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Implementation experiences of Lean Organization in healthcare for Apulian hospitals: a longitudinal interview in-depth study

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Abstract

The purpose of this study is to explore how representatives of the pilot projects teams and dissemination practitioners, belonging to several hospitals in Apulian hospitals in Italy experienced the implementation of Lean over 3 years. An exploratory and qualitative design was drawn based on data triangulation from semi-structured interviews, documentation analysis relating to Lean implementation and direct observation. The main implementation drivers of the methodology in hospitals were increasing patient value and improving workplace well-being. The panel highlighted three pivotal implementation stages: introduction, spontaneous and informal dissemination, and strategic-level implementation. Critical success and failure factors emerged for each of these stages. During the introduction, expert training and coaching from an external consultant are among the most impactful factors in the success of pilot projects, while time constraints and the adoption of process analysis tools are the main barriers to implementation. However, the absence of managerial expertise to support implementation and organisational constraints, such as departmental organisational structure, do not allow for systemic adoption of the methodology.

Keywords: Lean healthcare, Organisational models, Critical success and failure factors, Longitudinal analysis, Lean adoption phases.

1. Introduction

The continuing and steady rise in healthcare costs, the increasing demand for care and assistance, and the high variability in operational performance have prompted national and local healthcare organisations to explore new ways to increase the level of service quality for patients and, more generally, to enhance value for healthcare stakeholders [1, 2]. Lean management is recognised as one of the most effective managerial paradigms for improving operational performance and reducing waste [2-3]. Nowadays, many testimonials and articles discuss the benefits of implementing Lean projects in primary and support healthcare processes [1, 4, 5-6]. However, the literature shows that due to a lack of skill in managing internal and external contextual factors and critical failure factors, many organisations experience failures or under-optimised performance when implementing Lean at the systemic level [7-10]. Developing the skills needed to implement the paradigm at the systems level requires great organisational and managerial efforts from healthcare organisations [9-10]. In this scenario, an important role can be played by healthcare agencies, which through programmes for the introduction and dissemination of Lean, can encourage and assist the adoption of the paradigm by healthcare organisations [11-13]. Thus, how Lean diffusion programs promoted by healthcare agencies facilitate the adoption of the paradigm is still an issue to be explored. In presenting the experiences of several Apulian hospitals staff that were involved in the Lean introduction and dissemination program-'Lean Lab'- promoted by the Apulia Regional Strategic Agency for Health and Social Care (AReSS), this article aims to explore issues related to the Lean implementation in multiple healthcare organisations. The study aims to answer the following questions:

Rq.1 What factors drove the regional initiative's success or failure?

Rq.2 How have Lean Lab participants experienced the Lean introduction and dissemination in their organisations?

Rq.3 How have hospitals managed Lean implementation over time?

A qualitative research methodology was used to assess the effectiveness of the Lean strategic introduction and dissemination programme. It consists of data analysis from semi-structured interviews, AReSS reports describing the design and implementation of the 'Lean Lab', internal hospital reports on Lean adoption and direct observation. The article comprises four sections, discussed in the following order: literature review, research methodology, results, discussion, and conclusion.

