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Implementation of lean thinking in healthcare services: Why is it importance

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Abstract

Background: : Indonesia has implemented National Health Insurance since 2014 through quality improvement and cost efficiency strategy. In the early implementation, many hospitals suffered a loss due to the absence of efficiency in operational health services. In the other hand, few hospitals have implemented lean as an attempt of quality improvement and cost efficiency in National Health Insurance era. There is not enough evidence in Indonesia to support management tools implementation such as Lean for improving efficiency.

Aims: This study aims to develop scientific knowledge and goodwill of Lean implementation in healthcare services in many countries. This study also becomes evidence-based to implement lean in Indonesia.

Methods: This study used a systematic literature review and searched PubMed, Scopus, Clinical key, Sciencedirect, EBSCO, and other related journals from 2009 to 2018 with syntax keywords for each database. Twenty-two articles were included in the reviewed.

Results: The result showed that most journals discussed Lean reducing lead time and ALOS to improve the patient value and patient safety, as well as the amount of journal discussed about Lean made cost reduction in healthcare operational to improve efficiency.

Conclusion: Lean implementation should be adopted by Indonesian hospitals as quality improvement and cost containment strategy and enhance patient safety under National Health Insurance era.

Keywords: Cost reduction; Efficiency; Lean Healthcare; National Health Insurance; Waste elimination.

1. Introduction

National Health Insurance (NHI) has been implemented in Indonesia in January 2014, and planned to achieve universal health coverage by 2019. The implementation of this policy is the embodiment of Law No.40 of 2004 on National Social Security System. NHI is one of the government's responsibility to provide protection to every citizen of the unpredictable due to socio-economic risks and threaten health. This aim is in line with the essential part of Sustainable Development Goals (SDGs) what has known as "Universal Health Coverage" (UHC) to ensure that everyone and everywhere can access essential quality health services without facing a financial hardship (1).

In the NHI scheme, the Indonesian Ministry of Health incorporated with BPJS Health (Badan Penyelenggara Jaminan Sosial) as a third party payment institution with primary, secondary, and tertiary healthcare in Indonesia. BPJS Health pays hospitals using a prospective payment system based on Indonesian Diagnosis-related Groups (known as INA-

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CBGs), with health care costs varying according to the region and hospital class but identical for public and private providers (2). Since 2014, public hospitals were automatically registered under national health insurance scheme while the private hospitals have increasingly cooperated with this scheme (3). There has been a complaint from many hospitals because the claiming processes were often late, and the healthcare standard tariff of INA-CBGs was too low (4,5). Furthermore, these hospitals went through the absence of efficiency in operations. This condition would make hospitals suffering a loss if it did not overcome by an exact solution. One of the strategic management, which is well known in many sectors including healthcare that improves the quality of care and reduces cost, is Lean (6).

Lean was invented by Toyota and developed over many decades that starting in 1945 (7). Toyota learned and was inspired by many sources, like Henry Ford (7). After World War II, Toyota experienced very cash low and had a small market (8). The company forced to be creative and innovative during the crisis era, it developed a lean technique afterwards (8). Lean was designed to improve production efficiency by eliminating waste. The principle of Lean manufacturing is a five-step process: defining customer value, defining the value stream, making it flow, pulling from the customer back, and striving for excellence (9). Lean was developed to fit not only in manufacturing but also in other sectors such as healthcare. Since the type of healthcare like other organization which concerned in cash flow, customer satisfaction, and quality, it fitted applying lean to the processes.

Lean started implementing in some hospitals in developed countries such as the United States in the 1990s. Lean thinking as a management tool that focuses on continuously identifying and eliminating waste throughout the process to streamline the patient flow and enhance the quality of services provided. There are many examples positive impact of Lean in hospitals around the world such as reduced patient waiting time for orthopaedic surgery from 14 weeks to 31 hours (ThedaCare, Winsconsin) and saved $7.5 million from implementing Lean and reinvested the savings inpatient care (Park Nicollet Health Services, Minessota) (10). Moreover study in Turkey hospital showed that implementing lean tools on hospital processes is an effective way to reduce the healthcare costs while maintaining the patient satisfaction levels. Despite those benefit, many hospitals have not yet applied Lean due to some obstacles. Few hospitals in Indonesia have implemented Lean thinking while it is essential to consider a strategy in National Health Coverage era as an attempt of quality improvement and cost containment. So the specific aim of the study was to develop scientific knowledge and identify the advantage from lean implementation in healthcare services to use as evidence-based to implement lean in Indonesia.

