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Implementation of 5S lean tool at the obstetrics department of a General Hospital – A case study

Dao Cao Thi Anh [1, 2] and Ngoc-Hien Do [1, 2, *]

[1] *Department of Industrial & Systems Engineering, Faculty of Mechanical Engineering, Ho Chi Minh City University of Technology (HCMUT), 268 Ly Thuong Kiet Street, Dien Hong Ward, Ho Chi Minh City, Vietnam.*
[2] *Vietnam National University Ho Chi Minh City (VNU-HCM), Linh Xuan Ward, Ho Chi Minh City, Vietnam.*

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Abstract

The purpose of the article is to present a practical study on building a 5S culture at the Obstetrics Department of a General Hospital. Some useful guidlines would be suggested to avoid errors when implementing 5S. It would show the ways to apply job design method, Kaban system, improvement PDCA cycle, and other suitable tools. The study aims to improve the utilization of storage space, save time to find healthcare tools and reduce the risk of mistakes. The implementation of 5S at the obstetrics department brings the better working environment, more resources effeciency, and enhancement of customer service level. It is known as a pilot application of 5S in the studied general hospital.

Keywords: 5S; General Hospital; Obstetrics Department; Kanban System; Wastes; Healthcare Risk

1. Introduction

In the healthcare industry, the 5S methodology, principles or tool is a systematic approach to workplace organization and standardization. The 5S principles are applied to create a clean, organized, and efficient work environment. This methodology has gained recognition for its ability to improve productivity, safety, and quality in hospital settings. 5S is a workplace organization methodology that involves Sort, Set in order, Shine, Standardize, and Sustain, aimed at also creating a clean, organized, and efficient work environment in healthcare settings [1].

In healthcare, 5S refers to a structured approach to workplace management, focusing on decluttering, organizing, cleaning, standardizing, and sustaining practices to enhance patient care quality and staff productivity [2]. The 5S methodology in healthcare involves Sort (remove unnecessary items), Set in order (organize necessary items), Shine (clean work areas), Standardize (establish work standards), and Sustain (maintain the system), contributing to improved patient safety and operational efficiency [3].

5S practices usually account with the goal of promoting workplace organization, cleanliness, and safety to optimize patient care delivery [4]. The 5S framework in hospitals involves sorting out unnecessary materials, arranging essential items in an orderly manner, cleaning workspaces thoroughly, setting workplace standards, and sustaining these practices to enhance operational efficiency and patient outcomes [5]. It is a methodology utilized in healthcare to create safe, efficient, and well-organized work environments through continuous improvement practices [6].

The 5S methodology, emphasizing workplace organization, cleanliness, and standardization, is applied in healthcare settings to promote efficiency, safety, and quality of care delivery for better patient outcomes [7]. It would bring many benefits as followings:

* Corresponding author: Ngoc-Hien Do.

Enhanced Patient Safety: By implementing 5S principles in hospitals, the work environment becomes more organized, clean, and standardized, reducing the risk of medical errors, infections, and other safety hazards. This leads to enhanced patient safety and a lower likelihood of adverse events during healthcare delivery [8].

Improved Operational Efficiency: The application of 5S methodologies streamlines processes, reduces waste, and optimizes resource utilization in healthcare facilities. This improved efficiency leads to faster turnaround times, smoother workflows, and ultimately, better delivery of care to patients [9].

Enhanced Employee Productivity and Satisfaction: Engaging staff in 5S practices fosters a sense of ownership, pride, and responsibility in their work environment. As employees work in a clean, organized space, they can focus better on their tasks, leading to increased productivity and job satisfaction [10].

Reduced Equipment Downtime: The successful implementation of 5S in hospitals leads to better maintenance schedules, easier equipment access, and improved asset tracking, resulting in reduced equipment downtime and ensuring that medical devices are readily available when needed for patient care [11].

Enhanced Infection Control: Effectively applying 5S principles in healthcare facilities promotes cleanliness, proper storage of materials, and regular disinfection practices, which contribute to enhanced infection control measures and reduction in healthcare-associated infections (HAIs) among patients [12].