2 Literature Review

Lean is a management paradigm that integrates approaches and methods focused on employee empowerment and continuous process improvement [14]. The paradigm was born and developed in the manufacturing sector and was later adopted by other sectors in the late 1990s [15]. Over the past two decades, the healthcare sector's adoption rate has grown at a very high rate [1, 16]. The great interest of healthcare organisations in this paradigm is due to the numerous testimonies of the benefits achieved in patient pathways support processes and related to the organisation's work environment [6, 16-17]. As widely demonstrated in the literature, implementing Lean in primary healthcare processes improves risk and safety performance, promotes multidisciplinary learning, enhances vertical and horizontal communication and facilitates the creation and adoption of standard work. Improvements related to supporting processes include increasing resource availability (e.g., operating rooms, diagnostic laboratories, maintenance activities), reducing waste in transportation and travel (e.g., drug logistics, space arrangement, layout), organisational flexibility and reducing excess processes (e.g., referral activities, discharge administrative activities), and cost performance [5-6]. Although the methodology seems to be increasingly popular in the health sector, a closer investigation of how it is implemented reveals that, in most cases, it is merely applied at the level of stand-alone clinical or support processes [1-6]. This form of implementation, also called micro-level implementation, is typical of organisations that are introducing the paradigm or have a low level of maturity in their deployment [7, 18, 19]. Organisations aiming to exploit the full value of Lean are required to disseminate and adopt its concepts at every organisational level and apply them systemically [19, 20]. Key characteristics of systemic or meso-level implementation include the continuous improvement culture deeply rooted in the organisation, consensus-based decision-making systems, the use of improvement-oriented project management systems, high staff maturity in the use of Lean tools, regular evaluation of improvement programmes, formalised Lean management systems and alignment between strategic and operational Lean objectives [1, 21]. Prior to the Lean introduction, critical failure factors refer to organisational barriers during the Lean dissemination phase [23, 24, 25]. Among the hindering factors related to the internal context and most critical to consider is the inability to manage benchmark activities [24, 26]; the silo logic affecting both organisational functions and clinical specialities [7, 26]; the lack of confidence toward methodology [7, 9, 10]; the absence or ineffectiveness of communication systems [7, 10]; the inability to manage multidisciplinary teams [7, 24]; and, most importantly, the total lack of project management skills [7, 8, 6].

Furthermore, the successful implementation of Lean is largely determined by the organisation's ability to understand stakeholder value and optimise processes in relation to it; in this perspective, knowledge and interpretation of the external context is a key determinants in defining effective implementation strategies [10, 14]. With regard to critical failure factors, the most discussed and common ones include lack of investment in training and education; lack of time resources; lack of managerial and staff commitment; poor leadership; ineffective communication system; poor alignment between strategic objectives, main goals and goals of Lean projects [2, 7]. Other failure factors discussed in the literature refer to a lack of project management skills, structural constraints, unclear Lean implementation roadmap, inadequate data collection system, lack of performance measurement systems and lack of dissemination agents [2, 7]. Overcoming these barriers requires significant organisational efforts [2, 8, 20]. Some authors discussed the role that local, regional or national health agencies could play in supporting health organisations to overcome barriers and constraints to successful paradigm implementation [13, 27]. The main success factors of multi-organisational Lean deployment initiatives undertaken by agencies include stakeholder involvement in programme development; long-term strategic planning; effective communication with stakeholders to raise awareness of continuous improvement in healthcare; the ability to motivate organisations to embark on the implementation journey; defining a clear vision of objectives; developing a training and implementation support programme; and testing and improving the programme over time.

3. Research Methodology

3.1 Case description

In order to better contextualise the research methodology and the results obtained, this section discusses the role of the AReSS agency, the objective of the 'Lean Lab' programme and its implementation framework.

The Apulia Strategic Regional Agency for Health and Social Care (ARess) was established by Regional Law No. 29 on July 24, 2017. It is a technical-operational agency established to support the definition and management of social and health policies of the Apulia Region. The agency identified Lean as a useful methodology for responding to this goal while simultaneously reducing waste and improving working well-being in Apulian healthcare organisations. Therefore, AReSS proposed to the ten Apulian local healthcare authorities (USLs) to collaborate in order to co-design a strategic plan for the development and implementation of the Lean paradigm at the regional level. The USL is the set of facilities, offices and services organised in a given geographical area through which municipalities provide health care to citizens in accordance with the principles and objectives of the National Health Service. Within its area of responsibility, the USL is called upon to perform the various tasks of prevention, diagnosis, treatment, rehabilitation and forensic medicine as a whole. During 2018, the program was developed through collaboration between the AReSS and a scientific committee composed of senior managers from the Apulian USLs and representatives of physicians and nurses from those organisations. The programme framework is based on the model of "The Productive Ward" implemented by the NHS and is developed considering the contextual factors of Apulian healthcare policies. At the end of 2018, the programme was defined in detail and was named 'Lean Lab' (Figure 1).
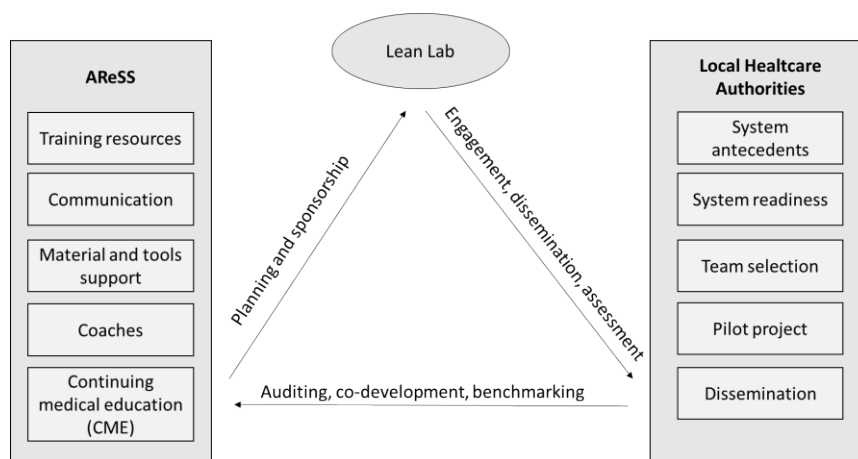
Figure 1: Framework describing the 'Lean Lab' programme