2. Material and methods

This is a literature review study used the PRISMA statement. PRISMA statement help to ensure the clarity and transparency of reporting systematic review and recent data indicate that this reporting is much needed (11). Method of the analysis and inclusion criteria in this study were specified and documented in the protocol.

2.1. Eligibility Criterias

This study considered publications eligible for review if they meet five criteria: (1) primary studies; (2) intervention studies (implementation of lean management and outcome of implementation in hospital); (3) ten years limitation; (4) published in English and peer-reviewed; (5) both abstract and paper are open accessed. These inclusion criteria allow the study to measure only the influence of lean implementation in the hospital and decrease the heterogeneity. Publications are excluded if they are book, reporting, proceeding, and grey literature. The study did not mention any specific department in hospital as inclusion criteria because all department are needed to bring evidence for a hospital in Indonesia.

2.2. Searching Srategy

The search was conducted by two reviewers independently by searching the electronic database: PubMed, Scopus, Ebsco, Clinical Key, Google Scholar, Wiley, ProQuest. Investigations were carried out using the following terms: “lean hospital”, “lean healthcare”, “lean approach”, “lean methodology” AND “healthcare”, “lean” AND “kaizen”, “lean hospital” AND “cost-effectiveness”, and “lean thinking” AND “hospital”.

3. Results and discussion

Study selection starts with screened the existing title and abstract according to predetermined criteria. Publications were included if they were written in English and published in a peer-reviewed journal. Furthermore, publications are up to 2009 with related the search term in the title, abstract and keyword. All publications considered potentially relevant were retained, and the full text was reviewed for eligibility. The disagreement was resolved through discussion

to reach a final decision by the reviewers. Following the process, 519 potentially relevant records were identified by searching in the search engine.

Next, the screening process was done, and 117 articles were assessed for eligibility. Finally, by excluding some paper that did not meet the criteria, 22 articles were included in this study. Figure 1 shows the selection process of the studies

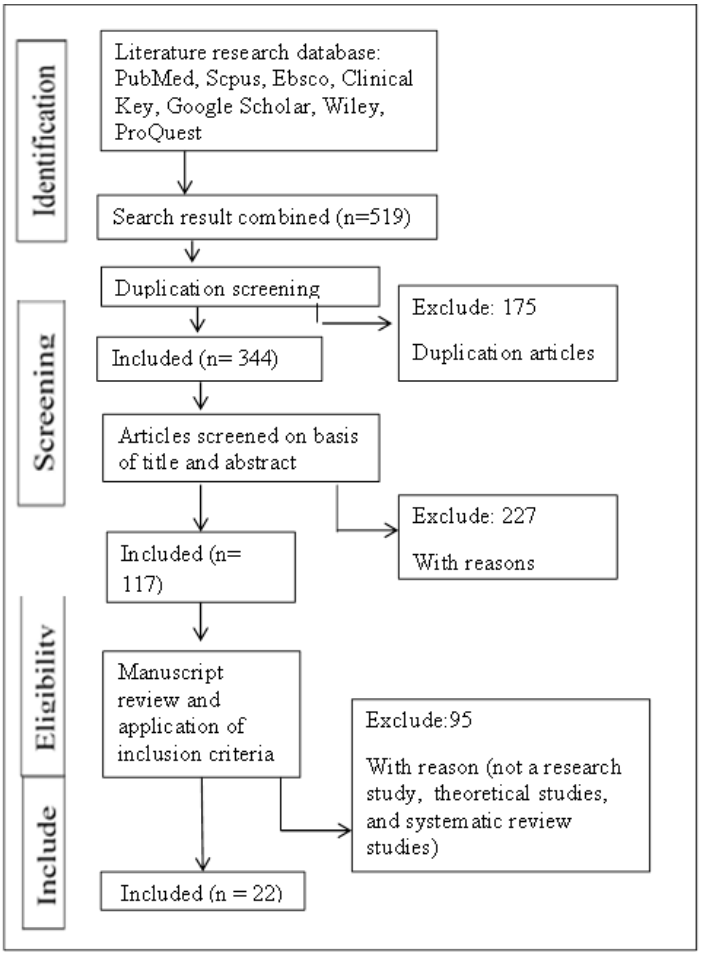

Figure 1 Study Selection Process

The finding was organized with a cumulative frequency analysis of the included paper to show the trend of publication of lean management in healthcare services studies (Figure 2). An analysis of the empirical and theoretical literature according to the dimensions depicted in the next discussion.