Optimized Inventory Management: Successful 5S implementation in hospitals enhances inventory management practices by reducing excess stock, minimizing stockouts, and enabling efficient tracking of supplies. This optimization leads to cost savings, better resource utilization, and improved supply chain efficiency [13].

Improved Patient Flow: The application of 5S methodologies in healthcare settings helps streamline patient flow by creating organized workspaces, standardized processes, and clear visual cues. This leads to reduced wait times, smoother transitions between departments, and overall improved patient experiences [14].

Enhanced Staff Collaboration and Communication: Successful 5S implementation fosters a culture of teamwork, collaboration, and effective communication among healthcare staff. Clear workplace organization, visual management tools, and standardized processes encourage staff engagement, decision-making, and accountability, leading to better coordinated care delivery [15].

The studied general hospital recognized the necessary to improve the working environment. A 5S project was set up and implemented at the obstetrics department as a pilot. It helps organization improve the customer service level and importantly reduce the healthcare risk.

2. Background and methodology

2.1. 5S

It comes from Japan phylosophy, which includes 5 stages:

- S1- Sort: if you don't need something, throught it or give it to somebody need. Know which you need and which you dont need to use.
- S2 - Set in order: set the tools's place easy to take and to put it back.
- S3 - Shine: make everything clean and clear.
- S4 - Standard: make the standard for S1 to S3.
- S5 - Sustain: Make 5S became the habbit at the work station.

2.2. Risk priority number (RPN)

RPN is a scale for the hidden hazard at the work station. It is known as the important factor to evaluate healthcare risk. RPN is scale on three elements and calculated by equation (1).

- S -Severity: the severity of errors at random.
    - occurrence: the frequently of occurence of the errors.
- D - detection: the ability to detect if an error occurred.

$$RPN = S \times O \times D \quad (1)$$

The process to set up the 5S system for the pilot project is summarized as in Figure 1.