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3.2 Study setting and design

Based on the research by Dannapfel et al. [12], this article aims to investigate the impact of 'Lean Lab' - the AReSS strategic Lean dissemination programme - on adopting Lean in Apulian healthcare organisations. In contrast to the research by Dannapfel et al. [12], the research focuses on the lived experience of the pilot project participants - subsequently referred to as dissemination practitioners - of the organisations involved. The research covers three 'Lean Lab' operative phases over almost four years. The first phase concerns Lean introduction in the first year, while the second and third phases are related to Lean dissemination phases in Apulian healthcare organisations over the [second and third] years. As the 'Lean Lab' is a 5-year strategic programme, the study's results cannot cover the entire period of the programme. In order to ensure the validity of the qualitative study, multiple data sources and data collection methods are used. Through the use of triangulation methodology [28], data are analysed by the researchers. The authors conducted the interviews and recorded the responses. Interviews were administered to each of the 52 participants in the first operational phase of the programme over 6 months. The first interview focused on the early experiences of introducing the paradigm through a pilot project, and the second on the dissemination phase in organisations they belong. During the second operative phase of the programme, the 52 participants are called disseminator practitioners as their role changes from learners and executors of the pilot projects to trainers, Lean leaders, and coaches of the subsequent projects implemented in healthcare organisations. The interviewees come from one of the ten USLs in the Apulia region. The interviews were structured to reveal experiences according to the macro determinants of Lean implementation success proposed by the Model for Understanding Success in Quality (MUSIQ) [22]. The macro-factor is the external environment, organisation, quality improvement team and micro-system.

4. Results

The results are organised in paragraphs discussing the participants' experiences of the operational phases of piloting, testing, and dissemination. They also include perceptions regarding programme support activities. The second set of interviews was conducted before the activation of the reinforcement phase. The dissemination practitioners acted as Lean disseminators within their organisations and participated in the auditing and review phases of the Lean Lab. The results are aggregated per group of participants. Each participant group is assigned a label G_x where X range from 1 to 10.

Piloting and testing phase

Approximately 100 applications for the piloting and testing programme were received (equally distributed among the USLs). The communication campaign for the Lean Lab programme was instrumental in understanding the opportunities arising from the methodology and overcoming mistrust of the methodology (G_{1-10}). The most motivating factors of the communication campaign included training credits and the description of external contextual factors, such as the results of benchmarking activities against other territorial organisations and the presentation of healthcare policies aimed at improving waste and optimising stakeholder value (G_{1-10}). In addition, the opportunity to participate in