There is almost no healthcare facility implementing Lean at the organization level. Moreover, Lean healthcare tends to carry out at the department or specific unit level. The implementation of lean healthcare is commonly found on the high-risk departments such as emergency and pharmacy. The data matrix analysis of empirical paper can be shown in appendix.

National Health Insurance aims to ensure every citizen has access to high quality of promotive, preventive, curative and rehabilitative services fairly. Two keys elements in the implementation of NHI in Indonesia are access to quality health services and financial risk protection in health services (12). NHI carries the goal of humanity so it requires a humanity effort. Lean healthcare as one of the strategy to improve the process of healthcare services as well as reduce unnecessary cost that happen during the services (13).

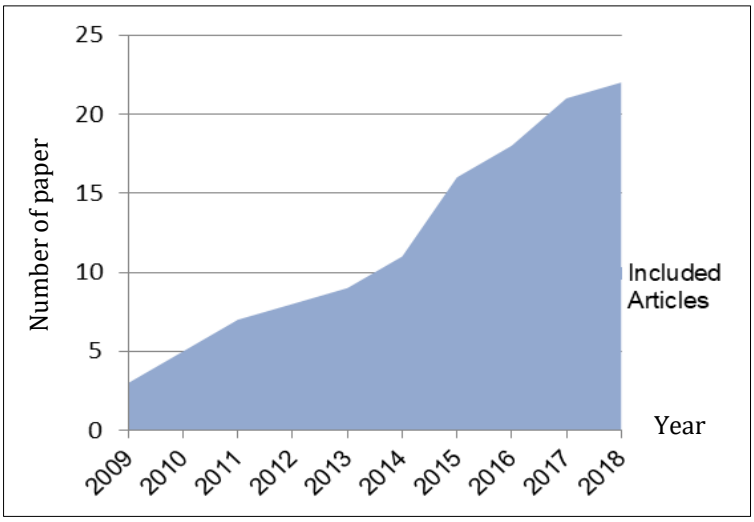

Figure 2 Accumulated frequency of papers included the review

The implementation of lean healthcare basically focuses on patient's value and preferences of the services. As shown in the Oncological Portuguese Institute Lisbon, which adopting lean thinking in the use of Telephone Triage System, they acquired 82.3% patient satisfaction regarding telephone care and resolution of the problem (14). Applying lean thinking to develop Triage system can decrease both arrivals to physician start time from 62.2 minutes to 41.9 minutes and also the admission waiting time from 54.76 minutes to 24.45 minutes (15,16). The promptness of healthcare services is one of the patient's value that must be prioritized (17). Unfortunately, waiting time is still unsolved problems in Indonesia. One of the reasons behind is National Health Insurance increases access to healthcare services when the healthcare facility is not ready with these situations.

Waiting time frequently leads to scheduling problems in oncology services due to the limited human resources and equipment. Lean healthcare improves the patient flow by reducing 94% delayed surgery due to lack of material and increasing 23% number of chemotherapy applications (18). Furthermore, lean management could improve labor productivity by 114% in Indian hospital (19). Improving patient flow and scheduling also enhance labor productivity (20).

Besides improving waiting time and patient flow, it is also important to improve the quality of healthcare over the quantity as stated in the NHI scheme. Previous studies in the U.S. showed how lean could improve clinical outcome such as decrease the rate of prolonged mechanical ventilation (>24 h) from 29% to 9%, reduce the overall mortality rate from 20.7% to 11.4% and 30-day mortality 11.7% to 6.7% (21,22). It also has noteworthy improvement after implementation of lean healthcare on patient safety through a decrease in production errors such as the reduction of missing i.v. doses from 53 to 13.8 per day and 1–1.5% to 0.21% reduction in infection rate in clean surgeries (18,23).

By improving many aspects in healthcare services, it eventually influences financial outcome in management. Studies showed that cost-effectiveness could be achieved by eliminating waste in the process. This improvement helps to save the company by more than $27 million and declining cost for a coronary bypass by 22% (24). In The University of Minnesota Medical Center was also reported an estimated annual cost saving of $289,256 due to waste reduction, the cost-saving of $50,000 in medication inventory 20% through outdated products (23). In addition, cost reduction also comes from the strategy of inventory and prevention maintenance of equipment (25–27).

