Lean Healthcare: how to start the lean journey

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Abstract. In this paper we present how ASST Cremona, an Italian hospital belonging to the National healthcare system, started its lean journey. In order to spread out the lean culture within the company and to engage people, the first initiative launched was a 4 months improvement project within Internal Medicine department. This was carried out following A3 framework and was aimed at improving the service level provided to the patients, in terms of the critical KPI represented by the length of stay. The improvement project was successful leading both to a strong reduction in the length of stay and to the spread of improvement culture within the hospital, that will continue its lean journey in different departments.

Keywords. Lean Healthcare, Italy, Discharge process

1 Introduction and company's profile

Healthcare systems – especially hospitals – face serious challenges, from a rapid growth in patients demand to higher quality expectations, in terms of both application of new expensive treatments and service level as shorter waiting and processing times (Graban M., 2016). Furthermore, hospitals have limited budgets, which force than companies in utilizing scare resources effectively and efficiently (Bhasin S., 2015). There is extensive literature about hospitals that search for solutions to increase productivity and apply lean management concepts to operations (e.g. Brandao de Souza L., 2009; Waring J, Bishop S., 2010). As a matter of fact, in the US, lean experiences within hospitals seem to have significantly increased over time, and in the UK, the government chose lean management as a mean to reform its public sector.

Despite the interesting results achieved by those organizations, in Italy only few hospitals attempted to implement a system-wide approach including lean thinking in their operations. Italian healthcare is still in its early stages of searching for operational excellence (Portioli-Staudacher A., 2008). Hence, there is a wide room for improvement in Italian healthcare in order to decrease costs and increase service level (e.g. Zidel T. G., 2006). According to 2018 annual report of Observatory on Healthcare

Organizations and Policies in Italy (Cergas, 2018), hospitals are now more opened to new managerial tools and methods aimed not only at redesigning programs and control systems, but also at strengthening operation management, intended as patient logistics and asset management.

The example we present hereby is from ASST-Cremona, an Italian hospital belonging to ATS Valpadana: its board saw in the lean culture the proper way to cope with industry's challenges. But how to start a lean journey within a hospital? For ASST-Cremona the preliminary step was to create a new department in charge of improving the service level, studying and planning all activities related to surgery and bed management. Then, the first proper lean initiative launched was within the critical department of Internal Medicine, where patients coming from the Emergency room are nursed. According to the literature, not only around 27% of patients in Emergency room are then hospitalized in the Internal Medicine department, but also 60% of them is elder than 75 years old. All these factors led to significant criticalities in the discharging process of patients, with a related increase in the average hospital stay, causing problems in both management and clinical activities. This context easily justifies the need of the improvement project carried out as first lean activity within the hospital.

2   The project

The improvement project lasted 5 months and was carried out by Lean Excellence Centre of School of Management of Politecnico di Milano in collaboration with and supervision of the Operation Manager, Bed Manager, Ward Chief, Head nurse and Medical direction of the hospital. The total workload assigned to the project considering all involved people is around 700h. Moreover, the project was developed according to A3 framework, as a useful structured problem solving tool.

2.1   Problem background

The medical ward of the department under analysis has a capacity of 58 beds splitted into two blocks of 30 and 28 each. Personnel is the same for the two blocks and rotates according to work shifts. The ward hospitalizes multi-pathological elderly patients, with an age average of 76.8 years, who often require assistance even after being discharged by the hospital. According to 2018 data, the ward is characterized by high saturation of beds (99,9%) and around 30% of patients has a length of stay (LoS) higher than the maximum permitted by law (11 days). Furthermore, the LoS variance is about 52 days. All these aspects lead to face a high managerial complexity in the ward, that affects not only patients turnover (availability of beds), but also the service level provided to patients and the overall hospital cost structure. Managing high/variable LoS will enable the company to better manage beds, thus to satisfy the real demand of the ward, to reduce waiting times for patients, to provide higher service level. However, even the high expectations related to this project, internal staff was not convinced about its success due to resistance to change, lack of knowledge about lean approach, and low commitment of the department.