a five-year strategic programme highly supported by the directorates and learn about projects from other regions represent another motivating factor ($G_{1-3, 6, 8-10}$). $G_{2-4, 6-10}$ stressed that the communication campaign allowed them to reconsider the Lean paradigm. They viewed it as a mere and exclusive tool to reduce costs and increase productivity at the expense of occupational well-being. $G_{1-2, 9-10}$ emphasised the importance of effective communication of the implementation modalities and the operational and strategic objectives of the programme. All groups highly appreciated the modalities of carrying out the piloting and testing phase. The theoretical training hours are also considered fundamental for better understanding the methodology and introducing the Lean tools. $G_{2, 5, 7-8}$ claimed that through the serious games and testimonies, their concerns regarding the difficulty of implementation were allayed. Other elements strongly valued by all the participants were the subdivision of the training and implementation phases of the Lean projects ($G_{2, 5,8-10}$), the chance to define the application areas of the project with experts and managers ($G_{2-4; 7-8, 10}$); and the time allocated to run the Lean project ($G_{4-6,10}$). All groups completed the project implementation sub-phase. At the end of the follow-up phase, all but two projects returned better results than expected ($G_{1-7,10}$). Goal setting and outcome evaluation were conducted jointly with the project coach. Goals were set to be clear, challenging and measurable (G_{1-10}). Here are some outcomes settled and achieved: increase in the percentage of surgery for hip fracture; lead time reduction of the oncology patient pathways for chemotherapy. All groups emphasised the difficulty of collecting data during the patients' pathway (adoption of standard data collection tools, Gemba Walk) and independently using mapping tools such as the visual stream map or demand map (G_{1-10}). $G_{4, 5, 8,}$ and $_{10}$ stated that working on the project was very stressful regarding the time they spent on it. Most project activities were carried out outside working hours without the executors being paid overtime. $G_{1, 2, 6, and 9}$ reported the commitment of the managers who provided the material resources (printing, blackboards, brainstorming and meeting rooms) and technical-managerial support (historical data collection, management control, data analysis) was central to the success of their project. Among the most interesting pieces of evidence to note are: that all groups reported that they achieved more than they expected and that all of them understood the importance of finding and addressing chronic structural problems instead of dealing with them reactively (G_{1-10}). The groups particularly appreciated the final follow-up meeting and celebration phases (G_{1-10}). While the former enabled an effective exchange of ideas among the groups ($G_{1-6; 8}$), the latter further motivated participants through prestige-based reward systems ($G_{2-7; 9-10}$).

Dissemination phases

The members of the ten groups that participated in the first operational phase were appointed as dissemination practitioners and have been involved in the programme communication activities and the programme review and improvement phase. The directors of the USLs involved dissemination practitioners in carrying out peer-to-peer training courses and witnessing the success of the projects implemented within their organisations. Although many dissemination practitioners valued the initiative, they complained about the lack of time to conduct the training activities ($G_{1-7; 9-10}$). Another issue related to outreach activities was the absence of a formal mission statement by the directorates and voluntary course participation ($G_{2-5; 7; 8; 10}$). The celebration phase of the previous year's projects and the Lean Award were the strongest motivating factors for participation in the programme ($G_{1-7; 10}$). All other motivational factors related to the first operational phase were re-confirmed (G_{1-10}). In the 2nd phase, applications exceeded 600. The directors of each USL selected doctors and nurses from departments other than the participants in the piloting and testing phase.

In the dissemination phase, three groups were involved in each USL (153 participants). The selection method took into account feedback from dissemination practitioners. They stated that the methodology, due to the proximity among colleagues, spread naturally and spontaneously in departments where Lean projects have been implemented ($G_{2-7; 10}$). By involving other colleagues, several dissemination practitioners implemented multiple Lean projects in their departments even before the start of the dissemination phase ($G_{1, 3, 5-7, 10}$). While some of these projects, mostly conducted with the kaizen blitz method, have yielded satisfactory results, others have failed ($G_{1, 3, 5-7, 10}$). The lack of management involvement in implemented projects has frequently been pointed out by dissemination practitioners ($G_{1- 3, 5, 7-9}$). In particular, although fully skilled in using mapping tools, internal coaches could not manage multidisciplinary teams or employ complex data and analysis models. As of the end of the project implementation sub-phase, 26 projects had achieved the planned results, while 4 had failed. The successful projects focused on patient value (20), improving the resource management of the organisation (4) and improving the quality of the working environment (2). Lack of commitment and support from leadership and management, which is essential to undertake a project involving external organisations, was the main critical failure factor of the failed projects ($G_{1,3,6,7}$). At the end of the first dissemination phase, the dissemination practitioners highlighted several

problems: many participants complained about a lack of time to devote to projects ($G_{1-7,10}$); although the directorates show great interest, they often do not support or facilitate project implementation ($G_{1-3, 5, 7-10}$). Several USLs have activated an internal Lean Award to stimulate implementing Lean projects ($G_{1, 6-8, 10}$). Spontaneous Lean projects were applied to clinical pathways. In one USL, a Lean project was conducted to improve administrative activities related to booking outpatient visits and patient care continuity (G_4). Perceptions of the training, project execution and Lean award sub-phases of the second dissemination session are the same as those of the first session (G_{1-10}).