The impact of lean management holistically can be achieved inpatient, employee, and management perspective. In this case, it may become challenging to implement lean management in the level of organization of healthcare. This is likely to become a particular unit or department in implementing lean healthcare to maintain the focus of the project. Moreover, understanding the more significant scope of lean management in healthcare is essential. Rather than become a tool for quickly fixing the problem, lean management has a broader aim that focuses on value and becomes a lean culture (28,29).

Table 1 Matrix analysis of empirical paper

Focus/Countries	**Europe countries**	**U.S. countries**	**Asian Countries**	**Total**
Level of Care				
Primary healthcare		1		1
Secondary and tertiary healthcare	6	12	1	19
Not mentioned		1	1	2
Subtotal	6	14	2	22
Cross Comparative analysis				
Within countries	1			1
Between countries		1		1
Subtotal	1	1		2
Impact on implementation				
Financial outcome		6		6
Patient and staff safety	1	3		4
Waiting time and Alos	3	7	2	12
Motion of staff and productivity	3	6	1	10
Clinical outcome and Patient satisfaction	6	5		11
Pharmaceutical Inventory		1		1
Subtotal	13	28	3	44
Departement/ specialities				
Obsgyn	1	1		2
Emergency	2	2	1	5
Urology	1			1
Orthopedic	1	1		2
neurology		1		1
Pharmaceutical		3		3
Other	2	6	1	9
Subtotal	7	14	2	23

Table 2 The Data Matrix Analysis Of Empirical Paper of Lean Healthcare (2008-2018)

Author	Year	Outcome				
		Financial Outcome	**Patient and staff safety**	**Waiting time and ALOS**	**Motion of staff and productivity**	**Clinical outcome and Patient Satisfaction**
Reijula, et al.	2016		Closeness of the maternal parenatal ward, labor and delivery room, and the NICU reduce response time in emergency case and increase patient safety	The patient discharge process become quicker	New design of obstetric and neonatal care reduce motion of staff	
Carvalho, J., Ramos, M., and Pixao, C.	2013		63.5% patient agreement of increasing effectiveness and speed of TTS (Telephone Triage System) (Avg. 4.8% , Standar 5.1%)			Telephone Triage system increase Patient satisfaction 82.3%
Boronat, F, et al.	2017				Improvement of productivity trough communication between the boss and the team	RACI improved of 0.59 RAMR of 0.24 RALOS increase 0.61 with saving 2869 stays RARI 1.36
Murrel, K., Offerman, S., and Kauffman, M.	2011					LOS before RTT (4.2hours, 95%[CI]=4.2-4.3; [SD]= 3.9) and after (3.6 hours, 95%CI = 3.6-3.7;SD=3.7). Arrival to physician start time was 62.2 minutes(95% CI = 61.5-63.0; SD =58.9) prior to RTT and 41.9 minutes (95%CI = 41.5-42.4; SD = 30.9) after. The LWBS rate prior to RTT was 4.5% (95% CI = 3.1-5.5) and 1.5% (95% CI = 0.6-1.8) after RTT initiation.

Kansagra, A, et al.	2018			Treatment time reduce from 147 minutes to 39 minutes (74%)		
Costa, L, et al	2015	78% SSD cost reduction 33% increase monthly revenues	1-1,5% to 0,21% reduction in infection rate clean surgeries	94% reduction delayed surgery due to lack of material Autoclave cycle time reduce by 30 minutes 42% reduction patient lead time 50% reduction patient waiting to begin chemotherapy	64% increase SSD Capacity	23% increase number of chemoteraphy applicants
Mazzocato, P. et al.	2012			Reducing lead time by 19-24%	Improving staffing and scheduling, communication and coordination, work space layout and problem solving	
Duska, L, et al.	2015			Reducing lead time from 119 to 82 minutes		
Sirvent, J., et al.	2015			Time delay in the discharge of ICU decrease from 360.8±163.9 min to 276.7±149.5 min	Professional satisfaction increase from 6.6±1.5 point to 7.5±1.1 point	No significant difference for indicator readmission, LOS ICU, and mortality.
Chan, H., et al.	2014			Admission waiting time in ED decrease from 54.76 minutes to 24.45 ($P<0.05$)		
Jennifer, L., et al	2016					Reduce prolonged mechanical ventilation (>24h) from 29% to 9%
Sayed, M.,	2015			Lead time decrease in ED 40.0±53.44 vs		

