

LEAN HOSPITAL - CONCEPTUALIZATION AND INSTRUMENTATION

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Sanitary organizations function on a market with certain particularities, reason for which the public hospital must strive to elaborate and implement viable management systems, by relating to the private enterprise model. In order to answer the question: „what system to chose best for the hospital?”, we have performed a literature review of known lean management system. And since, like any other enterprise that is modernizing, the hospital evolves from an archaic system, to a modern one, we propose to highlight the benefits of the Lean school of enterprise administration, which analyses performance, seen from two perspectives - productivity and quality – through continuous improvement and cutting down losses.

Key words: Lean hospital, value stream map (VSM), standard work, five S, mistake proofing, single minute exchange of die (SMED)

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1. Lean – definition and history

The „Lean” enterprise management school is interested in the **performance** seen under the two aspects of **productivity** and **quality**, trying to reach this performance through **continuous improvement and cutting down losses** (*muda in Japanese*). Being originally a concept applied to production, „LEAN MANUFACTURING” is the name of the production systems that produces „**more with less**”, also known as „*Lean production*” or „*No waste production*”, meaning „*minimum COSTS production*”. There are many definition of the concept of **Lean manufacturing**, such as (Drew, McCallum, & Roggenhofer, 2006):

„**A production philosophy that reduces the time interval between the client’s order and the product delivery, through minimizing the waste (non adding value work activities)**”.

„**A team approach, meant to identify and eliminate waste, (non-value adding work), through the continuous improvement of the production flow, undertaken at the client’s request, aiming towards perfection**”.

„**A way of thinking and involving in view of completely eliminating waste, focused on the customer’s success, made possible through the simplification and continuous improvement of all processes and relationships in a climate of mutual trust, respect and involvement of the employees**”.

Originally applied to „**production**”, the concept of Lean management was invented in the **1970’s** by **Toyota Company**. Following the enthusiasm of the Japanese methods of the 70’s and 80’s, the Americans have later expanded the concept to **the assembly of the enterprise**, thus conferring it, a coherent theoretical frame. Therefore, the notion of *Lean* was first coined in *James P. Womack’s* and *Daniel T. Jones’* book ***The machine that changed the world, 1990***, which, even though sold in 400,000 copies, did not represent, as the authors claimed, but a „*wide range of gathered benchmarks in a long journey around the world*”. The following year, **1991**, was depression year in the USA, making a large number of enterprises review their fundamental strategy. As such, „**The machine that changed the world**” came back on the market with new solutions. What was the result? A growing number of managers started asking themselves: „*How could we do likewise?*” and „*Which are the key principles that should guide our actions?*”. As a consequence, another book, „**Lean Thinking**” was edited by the same authors towards the end of

1996, in order to answer to what it was desired to be the **five Lean principles**: *the exact specification of the added value expected by the client; the clear identification of the assembly of value-adding processes; the instauration of a continuous flow between the value-adding processes; ordering the activities, by resorting to the client; the constant improvement power of the previous elements.*

The subsequent papers, „**Team Toyota**” (1996), by Terry L. Bresser and „**The Toyota Way**” (2004), written by Jeffrey K. Liker have made possible the clarification of the Lean concepts and practices, the understanding of the cognitive and social fundaments the systems responds to. Therefore, we can distinguish **four levels of analysis of Lean thinking**:

1. A redefinition of the value produced by the enterprise: the added-value of a product must be defined from the client’s point of view; the enterprise must ensure an uninterrupted creation of value, all along the production line.

2. A development of a characteristic production scheme: the enterprise produces goods according to the demands and not according to the local production capacities; the production lines are standardized in such a manner that they could facilitate the continuous improvement through eliminating the lines the don’t add value; the enterprise maintains a rich partnership with the suppliers and it stimulates them to adopt its own production methods.

3. A development of the original managerial attitudes: the managers and parties involved must find and eliminate the deep causes of the emerging problems; each employee is encouraged to reflect upon and propose the improvement of the productive system, demarche called *Kaisen*; the management must be conducted „on the field”, because only the close experience of crisis situations enables the articulation of an efficient diagnosis (in Japanese - *genchi genbutsu*); decisions are necessarily made consensually.