3. Case study

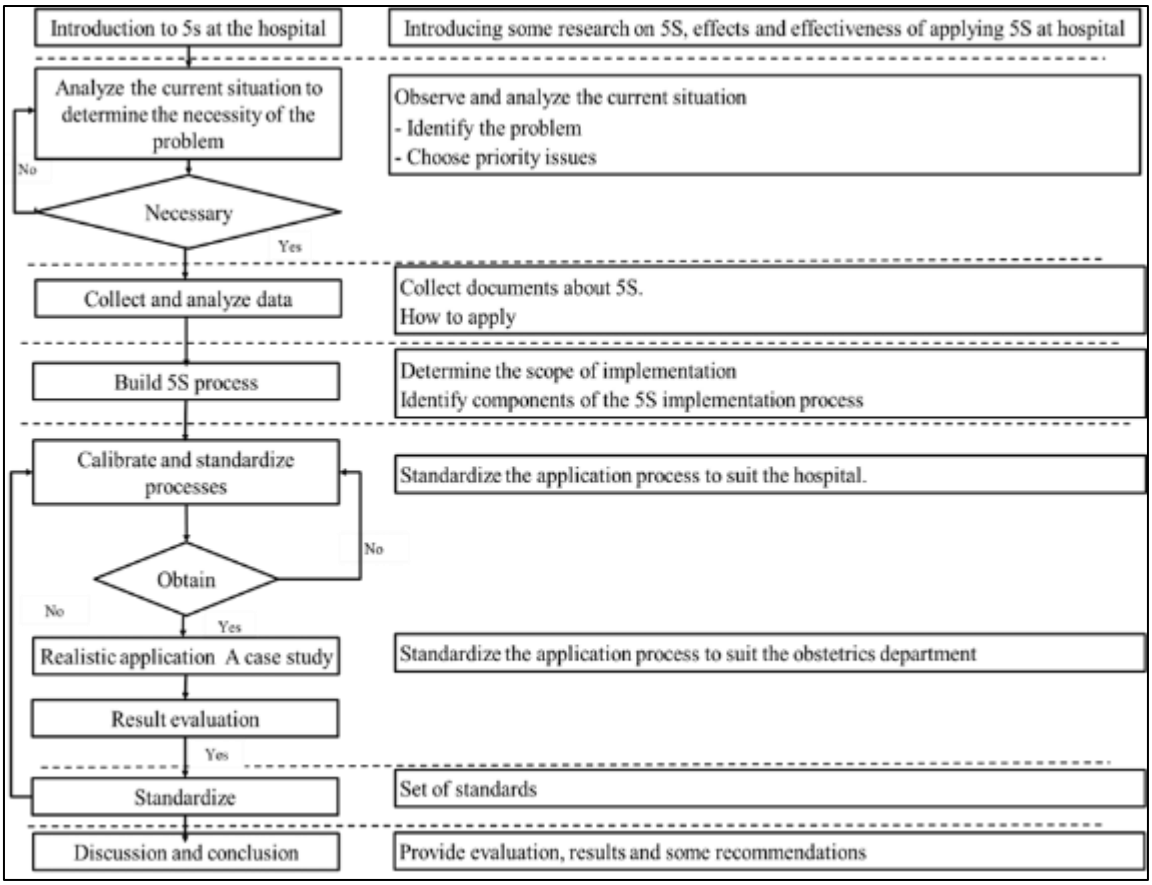


Figure 1 5S process for the pilot project

3.1. Introduction to researched object

There are17 employees including doctors and nurses, who work at the obstetrics department. The working time is 24 hours/day, 7 days/weeks, which includes 2 shifts in a day and 2 kips to changed. One kip has at least 3 doctors and 5 nurses.

The obstetrics station is divided into 3 areas:

- The medicine cabinet.
- Patient's area.
- Medicine cars (three cars). In this paper, 5S would be considerd to apply for one car as a pilot. Other ones should be organized similarly.

3.2. The problems:

3.2.1. Sorting problems

The tools, medical materials aren't sorted in the right place, right position, right quantity, right time and also right quality as shown on the Figure 2.

Figure 2 The chaos items

It is difficulty for nurses finding necessary drugs and medical equipments because they are not clearly classified as shown on Figure 3.

Figure 3 The unclassified medicine, healthcare tools at cabinets

The item in the medicine car didn't have clearly place, in which some items had been removed or located in the wrong place that make nurses couldn't find them (Figure 4).

Figure 4 The items in the wrong place

3.2.2. Setting problems

The old items and a new ones were places in the same position as on Figure 5. Therefore, the nurses were hard to seek the right items.

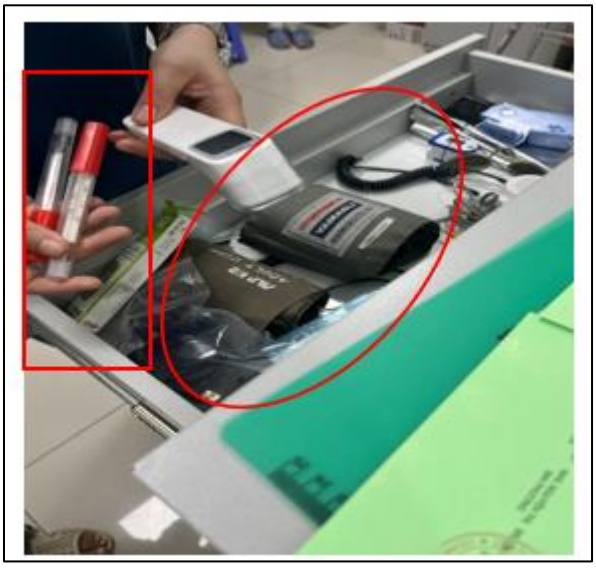


Figure 5 Old and new items in the same place.

3.2.3. Visual managment problems

In the medicine cabinet, the different types drugs look very similar and also the name sound is very difficult to distingush (LASA) as on Figure 6. Unfortunately, they didn't have any highlight, so it could be a reason why the nurses make misstake when give the drugs to the patients.