2.2 Breakdown the problem

Thanks to historical data and to interviews, the overall LoS has been studied and split into six different main activities: (1) Ward entrance, (2) Clinical activity, (3) Blood tests, (4) Instrumental tests, (5) Medical Advice, (6) Discharge process. These activities and related times are analysed through Pareto in order to understand the ones most responsible for the long LoS. Clinical and discharge times contribute to 80% of the total time. However, due to technical reasons, the focus of the project is only on discharge time (which accounts for 37% of the total LoS).

Moreover, discharge process is further clustered by the hospital into 9 groups[1] depending on the different typologies. Related number of patients and average time were analysed and the results are reported in the following table.

Table 1 - Discharge codes

Discharge Code	Number of Patients	Average Required Time
1	1480	8,27
2	15	3,6
3	10	18,8
4	98	7,56
5	160	7,9
6	1	22
7	131	13,17
8	146	17,26
9	2	14
Total	**2043**	**9,19**

Thanks to a crossed ABC analysis, we focused on code 8, that showed the highest number of occurrences as well as an average time to be procecced significantly higher than the overall ward average.

After several Gemba walks and interviews, we used a Makigami chart to study and map the discharging process of code 8. It highlighted that around 99% of discharging time was waiting time. Discharging is indeed a really fragmentated process, where several actors are involved that have only partial information. The only structured moment when all the information regarding the patients are shared among all actors was the briefing held by the Multidisciplinary equip (i.e. Head Nurse, Bed Manager, Case Manager and Social Worker). However, physicians, who have a critical role in the discharging process, did not take part to this moment. It is worthy to stress that

[1]Discharge classification: 1. Ordinaria domicilio del paziente; 2. Volontaria; 3. Trasferimento ad un altro istituto di cura per acuti; 4. Deceduto; 5. Dimissione ordinaria presso Residenza Sanitaria Assistenziale; 6. Dimissione al domicilio del paziente con attivazione di ospedalizzazione domiciliare; 7. Trasferimento ad altro regime o tipologia di ricovero all'interno dello stesso istituto; 8. Trasferimento ad un altro istituto pubblico o privato non per acuti; 9. Dimissione ordinaria con attivazione di assistenza domiciliare integrata.

communication among actors inside and outside the ward was mainly paper-based and the FAX was the primary tool used. Many delays were caused for example by not readable forms that needed to be re-filled. This situation was even emphasized by the lack of a responsible of the process, who monitor and check the progress of discharging process.

2.3 Target

Must have goal regarded the reduction of the average LoS for patients discharged with code 8 from 17 days to 14 days (-17,6% of the total time). A *Nice to Have* target was also set regarding a further reduction of average LoS to 11 days (-35% of the total time).

2.4 Root-causes analysis

We interviewed different actors involved in the process, checked emails and medical records to grasp the causes of long duration of discharging process for code 8. At the end, Ishikawa diagram allowed to give structure to discovered causes and to define root-causes.
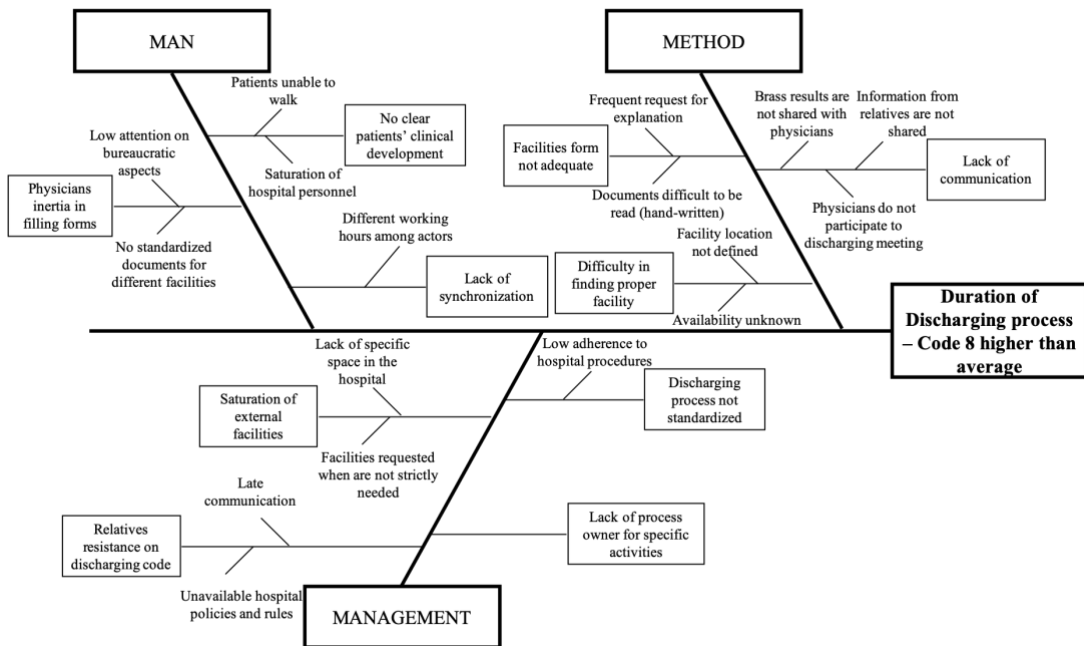

