guide based on supporting theory, as a result, it will be known whether the proposition can be applied or not so that it will be the next conclusion and recommendation.



Picture 4. Research Flow

3.2. Measurement

Researchers used the DMAIC measurement method (Define, Measure, Analyze, Improve, Control). This method is combined with the Lean concept which aims to eliminate waste.

Define is the stage to determine the success of the implementation process and the limits that will be used in this project. The chosen measure of success is the average time of completion of service in each month based on the Check-list Guidelines for documents and records using the Time Series Plot tool.

Measure is the stage to determine the focus of the problem by understanding the current process map (Current Process Map) based on Interview Guidelines, Observation Guidelines, Document Guidelines and other Tools. By using the Lean Consumption Map (LCM) tool, the researcher will mapping so that it can measure the performance of total consumer time (total customer time) and total provider time (total service provider time). Besides total time, the researcher measured the total value added time and total non-value added time both from the consumer and provider side. Consumer in this case is the public as a patient or service user and the provider is a service officer in health facilities.

Analyze is the stage of validation and determine the root causes that directly impact the focus of the problem based on Interview Guidelines, Observation Guidelines, Document Guidelines and other Tools. At the Analyze stage the

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019

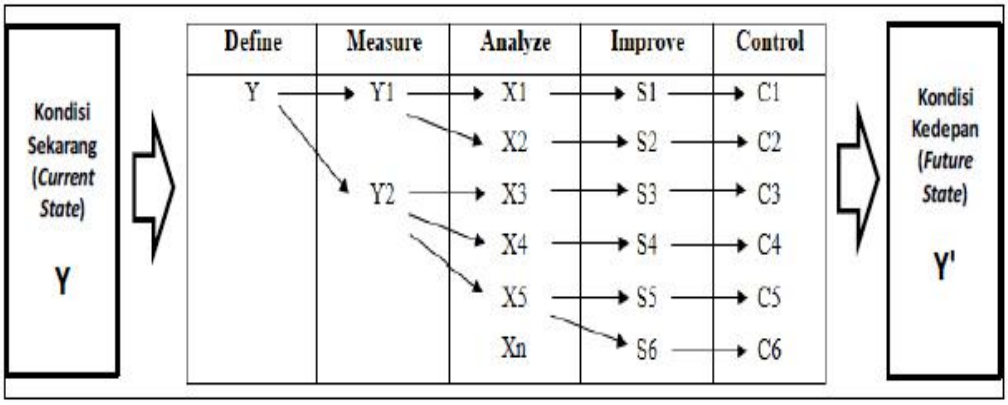
researchers used the FMEA (Failure Mode and Effect Analysis) tool to get the root of the problems that had RPN (Risk Priority Number) values that were at great risk of the focus of the problem.

Improve is the stage of determining proposed improvements for each root cause by developing potential improvements that can come from published journals, Lean reference books, Interview Guidelines and Observation Guidelines. The potential improvements are then validated using the IEM (Impact and Effort Matrix) tool. Potential improvements that receive a Zone I, Zone II and Zone III score will be proposed improvements that will be validated in the improvement simulation process. The simulation process will use 25 sample data that will be a reference that the proposed improvement is effective or not, and at the same time see the effect of improving time in each process with the Lean Consumption Map (LCM) tool. Value Added Assessment will be used to compare the value added activity against waste (waste).

Control is the stage to determine the control measures of the results of the Improve stage so that the positive influence when at the Improve stage is continuously maintained and consistently carried out by employees in the BPJS administrative services section of the Mulia Mother and Child Hospital. The results of the Control stage are in the form of a Change Management Plan document in which there are changes to the SOP (Standard Operational Procedure), training employees, determining key parameters, determining process indicators or control indicators, OCAP (Out of Control Action) Plan, Checklist or Audit, etc.

IV. RESULTS

The research used in this thesis is based on the DMAIC cycle with the concept of Lean Hospital. This was chosen because the researcher had an understanding of the framework of the previous research and considered it to be very suitable when implementing the types of improvement projects. DMAIC is a continuation of Define, Measure, Analyze, Improve and Control.



Picture 5. DMAIC Diagram

As the picture above this study illustrates the current condition as Y which will be improved to Y 'or future conditions through the DMAIC process.