However, some dissemination practitioners brought up a need concerning the management of the dissemination activity (G3-8; 10). In their opinion, as the number of projects was growing rapidly, organisations should have set up a dedicated structure to monitor and support the projects (G3-8; 10). In the 2nd phase，micro implementations increased in all USLs (G_{1-10}) (Table 1). However, although the number of projects increased, the project failure rate increased more than proportionally. Moreover, organisations were no longer able to govern the dissemination process. In those USLs where the Lean Award was not introduced, many projects were implemented without being communicated to management (G_{2-5}). Dissemination practitioners pointed out that, as the number of projects increased, priority management and resource allocation conflicts have risen ($G_{1-7, 10}$). In addition, there were cases in which the increase in the performance of certain patient pathways (in terms of execution time, waiting time, saturation of resource capacity utilisation and quality perceived by patients) was counterbalanced by a reduction in the performance of other processes that shared the same resources ($G_{1, 5-7, 10}$). Although dissemination was spontaneously arising, and maturity in the use of the tools was growing, organisations could not govern implementation at the meso level (G_{1-10}). The lack of a dedicated structure to drive Lean dissemination, management involvement, and clear, formalised strategies are considered the main barriers to meso implementation ($G_{1-6, 8-10}$). Thus, in preparation for the operational phase of the reinforcement, many dissemination practitioners discussed with management setting up pilot control rooms to support and monitor the spread of Lean in selected organisations ($G_{1-4, 6, 8-10}$). Although the directorates had planned to test such a solution with AReSS during the 'Lean Lab' programme planning, they seemed hesitant about it. The concern was that assigning resources to control and monitor the paradigm's dissemination might negatively impact organisational performance and, above all, generate internal conflicts ($G_{3-4, 6, 8-10}$). The perception of dissemination practitioners was that managers not experiencing project implementation could not understand the need for this type of facilitation ($G_{1-4, 6, 8-10}$). In May 2022, none of the USLs had a control room or had established an operation manager team (G_{1-10}). Therefore, in the review phase (January - April 2020), dissemination practitioners emphasised the importance of primarily management staff participating in the reinforcement phase.

The publication of the National Outcome Plan System, covering the initial year's 1st-year deployment, confirmed the great improvements achieved in patient pathways where Lean projects had been implemented.

Table 1: Lean dissemination in Apulian USLs

	Year	Internal coach	Internal Training Hours	No internal training courses	Staff trained by an internal trainer.	Lean projects detected	Internal Lean Award Success Yes	No	Dedicated structure to monitor & support the projects Yes	No
USL1	2019	0	0	0	0	1	1	1	N	N
	2020	5	30	2	11	9	8	3	N	N
	2021	21	30	2	18	11	8	2	Y	N
	2022*	51	30	2	24	6	4		Y	N
USL1	2019	0	0	0	0	1	1		Y	N
	2020	5	40	2	21	5	4	1	N	N
	2021	20	40	2	25	8	8		N	N
	2022*	50	40	2	26	6	4	2	N	N
USL2	2019	0	0	0	0	1	1		N	N
	2020	5	20	1	15	8	8		N	N
	2021	21	32	1	10	9	6	4	N	N
	2022*	51	32	1	12	6	5	1	N	N
USL3	2019	0	0	0	0	1	1		N	N
	2020	5	30	2	14	5	5		N	N
	2021	21	36	2	16	9	6	3	N	N
	2022*	51	36	2	18	6	5	1	N	N
USL4	2019	0	0	0	0	1	1		N	N
	2020	5	32	2	17	5	4	1	N	N
	2021	20	36	2	25	7	5	2	N	N
	2022*	50	36	2	24	9	7	2	N	N
USL5	2019	0	0	0	0	1	1		N	N
	2020	5	20	1	15	4	4		N	N
	2021	20	20	1	11	6	6		N	N
	2022*	50	32	2	18	8	7	1	N	N
USL6	2019	0	0	0	0	1	1		N	N
	2020	7	36	2	31	7	7		Y	N