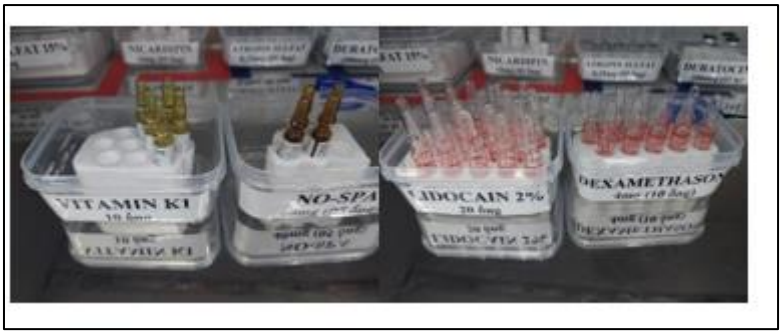


Figure 6 Different drugs have look and sound name very similar.

3.3. Set a 5S teams

The pilot 5S project was responsed by a team including one doctor, two nurses, one IE staff member.

The team would implement 5S actions in the obstetrics department. They would make 5S plan, and also decise on what improvements would be done, how to implement improvements, how to train staff on 5S aspects, and how to make 5S culture.

3.4. Set targets

- Remove unnecessary items and hazards.
- Know what supplies and tools are needed and how many
- Mark the RPN point.

3.5. Red card

The 5S team would train and instruct obstetric staff on how to post red cards.

3.6. Mark the RPN point

The RPN score represents hazards in the process. The 5S team would focus to find solutions to improve the process and eliminate hazards.

RPN inspectors include the members understanding the process, knowing the required standards, and having an objective view on the process.

How to mark RPN:

- Problems were recorded during operations.
- The 5S team would grade each issue.
- While grading, all members of the 5S team must agree, without taking on an average score (Figure 7).
- The hazards with scores above 500 would be focused on finding a solution to eliminate them.

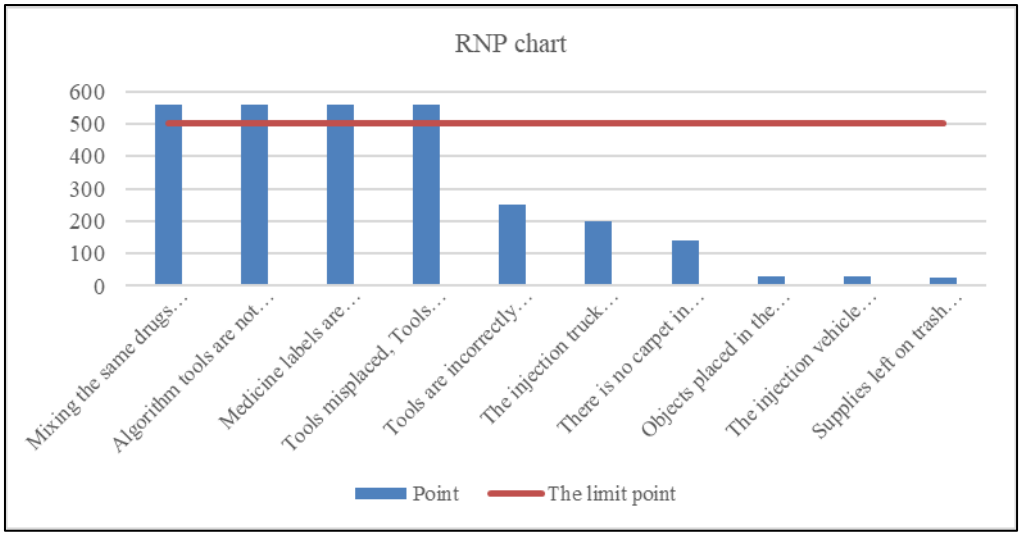


Figure 7 RNP chart

After marking the RPN, the 5S team based on the RPN chart choose 4 key problems to improve.

The target is to reduce 70% RPN score (¾ of the risk after applying 5S project. They should be improved with the RPN score less than 500 points).

Red tag is design as in Figure 8.

Figure 8 Red tag

The red tag card would be applied after the pilot implementation and trainning program in the obstetrics department were be done successfully. Other departments would follow to use red tags.