				25.3±15.93 min (P<0.001) LOS 2.6 to 2.0 hours Discharged 9.0 to 5.5 hours		
Yousri, T	2011					Overall mortality decrease 20.7% vs 11.4% (P<0.002) 30 day mortality decrease 11.7% vs 6.7% (P<0.034)
Miller, R and Chalapati, N.	2014			Reduce waiting time from more than 1 hour vs 15 min	Labor productivity improve 114%	
Field, E., et al.	2017	annual cost savings of approximately $11,000		Lead time supply request decreased from 50 days to 3 days (p<0.0001) processing time decreased from 14 min to 9 min (p<0.0001)		
Simon, R., and Canacari, E.	2014					the team reduced the instances of changing the sequence of orthopedic procedures by 70%, from 20 occurrences per month to six occurrences per month Reduces patient cancelation rate from 5.1% to 3.3% Patient satisfaction 84%
Kimsey, Diane	2010	The cost of nonpreventive maintenance decreased from $12,000 per month to $3,600 per month.			The average use of the equipment increased from 60% to 90%, responsibility plan for routine inspection and maintenance of equipment increased from 0% to 90%.	

Mc.Dermott, C. and Venditti, F.	2015				Reduction admission time on Avg 17 min (P<0,02) Reduction LOS	
Hintzen, B, et al.	2009	estimated annual cost saving of $289,256 due to waste reduction Medication inventory decreased by $50,000, and outdated products decreased by 20%	The number of errors that occurred decreased 83% missing i.v. doses was reduced from 53 to 13.8 per day			
Taosaint, J	2009	saving the company more than $27million costs for a coronary by pass declined 22 percent		removing 40–50 percent of wasted time and resources each time were design a care process or value stream ALOS fell from 6.3 days to 4.9,	increased productivity 12 percent since January 2006	Mortality dropped to 1.4 percent in 2008 and has been 0 percent through six months of 2009.
Bridges, J	2009				medication re n e w a l w e re incomplete at the end of each work day decrease from 74 to 32.	Patient satisfaction increase and complaint decrease.
Hommeidiu, T and Kappeler, K	2010	2.6% reduction in annual drug expenditure				Patient-days increased from 1,836 during the first collection period to 2,017 Wasted i.v. doses decreased from 1,339 (16.6% of the total doses dispensed) to 853 (8.6%

4. Conclusion

Lean healthcare as a culture should be considered a strategy that helps healthcare services in the NHI scheme in Indonesia. Previous literature shows that lean healthcare has an impact on the financial outcome as well as non-financial outcome (patient safety, patient flow, the productivity of equipment and employee, and patient satisfaction). This outcome is indeed helped both patient perspective for getting the services based on their need and also management perspective for reducing the unnecessary cost of services. Healthcare organizations need to implement Lean management to survive in the National Health Insurance scheme.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors have no conflict of interst.

References

[1] World Health Organization. Universal Health Coverage (UHC). World Health Report. 2010.

[2] Trisnantoro L, Marthias T, Harbianto D. Universal Health Coverage Assessment: Indonesia. Glob Netw Heal Equity. 2014;(December):1–16.

[3] Health Policy Plus, The National Team for the Acceleration of Poverty Reduction. Expanding Healthcare Access through the Private Sector. Jakarta; 2018.

[4] Faizal EB. Govt to revise health care tariffs in BPJS - National - The Jakarta Post [Internet]. 2014 [cited 2019 Mar 25]. Available from: https://www.thejakartapost.com/news/2014/04/01/govt-revise-health-care-tariffs-bpjs.html

[5] Private Hospitals Complain About Late BPJS Health Claim. Tempo.

[6] White BA, Baron JM, Dighe AS, Jr. CAC, Brown DFM. Applying Lean Methodologies Reduces Emergency Department Laboratory Turnaround Times. Am J Emerg Med. 2015;33(11):1572–6.

[7] Graban M. Lean Hospitals : Improving quality patient safety and employee satisfaction. Boca Raton, Florida: CRC Press; 2008.

[8] Bozdogan K. Evolution of The Lean Enterprise System : A Critical Synthesis and Agenda for The Future. In: Blockley R, Shyy W, editors. Encyclopedia of Aerospace Engineering. Cambridge: john Wiley; 2010. p. 1–26.

[9] Gupta S, Jain SK. A literature review of lean manufacturing. Int J Manag Sci Eng Manag. 2013;8(4):241–9.