USL	Year									
	2021	22	28	2	33	11	9	2	Y	N
	2022*	52	28	2	31	5	5		Y	N
USL7	2019	0	0	0	0	1	1		N	N
	2020	5	40	2	22	5	5		N	N
	2021	20	40	2	20	8	7	1	N	N
	2022*	50	40	2	32	10	8	2	N	N
USL8	2019	0	0	0	0	1	1		N	N
	2020	5	16	1	18	6	6		Y	N
	2021	20	16	1	24	10	8	2	Y	N
	2022*	50	16	1	14	8	6	2	Y	N
USL9	2019	0	0	0	0	1	1		N	N
	2020	5	32	2	32	7	7		N	N
	2021	20	60	4	54	8	7	1	N	N
	2022*	50	60	4	60	11	7	4	N	N
USL 10	2019	0	0	0	0	1	1		N	N
	2020	5	32	2	25	8	8		Y	N
	2021	20	32	2	31	12	10	2	Y	N
	2022*	50	32	2	25	9	6	3	Y	N

* Period: January - May 2022

** In some USLs, the number of projects implemented may differ from those shown

5. Discussion

The results from the study provide clear answers to the research questions. With regard to the determinants of the success or failure of the regional Lean Lab programme, co-design with the organisations involved and communication of the objectives and methods of implementation were among the most decisive factors in increasing and sustaining motivation among potential participants and eliminating barriers related to mistrust of improvement methodologies. The communication campaign was also important in spreading the potential of Lean and familiarising potential participants with the concept of the value and the importance of external contextual factors. These results confirm what has been reported by Dannapfel et al. [12] and Morrow et al. [29].

Furthermore, from an operational point of view, the training and coaching were instrumental in the paradigm introduction and dissemination phase at the micro level. The celebration and the Lean Award sub-stages were other elements of great value in the programme's success. Recognition of employee involvement is instrumental in aiding lean program success [30, 31]. While the assignment of witnessing, coaching and communication tasks to the dissemination practitioners during the operational phases allowed them to gain experience in both the use of tools and project management, the workload assigned was also negatively evaluated because it was not recognised as working time. In summary, although the dissemination practitioners were willing to take on the assigned roles, the difficulties they experienced in relation to time availability were a major obstacle. However, it is crucial to remember that the role of the dissemination practitioners was decisive for dissemination.

Even though the operational phases took place from May to December each year, organisations were always engaged in the micro-implementation and dissemination phase of Lean. This increased the speed of dissemination and increased employee involvement.

About the implementation experiences within the organisations, the success and celebration of the pilot projects was the key trigger for activating the dissemination process. However, as reported by the practitioners, dissemination occurs more easily in units with at least one junior or senior Lean coach, while it is null or slow where there is no staff skilled in the methodology. In addition, some Lean tools, such as simulation or data-taking models, cannot be easily used by doctors and nurses. Thus, experienced coaches are needed to perform these tasks. Managers' commitment is a critical factor in the experience of dissemination practitioners during the introduction and dissemination phases. Facilitation activities of management and internal initiatives such as the Lean Award are concrete elements of management commitment.

On the other hand, the lack of management commitment is a failure factor of both micro- and meso-implementation. Based on the study's findings, even though organisations have shown great capacity in planning and implementing the introduction and dissemination phases of Lean, they have not managed the latter phase to its fullest extent. As a result, it has become a spontaneous and natural phenomenon rather than strategically organised. When the number of projects and their failure or sub-optimisations realised increased, organisations could not adopt project management systems or consider introducing dedicated structures for monitoring and controlling the strategic implementation of the paradigm. This was due to fears and a lack of strategic vision on the part of management and is a failure factor in many Operational Excellence initiatives [32].

6. Conclusion

In conclusion, the regional 'Lean Lab' plan strongly impacted the introduction and dissemination of the programme methodology. In turn, the organisations empowered the doctors and nurses who participated in the programme to take the lead in disseminating the methodology. After two years, organisations are still unable to implement Lean on a meso level, although many of their employees have reached a high level of maturity in handling Lean tools. It is critical for successful meso implementation that management is strongly committed and embraces Lean from a strategic point of view. The creation of a control room or team committed to project management and dissemination governance should be the main tool to support management in this regard. Further research will study further the impact and progress of Lean in hospitals since this study.

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