The practical phase in the obstetrics department of the 5S group would coordinate with other functions such as warehouse and inventory management to directly remove damaged tools and unused materials or tools. Figure 9 shows the procedure to handle non-conforming products, which is appled to machinery, supplies, equipment, and tools. Table 1 presents forms and documents for handling non-conforming products.

Table 1 Attachments for nonconforming product handling

No.	Document name	Code	Time to archive	Place to archive
1	Non-conforming product processing form	QĐ 02/BM 01	One year	Quality department
2	Non-conforming product follow up form	QĐ 02/BM 02		
3	Statistics form for materials and equipment discarded during the treatment process	QĐ 02/BM 03-01		

Figure 9 Flow chart for handling non-conforming products

Non-conforming products would be returned to the warehouse (damaged warehouse). The obstetrics department would send a report on the inadequacy of supplies, tools, and equipment after receiving approval from the department head. Items would be removed red tag with unusable items, damaged items, and expired materials, which were sent to the corresponding warehouse to restock damaged materials. Actually, different items would have a different specific solutions.

4. Results

The 5S results were summaried as followings.

- After sorting and setting steps were done, instruments in the obstetrics department were classified as in Table 2 and Table 3.
- There were four instruments/equipment of 77 instruments/equipment facing with problems. Its rate accounts for about 5.2%. Specific solutions were suggested they they should be solved out as shown in Table 2.
- According to the data in Table 3, in the patient area, the storaged instruments is sufficient and in good working condition with no problems. A plan to continue hygiene care according to instructions would be proposed.

Table 2 Attachements for nonconforming product handling

No.	Descriptions	Units	Quantity issued	Actual quality counted	Difference	Quantoty needs to be checked again	Problems	Propose a treatment plan	Estimated completion time	Status
18	Fetal heart monitor	pcs	2	2	0	1	Lack of accessories included with a machine	Explain reason; Get approval, make order; Buy new	28-Apr-24	Done
46	Oxygen humidifier	pcs	5	5	0	1	1 broken (cracked bottle shell)	Explain reason; Get approval; Buy new	14-Mar-24	Done
67	Blood sugar testing machine	pcs	2	2	0	1	Check the device again due to incorrect display (1pcs)	Calibrate the device	14-Mar-24	Done
77	Straight ruler	pcs	4	4	0	4	Do not use	Enter warehouse awaiting liquidation	3-Apr-24	Done

Table 3 Attachements for nonconforming product handling (inpatient area)

No.	Descriptions	Units	Quantities	Status	Note
1	Air-conditioner	pcs	8	Using	
2	Computer	pcs	5	Using	
3	Printer	pcs	3	Using	
4	Tool & medicine cabinet	pcs	4	Using	

5	Monitor 5 parameters	pcs	1	Using	
6	Oil suction machine	pcs	1	Using	
7	The car warms the baby	pcs	1	Using	
8	Portable ultrasound machine	pcs	1	Using	
9	Ultrasound probe	pcs	1	Using	
10	Phototherapy for jaundice	pcs	4	Using	
11	Hunchback lamp	pcs	3	Using	
12	Infrared lights	pcs	1	Using	
13	Hospital bed	pcs	18	Using	
14	Newborn bed	pcs	1	Using	
15	Baby crib	pcs	5	Using	
16	Desk	pcs	3	Using	
17	Birthing bed	pcs	5	Using	
18	Fetal heart monitor	pcs	2	Using	
19	Fetal heart monitor	pcs	1	Using	
20	Electric injection pump	pcs	2	Using	
21	Portable fetal heart monitor	pcs	1	Using	
22	Handheld mini monitor	pcs	1	Using	
23	Drug injection vehicle	pcs	2	Using	
24	Gynecilogical examination table	pcs	1	Using	
25	Bed	pcs	2	Using	
26	Stainless steel swivel chair	pcs	2	Using	
27	Movie reading lamp	pcs	2	Using	
28	3-storey stainless steel car	pcs	1	Using	
29	Spinning chair	pcs	2	Using	
30	Electronic scale	pcs	1	Using	

Figure 10 Before and after setting medicine car

Figure 11 Before and after seting medicine cabinet

After setting at medicine car, a compairision before and after was done as shown on Figure 10. Similarly, results after setting at medicine cabinet were shown on the Figure 11.