To explore this problem and achieve the above improvement target, the researcher determines the focus of the problem by understanding the current process map (Current Process Map) based on Interview Guidelines, Observation Guidelines, Document Guidelines and other Tools. By using the Lean Consumption Map (LCM) tool, the researcher will do a mapping so that the performance of total consumer time (total customer time) and total provider time (total service provider time) can be measured.

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019

The first step is to map the flow of the invoice claim billing process Outpatient and Inpatient or Flow Chart. The flow begins with registration by JKN participants, then submits it to the Casemix team. Then the Casemix team will recap.

The next step after mapping with the Flow Chart is mapping the Lean Consumption Mapping. It aims to determine and assess activities with added value (Value Added) and activities without added value (Non-Value Added). This Lean Consumption Mapping analysis is useful to find out waste in every activity both in terms of service users and service providers so that later it can be made improvements to activities that lack value added.

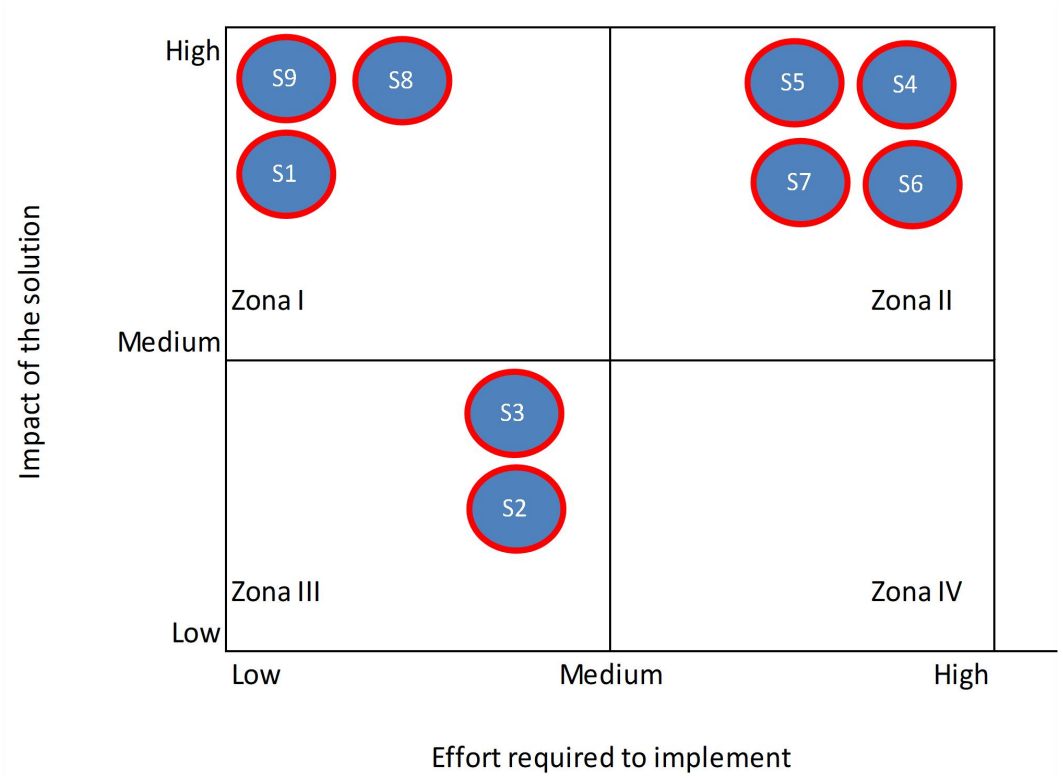
Tabel 1. VAA

VAA Before

Keterangan		Customer (Consumption Time)	Provider (Provision Time)
Total Time	(a)	1032	10397
Value Added	(b)	335	1320
Non Value Added	(c)	697	9077
% VA	=(b)/(a)*100%	32.46%	12.70%
%NVA	=(c)/(a)*100%	67.54%	87.30%
Value to Waste Ratio	=(b)/(c)*100%	48.06%	14.54%

VAA After

Keterangan		Customer (Consumption Time)	Provider (Provision Time)
Total Time	(a)	882	2257
Value Added	(b)	310	935
Non Value Added	(c)	572	1322
% VA	=(b)/(a)*100%	35.15%	41.43%
%NVA	=(c)/(a)*100%	64.85%	58.57%
Value to Waste Ratio	=(b)/(c)*100%	54.20%	70.73%