4. The formulation of a long term strategy: the enterprise must favor the long term game, explaining the objective, or, at a global scale, inscribing it in the future, in a sustainable way; the enterprise must constantly seek performance.

Therefore, the *Lean* concept, coined in the autumn of 1996, has had time to evolve into „*Lean enterprise*” or „*Lean management*”. Nowadays, the *Lean school of management* is in an uninterrupted evolution, the interest for Lean rapidly expanding to administrative services - „**Lean Office**”, to the outlining of the „**Lean development**” product and even to the informatics development.

2. Implementing the Lean management system in the surgery department

Step 1: examining the current managerial systems in order to identify the value-adding activities, from the patient’s perspective. By *value* we define the end user’s perception of the product or service provided by the supplier. In other words, *value is given by „what the client is willing to pay in order to satisfy their needs”*. And if they were told which is the weight of useless operations reflected in the price, of the waiting time, or of correcting the detected unconformities, they would surely disagree to pay for this additional waste of resources. Value is thus a totally subjective, personal notion, difficult to quantify.

Our recommendation no.1:

(a) The patient regarded as „process” and „activities”. The purpose consists in identifying all the critical processes along the „itinerary” of the patient through the section, from the moment **he/she arrives at the hospital, is hospitalized, submitted to medical investigations, to surgical interventions, undergoes treatment and gets discharged** - and critical processes emerging in identifying the impact this whole itinerary has on the diagnosis, communication and transport procedures, etc. What we are basically proposing is the following **patient process for surgical interventions**: *coming to the hospital; being entrusted to a hospital employee - reception; preliminary consultations; hospitalization decision; filling in the hospitalization papers; bed assignment; receiving hospital clothes; programming the necessary medical exams; meals; programming the exams evaluation; diagnosis; surgical interventions decisions;*

programming an intervention; (equipments, personnel, materials, OR); preparing the OR; intervention; anesthesia; post-op or Intensive Care (ICU); moving to a room; treatment; medical analyses; discharge papers; regular monitoring.

(b) Identifying the health problems of the patients or potential patients: classifying the previous processes, according to the constituent activities (for instance classifying the surgical interventions based on sex, age, emergency, frequency, complexity, type of intervention (classic or laparoscopic) criteria).

(c) The analysis of current processes in the department: the technical succession of the activities currently undertaken by the medical and non-medical staff of the unit; defining the activities in non-technical and technical terms; defining the Lean Hospital particular technique corresponding to each type of surgical intervention: *SIPOC Map (Suppliers, Inputs, Process, Outputs, Customers)* (*S - internal suppliers: anesthetist - surgeon; I - inputs: instruments and documents handed over by the internal suppliers; P - process: all the logical activities that make a transformation, a surgical intervention; O - outputs: documents, treatment, post-op medical exams; C - clients: patients, medical personnel from other departments.*

Step 2: Transposing the Value stream map (VSM) to the surgery department. VSM or „**Value flow cartography**” is a method that makes possible the identification of *the adding-value activities and the non-adding value activities in a manufacturing or transformation process, adding information flows (material flows, document flows, personnel flows).* (Jones & Womack, 2003). Therefore, we cannot speak of VSM without introducing the notions of *value, process and stream (flow).*

Wherever there is a **service** provided to a client, there is **value stream**. In order to offer a product or a service, a **production process** is usually undertaken, which includes the *succession of the necessary operations and production activities.* *The value stream refers here to the all the subsequent operations and activities that must be carried out in the adequate order in order to create value for the customer.*

Our recommendation no. 2:

(a) Defining, understanding and determining the key information in the VSM vocabulary and their transposition to the surgery department: **takt time** (the rapport between the patients’ demands and the capacities of the section); **cycle time** (total hospitalization time for each activity according to the types of the interventions; for instance: pre-op stage - time assigned for analysis, for evaluation, for diagnosis; etc. the operating stage - surgical preparation time - personal hygiene, anesthesia time, surgical intervention time, etc; post-op stage: intensive care time, recovery time, medical exams time etc); **flow** (the flow of patient in the operating block and the waiting time - dead time); **push** (planning the patient flow in the operating block, in view of avoiding errors); **changeover time** (time designated to preparing the operating block between the surgical interventions).