Figure 12 and Figure 13 show the results after applying visualization identification of LASA, which could help nurses recognize the difference between them.

Figure 12 Visual identification of LASA (name of oral medicine)

Figure 13 Visual identification of LASA (name of drug used for intravenous infusion)

After applying 5S, RPN was measured as on Figure 14. It shows that the RNP was reduced under 300 points that is better than expectation 500 points.

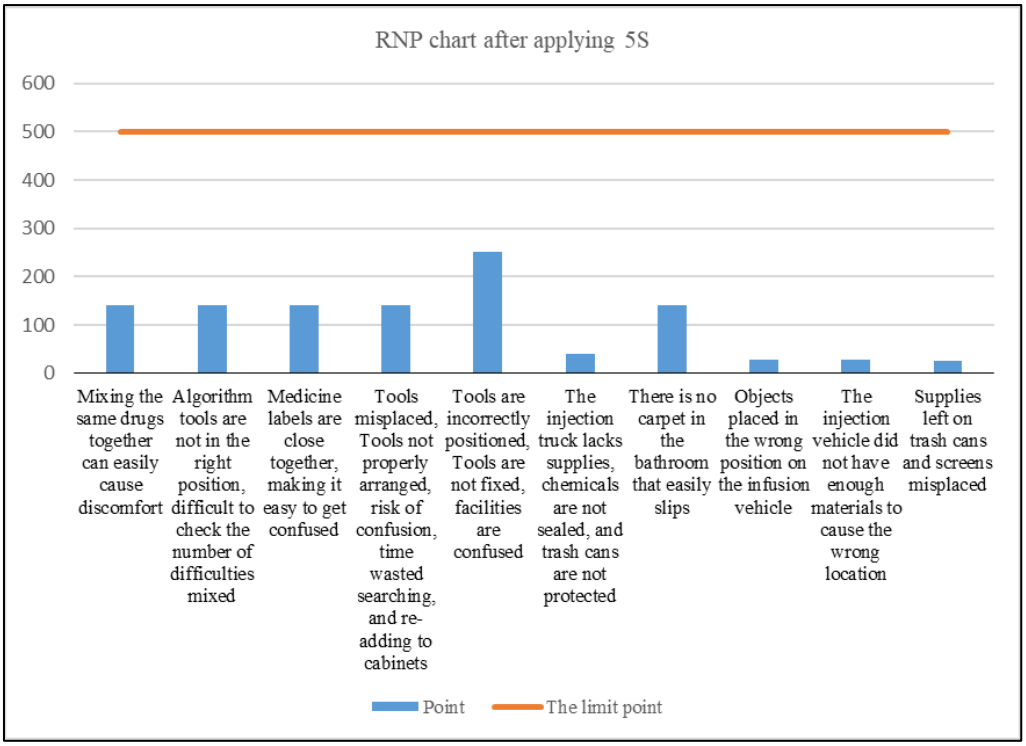


Figure 14 RPN chart after applying 5S.

Acctually, four focused items that had RPN points above 500 was reduced impressively after applying 5S as shown on Figure 15.