[10] Bittles N. Lean Six Sigma Leadership in Health Care Organizations. In: Symposium on Undergraduate Research and Creative Expression (SOURCE). Valparaiso: Valparaiso University; 2017.

[11] Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JPA, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. PLoS Med. 2009;6(7).

[12] Munaa N. NATIONAL HEALTH INSURANCE : AN EXPLORATORY STUDY OF PATIENT. 2020;1(1):1–4.

[13] Munaa N, Ardini L, Inayah Z. Lean Hospital: Strategy of Operational Financing Efficiency in Supply Chain Management. J Manaj Kesehat Indones. 2021;9(1):72–7.

[14] de Carvalho JC, Ramos M, Paixão C. A lean case study in an oncological hospital: Implementation of a telephone triage system in the emergency service. Risk Manag Healthc Policy. 2013;7:1–10.

[15] Chan H. Lean techniques for the improvement of patients' flow in emergency department. World J Emerg Med. 2014;5(1):24.

[16] Murrell KL, Offerman SR, Kauffman MB. Applying lean: implementation of a rapid triage and treatment system. West J Emerg Med [Internet]. 2011;12(2):184–91. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3099605&tool=pmcentrez&rendertype=abstract

[17] Mariotti G, Siciliani L, Rebba V, Fellini R, Gentilini M, Benea G, et al. Waiting time prioritisation for specialist services in Italy: The homogeneous waiting time groups approach. Health Policy (New York) [Internet]. 2014;117(1):54–63. Available from: http://dx.doi.org/10.1016/j.healthpol.2014.01.018

[18] Costa LBM., Filho MG., Rentes AF., Bertani TM., Mardegan R. Lean healthcare in developing countries: Evidence from Brazilian hospitals. Int J Health Plann Manage [Internet]. 2015; Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-84951986422&doi=10.1002%2Fhpm.2331&partnerID=40&md5=597a4c0ecbb7f2b3a000966246bc09dd

[19] Miller R, Chalapati N. Utilizing Lean Tools to Improve Value and Reduce Outpatient Wait Times in an Indian Hospital. Leade. 2015;28(1).

[20] Mazzocato P, Holden R, Brommels M, Aronsson H, Backman U, Elg M, et al. How does lean work in emergency care? A case study of a lean-inspired intervention at the Astrid Lindgren Children's hospital, Stockholm, Sweden. BMC Health Serv Res [Internet]. 2012;12(1):28. Available from: http://bmchealthservres.biomedcentral.com/articles/10.1186/1472-6963-12-28

[21] Hefner JL, Tripathi RS, Abel EE, Galloway J, Susan D. Quality Improvement Intervention to Decrease Prolonged Mechanical Ventilation Afteter Coronary Artery Bypass Surgery. Am J Crit Care. 2016;25(5):423–31.

[22] Yousri TA, Khan Z, Chakrabarti D, Fernandes R, Wahab K. Lean thinking : Can it improve the outcome of fracture neck of femur patients in a district general hospital ? Injury [Internet]. 2011;42(11):1234–7. Available from: http://dx.doi.org/10.1016/j.injury.2010.11.024

[23] Hintzen BL, Knoer SJ, Van Dyke CJ, Milavitz BS. Effect of lean process improvement techniques on a university hospital inpatient pharmacy. Am J Heal Pharm. 2009;66(22):2042–7.

[24] Toussaint J. Writing the new playbook for U.S. health care: Lessons from Wisconsin. Health Aff. 2009;28(5):1343–50.

[25] Fields E, Neogi S, Schoettker PJ, Lail J. Healthcare Using Lean methodologies to streamline processing of requests for durable medical equipment and supplies for children with complex conditions. Healthcare [Internet]. 2017;(November):0–1. Available from: http://dx.doi.org/10.1016/j.hjdsi.2017.11.003

[26] Kimsey DB. Lean Methodology in Health Care. AORN J. 2010;92(1):53–60.

[27] L'Hommedieu T, Kappeler K. Lean methodology in i.v. medication processes in a children's hospital. Am J Heal Pharm. 2010;67(24):2115–8.

[28] Rahmawati NV, Munaa N, Ummah F. Lean Healthcare Implementation : How is The Employee ' s Acceptance ? In: BIO Web Conferences The 4th ICOPH-ITD 2022. 2022.

[29] Munaa N, Ummah F. Lean Healthcare Readiness Evaluation among Staff in Private Hospital. BIO Web Conf 4th ICOPH-ITD 2022. 2022;00015.