Figure 1 *- Ishikawa diagram*

Thanks to a FMEA, causes were linked to the relative failure mode and failure effect. Assigning a score to the severity of the effect, occurrence of the failure mode, and to detectability enabled to compute Risk Priority Number (RPN) for each cause.

According to RPNs, an ABC analysis was performed to prioritize causes to address our effort coherently. Here following a table summarizing the results of the ABC analysis.

Table 2 - ABC analysis on causes

CAUSES	RPN	Cum. %	Class
Saturation external resourses	1000	15,2%	A
Lack of long-term care facilities	1000	30,3%	A
Lack of monitoring system for availability of external facilities	1000	45,5%	A
Patient is not more able to walk	810	57,8%	A
Patient needs subacute centers	500	65,4%	A
No check before sending forms	450	72,2%	A
Talks with relatives not defined in terms of time and methods	450	79,0%	A
Uneffective information coordination and sharing	300	83,6%	B
Lack of control on the overall process	300	88,1%	B
Hospital policy on discharge not defined	280	92,4%	B
3 different forms to fill for different facilities	160	94,8%	B
Usage of paper forms	100	96,3%	C
No structured tools to share information	96	97,8%	C
Resistance from family members on the discharge mode selection	80	99,0%	C
Responsabilities not defined on forms sending	30	99,4%	C
Synchronization among activities	14	99,6%	C
Use of Fax as communication system	12	99,8%	C
Facilities' form not correctly filled	12	100,0%	C

2.5   Countermeasures

A list of countermeasures was developed after several brainstorming sessions with the involved actors. In order to pick the most profitable countermeasures and to address

there our effort, an effort-benefit analysis was carried out. Here following the results of the analysis.

		EFFORT	
		LOW	HIGH
BENEFIT	HIGH	**STARS** -Define momoments for talks with relatives -Definition of Hospital Policy tha must be shared with relative with brouschure	**HIGH EFFORT/HIGH BENEFIT** -Opening a Subacuti center inside the Hospital - Software to manage requests for facilities - Mobilize the patient
	LOW	**QUICK WINS** - Attendance of physician to the briefing about discharges - Structured tools to share information (Dashboard) -Define Process Owner - Posters to rise relatives awareness about benefints of the return to the patient's home	**EXCESSIVE EFFORT** -Single form to fill for all type of facilities -Possibility to have visibility on the availability of facilities

Figure 2 - *Effort-benefit matrix*

2.6   Implement Countermeasures

According to the results presented and due to time constraints, we focused on quick-wins solutions. A Gantt chart was developed to guide the implementation.