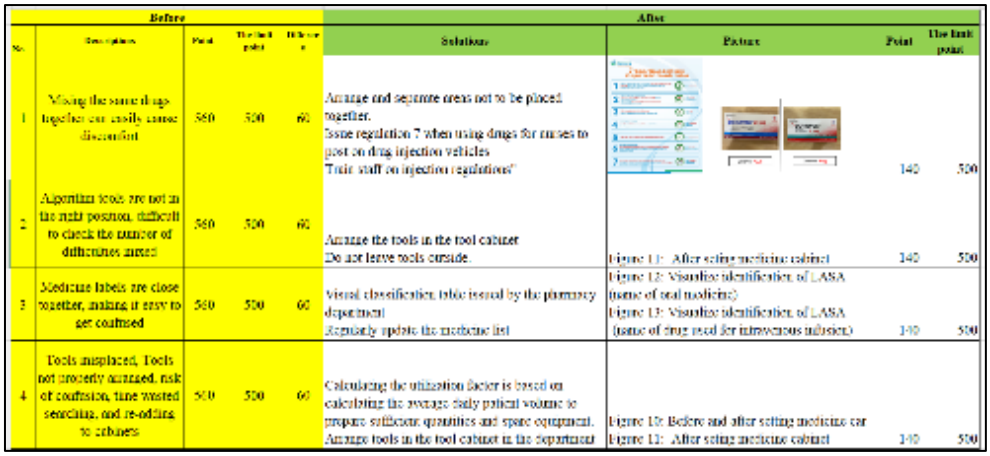


Figure 15 Suggested solutions and implementation 5S results.

Other issues were analyzed and also suitable solutions were suggested as in Figure 16. They would help improve the current situations if implementing in the future.

Standardization and 5S trainning program were done for all hospital department. 5S forms (Figure 17) were designed for specific purposes, specific work tasks, responsibilities, and functions, which are reported frequently to monitor the 5S results. A checking plan was developed to assure maintain the 5S results. A simple check sheet was used as in Table 4, which could help the 5S team follow the process. They could be considered as the way to sustain step.

Before					After			
No	Descriptions	Point	The limit point	Difference	Solutions	Picture	Point	The limit point
5	Tools are incorrectly positioned, Tools are not fixed, facilities are confused	252	500		Propose the addition of emergency bells in restrooms in boarding areas and obstetrics departments for the safety of pregnant women		252	500
6	The injection truck lacks supplies, chemicals are not sealed, and trash cans are not protected	200	500		Re-layout the injection truck Replenish missing supplies and tools Add quota to the injection cart for nurses to check daily and add quantity after the end of the shift Hand over tools and supplies on the injection vehicle.	Figure 10. after setting medicine car	40	500
7	There is no carpet in the bathroom that easily slips	140	500		Add a cleaning mat in front of the bathroom door Regulations do not discharge water onto the floor Visual visualization		140	500
8	Objects placed in the wrong position on the infusion vehicle	28	500		Rearrange and hand over to the nurse in charge	Figure 10: after setting medicine car	28	500
9	The injection vehicle did not have enough materials to cause the wrong location	28	500		Use the checklist to check the specified items on the injection vehicle in each area	Figure 10. after setting medicine car	28	500
10	Supplies left on trash cans and screens	25	500		Remove unnecessary and damaged items		25	500

Figure 16 Some solutions for the remaining items could be improved

In addition, a 5S implementation road map was planned as on Figure 18. It could help the 5S team prepair the necessary resources and control the project.

Actually, the 5S trainning program was done as shown on Figure 19 to clear about the purposes, and support knownklege of 5S for the relative members.

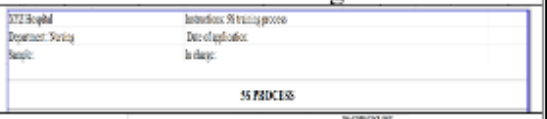
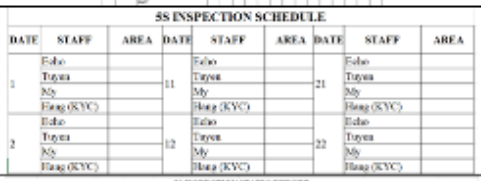
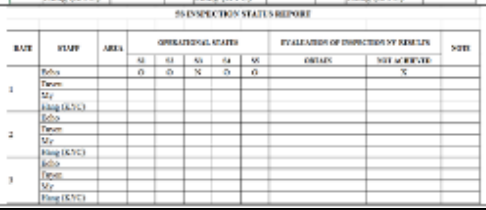
No	Descriptions	Attached images
1	5S Process	
2	5S Check List	
3	5S Inspection Schedule	
4	5S Inspection Status Report	

Figure 17 5S process and forms

Progress	Feb W 3	Feb W 4	Mar W 1	Mar W 2	Mar W 3	Mar W 4	Month Apr	May	Jun	Jul
Disseminate 5s to all employees										
5s training for a group of experts										
Data collection-Group activity										
Implement 5s in departments Pilot in obstetrics department										
Support and consulting activities for departments										
Evaluate the criteria for applying 5S										
Maintain continuous monitoring and improvement										