Picture 6. Proposed Improvement

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019

Table 2. Proposed Improvement

No	Usulan Perbaikan	Kode
1	Pembuatan lisensi dari instansi pemerintah untuk dokter radiologi	S1
2	Bimtek bagi staff petugas casemix tentang INA-CBG's	S2
3	Bimtek bagi dokter tentang pengetahuan tindakan INA-CBG's	S3
4	DI Sediakan dokter khusus yang menangani kendali mutu di Casemix	S4
5	DI Sediakan dokter khusus yang menangani kendali mutu di Casemix	S5
6	DI Sediakan dokter khusus yang menangani kendali mutu di Casemix	S6
7	DI Sediakan dokter khusus yang menangani kendali mutu di Casemix	S7
8	Sosialisasi tentang SOP Koding Casemix di Semua bagian	S8
9	Sosialisasi tentang SOP Koding Casemix di Semua bagian	S9

V. DISSCUSION

Lean Six Sigma is a powerful method for analyzing a performance process. In previous studies of Lean Hospital namely in the meantime Hospital, the application of Lean Government in Indonesia in one of the tax service processes in one of the municipal government agencies was examined to improve the service process of the casemix section so that the service time dropped from 10.397 minutes to 2.257 minutes Sunaryanto and Syah, (2019). In the case of the health service process, the Lean Six Sigma method has been proven to reduce the time of completion of a claim invoice to BPJS Health, by 21.7%, make the service provider effective and efficient performance, and reduce the work of non-added value.

The results of the analysis use DMAIC with the aim of eliminating waste focused to parse activities in a process of finding the core activities of the process. With the establishment of core activities, other activities that do not provide added value try to be minimized. Based on the Health Service Process Flow Chart in the Era of Universal Health Coverage (see appendix), core activities can be mapped

In general, the key to the health service process is that the patient gets a doctor's examination then gets a prescription and then gets medicine. In the conventional health service process, the patient is required to pay for services and medicines provided by the service provider in this case the health facility. With the Universal Health Coverage system by BPJS, the different thing is that patients are free of charge and the referral system. The absence of medical costs is certainly a benefit for service users but the referral system makes the service process flow make the service users who need referrals need more time. Similar to the service process in the conventional era, the problem faced by service users is that the length of the queuing process is compounded by repetitive processes in this era of universal health coverage. While in terms of service providers, the process of providing administrative and medical services needs to be standardized so that the process becomes efficient and only provides services according to the needs of patients both administrative and medical services.

In this study, researchers sought to minimize, substitute and even eliminate activities other than core activities in the health care process in the Era of Universal Health Coverage. The activities that need to be eliminated are ICD10 coding

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019

errors and ICD9CM coding errors such as, doctor misdiagnosis, doctor error, and input error at INA CBG's. Other activities that do not provide added value are also removed such as waiting in line, waiting for the previous process. Activities that have uncertainties such as medical standard operating procedures (SOP).

Furthermore, the process of handling medical patients also need to be considered. Often the absence of practice guidelines (Clinical Pathway) makes different doctors often make different treatments with patients who have the same medical diagnosis. Doctors often provide excessive service or even inadequate patient diagnosis. If the medical service is excessively detrimental to the service provider both financially and when the service is completed. Conversely, if the service is inadequate, the patient will also be disadvantaged. This requires the existence of a standardized medical service process by the service provider so that the medical treatment process becomes relied on by implementing Clinical Pathway guidelines.

The final process that needs to be improved is to establish good communication and cooperation with BPJS verificators in the hospital invoice claim process. To reduce payments to pending status and eliminate unfit status. By minimizing activities that have less value added and only trying to provide core activities, the process will run effectively with the aim of profit. Waste will be reduced and claim invoice completion time will be on time.

VI. CONCLUSION

The Lean Six Sigma concept is a one of method improvement that is often used in the manufacturing sector and can also be applied to other sectors such as the hospital service sector. Lean Six Sigma is able to be applied with LCM tools in improving the billing process of outpatient and inpatient hospital claims by reducing the total time at RSIA Harapan Mulia by 8,140 minutes and reducing the total time at the BPJS Verification Section by 150 minutes. Activities with Added value also increased from 32.4% to 35.1% from customers and 12.7% to 41.4% from the provider side. While non-added value is reduced both from the customer side from 67.5% to 64.8% and the provider side from 87.3% to 58.5%.