(b) The measurement and evaluation of the current VSM represent a photograph of the current moment that lets us know *what happens, when it happens and why.* The purpose consists in the analysis of each type of surgical intervention in terms of *time and technical and non-technical activities.*

(c) Identifying the performance indexes on VSM for each type of surgical intervention: **Operator cycle time** (the total number of individual medical and non-medical activities for each type of surgical interventions); **Activity Ratio** (the percentage of time in which the medical and non-medical activities are actually carried out); **Surgical occurrences** a year for each type of interventions; **The available number of working hours per year** for the medical and non-medical personnel; **The necessary medical and non-medical staff, Takt time, cycle time; the number of medical and non-medical accidents; the number of medical and non-medical errors; the number of waiting hours; the level of materials stocks.**

(d) Re-projecting VSM (future VSM), taking into consideration the resulting performance indexes.

Step 3: Implementing the Standard Work and 5S in the surgery department.

As **Henry Ford** stated, „Standardizing a method means choosing among the many methods the best one and applying it all the time. Standardizing doesn't mean anything else that standardizing for the better”.

The 5S represents a useful instrument in the organization of the working places, its name originating in the five Japanese words that start with the letter *S*: **Seiri, Seiton, Seiso, Seiketsu, and Shitsuke**. In other words, 5S is a program structured in order to obtain in a systematic manner *organization, cleanness and standardization at the working place*, contributing thus to the improvement of productivity and the reduction of quality and work safety related problems. The process of the 5S includes: (Tery, 2003).

(a) Seiri (Sorting). The first step of the process refers to releasing the space at the work place and eliminating all the unnecessary materials and objects.

(b) Seiton (Orderliness). The second step of the process deals with efficiency and the reduction of the time necessary for getting access to the equipments and for accomplishing the working tasks. This step consists in depositing the handy elements in a pre-established location and in a logical order, so as to facilitate their utilization, to make them easily accessible and brought back to their place as fast as possible.

(c) Seiso (Cleanliness). The third stage of the 5S process consists in cleaning the working place (floors, machines, lockers), making them „shine”. Everyone, from manager to operator, must participate to the cleaning process. All the spaces that constitute a working place must be cleaned, with no exceptions, because any abatement from the order established by the second S may be immediately noticed.

(d) Seiketsu (Standardization). This fourth step of the process consists in the establishment of the standards (rules, customs and standard procedures) that the personnel must report to in measuring and maintaining the degree of order and cleanliness.

(e) Shitsuke (Discipline). The last step of the process implies discipline and the respect for the 4 previous Ss. It requires the will of the entire staff to maintain order and to put in practice the first 4 S as a way of working.

Our recommendation no. 3:

(a) In the surgical line of services, a special importance is held by the demarches regarding: the definition of some precise standards for each task assigned to and performed by the employees from the medical and the administrative-operational sectors; the appropriation of these standards by the employees; attention is also paid to verifying to what extent they know the expected results; another matter of interest is represented by the registering in the procedure and quality protocols of the required changes in the standards plan and by the standardization of the behavioral codes.

(b) The elaboration of the following standardization mechanisms: the guide concerning the surgical protocol; the protocol for preventing the infections of surgical incisions; the specific guide of the linen circuit in the hospital; the protocol for daily cleaning in the hospital, for cleaning the hospital rooms, and other locations (it establishes the concrete work spaces, the time of beginning the actions in every sector, the employed solutions, the work techniques, the work stages, precautions and situational warnings).

(c) Establishing the protocol for sanitary personnel competences in preventing and controlling nozocomial infections; the protocol used in view of preparing the sterilization of the surgical instruments; the protocol for collecting and weighing wastes.

(d) Establishing the protocol of aseptic technique in the operating block, which comprises: general principle, the specific dress code in the operating room, walking around in the operating

block, washing the hands, hands antisepsis, wearing gloves, compulsory decontamination, collecting linen, solid waste, the responsibility of doctors, nurses, interns.

Step 4: Implementing Pola Yole (Mistake Proofing) in the surgery department.