We defined rules and structure for the briefing about discharges. As briefly explained above, physicians usually did not attend the briefing meeting about the discharge, causing longer coordination and waiting time. The natural consequence was to set a meeting in which physicians must participate in order to share the required information on their patients and to receive feedbacks from the multidisciplinary equip. Moreover, we relied on some visual management tools to tackle two different countermeasures. Firstly we designed posters to raise awareness about the risks connected to an improper stay in the Hospital: they are attractive, easy understandable by everyone and placed in locations frequently attended by relatives. Secondly, we created a visual dashboard not only to share information in the ward about critical discharges in order to avoid information's fragmentation among stakeholders, but also to monitoring results of LoS overtime. Lastly, we identified a Process Owner of discharge activity named as "Ward Discharge Manager". The Head Nurse was selected for this role, that implies continuous monitoring of the discharge process, summarizing all the patients' information updating the dashboard, identifying problems and stops in the process, soliciting activities to be done in case of delays.

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2.7   Monitor results and process

After a trial period of two weeks during which we performed several Gemba walks, we were able to summarize criticalities and further improvements of our countermeasures in a Snag list. Based on this, some adjustments to our countermeasures have been done. For example, a final version of the dashboard was defined in agreement with Chief ward and Head nurse, so to make operators directly involved in the project. Indeed, this was mainly done to increase both the commitment and the knowledge about the lean approach of department.

The final layout allows to keep under control the main steps of the patients' care process adding important information, like exams, and eliminating the useless one, with respect to the first draft of the dashboard.

In order to check if the implemented countermeasures had a positive impact on the organization and allowed to achieve the *must to have* target set in the initial phase of the process, a monitoring phase was needed. In the period immediately antecedent to the implementation, the average LoS was of 18 days (green line) while after the implementation the average decreased to 13 days. The *must have* target has been successfully achieved. There are just 4 points (22%) out of control over 18 observations: these are due to the intrinsic nature of hospital processes. Following the achieved results.
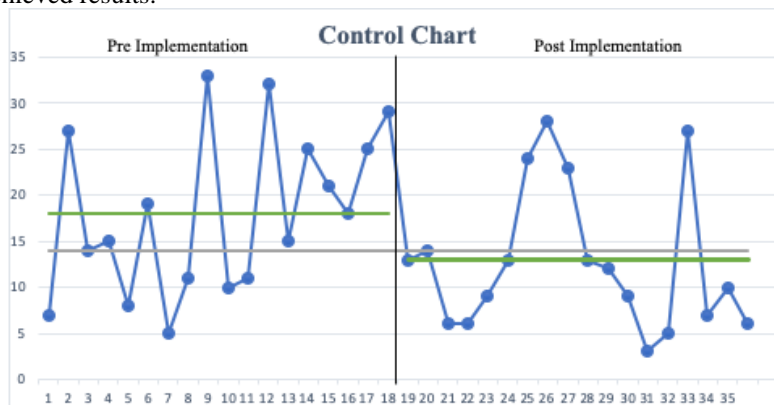

Figure 3 *- Control chart*

2.8   Standardize and share success

In the closing phase some future steps for the company have been identified for further improvements: (1) due to the positive effect obtained in Medical ward, countermeasures can be shared and standardized also in other wards of the Hospital; (2) the dashboard can be replaced by a digital and interactive screen directly interconnected to the digital medical record. Moreover, we also suggested a training session in order to easier the change management and to make operators more involved.

3   Discussion and conclusion

Even considering the strong effort required for the initial phases of the analysis, the lean approach revealed to be fundamental to address and tackle the root-causes of the long patients' stay in the Medical ward. Thanks to this successful first lean initiative, ASST-Cremona started the lean journey, aimed at improving the quality of service provided to patients. Through standardization, visual management tools and monitoring system Medical ward is now able to deliver a better quality to patients. Thank to this initiative, ASST-Cremona started to spread out the lean culture. Indeed, the success of the project within the Medical ward allow people to understand that a deep training on the topic is not needed to make the difference when guided by an expert. This deeply increases people commitment, affecting their resistance to change, because they can speak their voce loudly being heard by the management. According to this, ASST-Cremona is willing not only to start new projects, but also to define professional positions as lean experts, and train or hire people able to support the management in this transition.

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