VII. REFERENCES

1 Arfmann, D., & Barbe, G. T. (2014). The Value of Lean in the Service Sector : A Critique of Theory & Practice, *5*(2), 18–24.

2 Artadi, Rizky; Syah, T. Y. R. (2019). Lean Service Design in Purchasing Order of Motorcycles : Case Study at Mandiri Utama Finance Branches Tangerang , Indonesia, *01*(01), 1–5.

3 Chen, J. C., & Thota, C. (2012). Implementing Lean Methodologies in Healthcare Systems - A Case Study Caterpillar Inc. *Proceedings of the 2012 International Conference on Industrial Engineering and Operations Management*, 1046–1054.

4 D'Andreamatteo, A., Ianni, L., Lega, F., & Sargiacomo, M. (2015). Lean in healthcare: A comprehensive review. *Health Policy*, *119*(9), 1197–1209. https://doi.org/10.1016/j.healthpol.2015.02.002

5 Ginanjar, A., & Syah, T. Y. R. (2019). Lean Government Concept and Design Over Service Administration in Indonesian ID Card, *01*(01).

6 Kumar, S., & Bauer, K. F. (2010). Exploring the Use of Lean Thinking and Six Sigma in Public Housing Authorities, 29–46.

7 Lighter, D. E. (2014). The application of Lean Six Sigma to provide high-quality, reliable pediatric care. *International Journal of Pediatrics and Adolescent Medicine*, *1*(1), 8–10. https://doi.org/10.1016/j.ijpam.2014.09.009

8 Moraros, J., Lemstra, M., & Nwankwo, C. (2016). Lean interventions in healthcare: Do they actually work? A systematic literature review. *International Journal for Quality in Health Care*, *28*(2), 150–165.

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019

https://doi.org/10.1093/intqhc/mzv123

9 Papadopoulos, T. (2012). Continuous innovation through lean thinking in healthcare: the role of dynamic actor associations. *International Journal of Technology Management*, *60*(3/4), 266. https://doi.org/10.1504/IJTM.2012.049442

10 Saudi, M.H.M., Sinaga, O. & Rospinoedji, D., The role of tax education in supply chain management: A case of Indonesian supply chain companies, Polish Journal of Management Studies 18(2):304-319, December 2018.

11 Secchi, R., & Camuffo, A. (2019). Lean implementation failures : the role of organizational ambidexterity. *International Journal of Production Economics*. https://doi.org/10.1016/j.ijpe.2019.01.007

12 Siu, A., Cheng, Y., Bamford, D., Papalexi, M., & Dehe, B. (2015). Improving access to health services – Challenges in Lean application Journal : International Journal of Public Sector Management Manuscript ID : IJPSM-05-2014-0066 . R1 Manuscript Type : Case Study Keywords : lean , healthcare , Service redesign , Co-prod.

13 Sunaryanto, K., & Syah, T. Y. R. (2019). Application of Lean Thinking Development : Case Study over Badan Pendapatan Daerah (BAPENDA), South Tangerang Based on Lean Government, 20–26.

14 Syukron, Amin. (2013), *Six Sigma – Quality for Business Improvement*, Edisi Pertama, Yogyakarta: PT. Graha Ilmu

15 Pojasek, R.B., (2003), Lean*, Six Sigma and the Systems Approach: Management initiatives for Process Improvement*. Environmental Quality Management, Vol. 13, No. 2, pp. 85-92

16 Liker, J.K., Franz, J.K. (2011), *The Toyota Way to Continuous Improvement*. New York: McGraw-Hill

17 Larsson, Linus, (2008), *Lean Administration*. Inbunden, Svenska, Liber Malmö

18 Andersson, R., Eriksson, H., Torstensson, H., (2006), *Similarities and Differences between TQM, Six Sigma and Lean.*The TQM Magazine, Vol. 18 Iss: 3, pp. 282-296

19 Gasperzs, Vincent (2012), *All in one, Strategic Management, Lean Six Sigma Black Belt*, Jakarta: PT. Percetakan Penebar Swadaya

20 Gasperzs, Vincent (2011), *Lean Six Sigma*, Jakarta: PT. Percetakan Penebar Swaday

Received: 10 Nov 2018 | Revised: 20 Dec 2018 | Accepted: 02 Jan 2019