Poka Yoke is a **quality ensuring technique** developed by **Shigeo Shingo (the 60's)** in the Japanese companies. The term „poka yoke” in Japanese means inadvertent mistakes („poka”) prevention („yoke”). Poka Yoke is the path to detect, in a simple, robust and easy way the faults and errors in the company. The essential idea of „Poka Yoke” is process projection, with the helping devices, in such a way that mistakes are impossible to commit or easily detected and corrected. Mistakes are by hundreds in an organization but most of the times they engender the flaws „endured” by the customers.

Our recommendation no. 4:

(a) Identifying the failed surgeries, classifying them after the type of intervention, after the gender and age: *the moment of the intervention, seen from the perspective of the disease evolution degree; the treatment applied prior to hospitalization; the pre-op period (medical exams and the time for results release); establishing priorities in using the OR; the technical equipment of the operating block; the professional training of the surgical team; post-op treatment; bureaucracy; others.*

(b) Eliminating the obsolete procedures, the old instruments, of the defective materials and medicines; avoiding human errors through constantly qualifying the staff.

Step 5: Implementing Quick Changeover (SMED - Single Minute Exchange of Die) in the surgery department. SMED = **S**ingle **M**inute **E**xchange of **D**ie is a concept developed by **Toyota Motor Corporation, starting with the 50's, and described by Shigeo Shingo in the book „A Revolution in Manufacturing: the SMED System”, 1985, The Productivity Press, USA that was published in a highly competitive industrial univers, in which the Japanese economy has proved its pivotal role in the changes of the series of product and in the global industrial flexibility. The SMED dynamics enables the acceleration of the production, producing anything and anytime. In industry, the SMED method is known under the name of changeover time, meaning: the time spent until finishing the last piece of a lot and producing the first fine piece of the next lot, or the necessary time for a post or work system in order to pass from one type of product to another.**

The SMED objectives: reducing the changeover time, minimizing the volume of work necessary to attain an anterior objective, the target being: „no change shall take more than 10 minutes”.

Our recommendation no. 5:

(a) **A hospitalization planning:** it must set the hospitalization data of the patients for a surgical intervention. The planning horizon is of a few months, depending on the health system had in mind and the treated pathologies.

(b) **A construction of the surgical program on a time table noted with T days.** We are talking about establishing the surgical interventions that have to be performed during each day on the time table, according to the resources to be employed. Planning the hospitalizations provides the patient a date that risks becoming rather inexact because of the perturbations, which can occur in the operating block (emergencies, annulments, complications, inexact operating time estimations). Consequently, we propose to *adopt a process of hospitalization date confirmation, by constructing the time table of the surgery schedule, for T days.*

(c) **Setting the surgery schedule on a daily basis:** the objective is to update the previously settled surgery schedule for a T period of time, taking into consideration the various problems that can occur, due to emergencies.

(d) A real time governing of the operating block: this deals with the decisions of the person in charge of the operating block when an incident occurs.

3. Conclusions

Adapting Lean management to the hospital environment brings forth a **flawless methodology** that:

- Enables the description of the institution in the context or providing the means and analysis methods of the environment, of the internal and external opinions.
- Makes possible the description of the main development axis, of the objectives associated with each level of responsibility by using the method of collecting the facts referring to the activity and the means furnished by the list of internal and external opportunities.
- Facilitates the pursuit, on all levels, of the continuous improvement processes, relying on the knowledge and experience of the professionals, which ease the daily tasks.
- Enables the hierachization of realist objectives, associating them with the objectives of the human resources, and easing the analysis of the costs adherent to these resources.

By proposing a systematic auto-evaluative system, (VSM), Lean Management **introduces an auto-evaluation culture** inscribed in a project of the institution, in a contract based on objectives and means in its internal abatement.

By finally relying on a strong management system, Lean management enables the **directing of all energies towards a shared vision of the future.**

The conditions for the success of Lean Management can be outlined only in an endeavor to volunteeringly build a system meant to improve the performance of a healthcare institution, oriented not only towards the satisfaction of their patients, but also towards the satisfaction of the entire staff. Not any change is necessarily an improvement, but any improvement is a change. Therefore, we have to clearly explain which the targets are, what we expect and what we can change within the system: this is the responsibility of the of the administrative team, of the managers, and of the people involved.

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