Figure 18 5S implementtion roadmap

Figure 19 5S training sessions, hospital quality improvement

Table 4 Check list

5S check list			
Date: ...			
Who check	Area	Level	Note

5. . Discussion

The implementation of 5S in the obstetrics department of the hospital has brought about numerous positive changes. The discussion would now mention about the benefits reaped from adopting the 5S methodology, the challenges encountered during the implementation process, the devised plan for sustaining 5S practices, the evaluation of effectiveness, and the lessons learned from other healthcare institutions. Through this thorough evaluation and

reflection, the transformative impact of 5S on the efficiency, productivity, and quality of care provided to our patients in the obstetrics department would be presented.

Some points when applying 5S to the obstetrics department of a hospital as followings. The benefits that implementing 5S clearly brings to the obstetrics department of the hospital, including improving work efficiency, increasing productivity, reducing waste, and enhancing the quality of service for patients. However, challenges arised when implementing 5S in a healthcare environment, such as resistance from staff, resource constraints, and difficulties in changing work habits.

In this study, the specific process for implementing 5S in the obstetrics department of the hospital was suggested, which includes identifying the roles and responsibilities of individuals, planning training, and educating staff about 5S. The way to evaluate and monitor the effectiveness of applying 5S in the obstetrics department including setting measurement criteria and monitoring the implementation process was suggested. Good experiences from the pilot project was shared with other departments.

Research shows that applying 5S offers a structured approach to improving hospital work environments, increasing efficiency, safety and quality of care. By implementing and maintaining 5S principles, healthcare facilities can improve operational efficiency and deliver better outcomes for both patients and employees.When successfully applying the 5S methodology to the obstetrics department of a hospital, expected positive outcomes could be achieved.

Organizing the workspace in the obstetrics department according to the 5S principles would help reduce the risk of workplace accidents, medical incidents, and infections, creating a safe and clean working environment conducive to patient care and staff work. By arranging the obstetrics department following the 5S principles, staff workflows would become smoother, reducing time spent searching for and transitioning medical equipment, thus boosting productivity and reducing patient wait times. Organizing medical instruments, equipment, and supplies using the 5S principles helps cut down on wasteful activities related to unnecessary searching, repairs, or replacements of equipment. Efficient resource management aids in saving operational costs for the obstetrics department. A clean, tidy, and well-organized work environment contributes to providing high-quality healthcare services, enhancing professionalism, and building trust with patients. This can lead to increased patient satisfaction and positive experiences. Successfully implementing 5S not only facilitates efficient work processes but also fosters a positive work culture, promoting teamwork and cooperation among department members, ultimately strengthening staff unity.

Long-term effects of implementing the 5S methodology in the obstetrics department, focusing not only on immediate results but also examining the stability and sustainability of the improvements over time. Costs and economic benefits of implementing 5S in the obstetrics department, including initial costs, maintenance expenses, and reinvestment benefits from improved productivity and service quality would be improved. Use of information technology and automation, such as data management systems or robotic solutions, to optimize the application of the 5S method and space management in the obstetrics department were recognized. Continued research on how the implementation of 5S affects patient and staff satisfaction in the obstetrics department, and consideration of improvement measures to maximize these benefits would be done. Differences in performance, service quality, and work productivity between the 5S department with other ones were recognized. These research directions would further advance knowledge and understanding of applying the 5S methodology in healthcare settings, providing valuable insights for management and performance improvement in obstetrics departments.

6. Conclusion

This research shown the systematical way to implement 5S lean tool in the service industry. It help the organization reduced the RNP index from 700 points to 300 points. Improtantly, research results would help reduce the risk level, which would bring better service levels for the customers. In addition, it could make the better working environment for doctors or nurses working at the hospital. The research could be considered as a good case study that other hospitals could follow. The next target of the study would be to reduce the RNP index to under 100 points with the suitable lean tools such as Poka Yoke, Andone, Visual Management, Standardization, or Zero Defect.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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