Lean Healthcare. An Experience in Italy

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Abstract. In this paper we present the experience of a lean implementation in a Hospital. It all steamed out from a need to cut cost, and the focus on inventory reduction. The methodology adopted and the peculiarities of an implementation in a hospital are presented. A strong reduction in inventory has been achieved but, more important, broken processes which lead to excessive inventories have been identified so giving the possibility to remove the root causes and avoid having the problem again. Finally, one of the best results has been to make people in the hospital see differently about materials management activities: best and faster results, with less effort, are not achieved by batching (e.g. ordering 3 weeks consumption of a medicine needed) rather by standardizing activities and levelling orders and activities throughout the week (e.g. order every day all medicines consumed).

1   Introduction

Healthcare system in Italy is managed at a regional level, and 60% of Regions' expenditures (and budget) are for healthcare system.

Population is aging and life expectation increasing, therefore healthcare expenditure steadily increases, making cost reduction one of the main priorities for the Italian government.

On the other hand, citizens ask for a higher and higher service level from the healthcare system, and they are worried about decreases in healthcare budget because they think this will unavoidably lead to a service level reduction.

Our experience is that healthcare, and most services in general, are at the very beginning in the search for operational excellence, therefore much can be done to decrease costs and at the same time to increase service level.

Many models and techniques of Industrial engineering are being transferred from manufacturing to services, and books about service operations are starting to appear (e.g. Johnston and Clark, 2002, Hill, 2002, Slack and Lewis, 2002, Chase et. al, 1998). Lean production approach also is being implemented in services, but

experiences are at a very early stage, probably because lean approach is not widespread yet.

In this paper we present our experience in implementing a lean approach to material management in a leading hospital in Italy.

## 2   Materials and information management

In a hospital there are two main flow of materials: medicines and pharmaceutical, and other materials.

Medicines and pharmaceuticals are managed by a central Pharmacy, where the director is in charge of discussing with the medial doctors the best medicines, and alternatives for existing ones, also considering costs as a criteria. The director of the Pharmacy also selects suppliers, makes supply contracts, and sets stocks levels.

Most commonly used medicines are kept in stock and for a few of them there are contracts with suppliers setting prices over a period of 2-3 years.

Other medicines are not kept in stock but ordered when needed, for example because a person arrives who is already taking his/her medicines for a pre-existing disease, and the hospital usually carries on the same therapy.

Wards also have stock of most commonly used medicines, so to have them at hand. In the considered hospital Pharmacy delivers to wards twice a week, but medicines are not ordered so frequently. Because ordering takes time, medicines are ordered in lot quantities so to last for one week or two. If there are no orders for that ward, no delivery is done.

Material flow   **Fig. 1.** medicines and information flow
Information flow
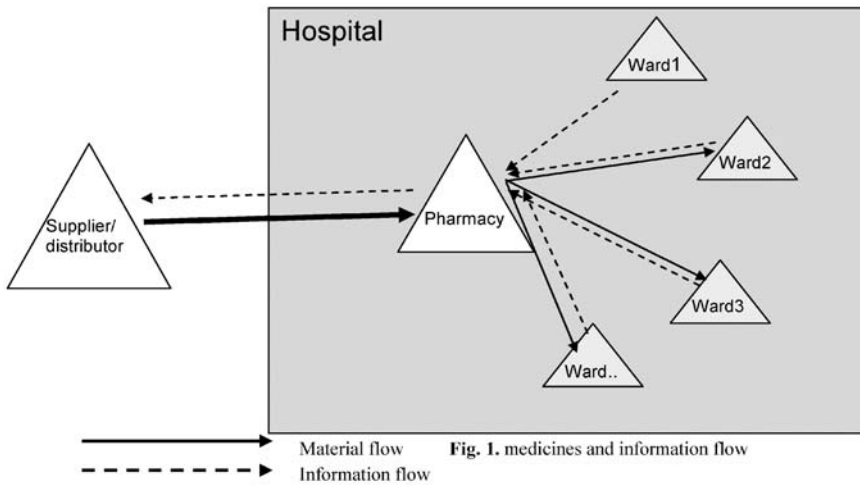
Non pharmaceutical materials are not managed by the Pharmacy but by a common purchasing department, which takes care of buying everything, from syringes to napkins to X ray plates.

Most non pharmaceutical materials are not kept in stock in a central location, but managed directly by the wards, which store them and ask the purchasing department to order a new lot whenever inventory gests to low. In the considered hospital the lot quantity is about 4 months consumption, with an ordering level of 2-3 months, due to the uncertain lead time to get what ordered.

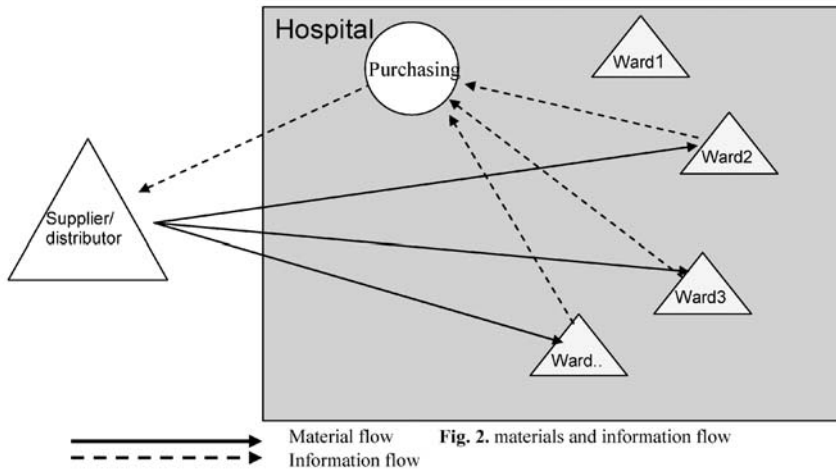Every ward orders what needed independently from what other wards are doing.

Material flow   **Fig. 2.** materials and information flow
Information flow

3   Inventory analysis

In the considered hospital, overall stocks, considering central stocks and stocks present in the wards, used to turn about 2,8 times a year.

We organised a kick off meeting with representatives of all people involved: director of purchasing, director of pharmacy, nurses director, IT director, and accounting director.

We were introduced by the top management of the hospital, and we presented the objectives of the work, and the methodology. In particular, the objective was to cut inventory without decreasing service level. Wherever possible, a reduction in expenditure was also an objective.

We described we wanted to map material and information flow, to highlight opportunities to decrease inventories. We made crystal clear we needed and wanted

their collaboration, and no-one will be considered responsible for present situation, only for not improving it.

The first step has been to discover with them how things were actually working, to make clear we did not want to impose a one-fits-all recipe, but wanted to know their specific problems, and find specific solutions with their contribution.

Finally, we made clear we wanted to start the improvement process, to give them the tools to understand and improve, but we also wanted them to become independent from us as fast as possible,

The material and information flow description often highlighted an unknown situation. Our mapping had as a first result to make clear to everybody present situation, in term of rules adopted to manage inventory (for example that there was no common and standard rule, but every ward implemented its own, and often different persons followed different rules). Moreover, regular meetings among key persons allowed to share a common understanding of the present situation, a common analysis and common improvement directions.

Scepticism was present for a long time, but we had a strong support from top management and this allowed us to have everybody doing what was needed, even if not 100% convinced.

We started from an overall inventory analysis because we thought the first problem was not in the overall stock management rules, but in problems with specific items and that there were very different situations among different items.

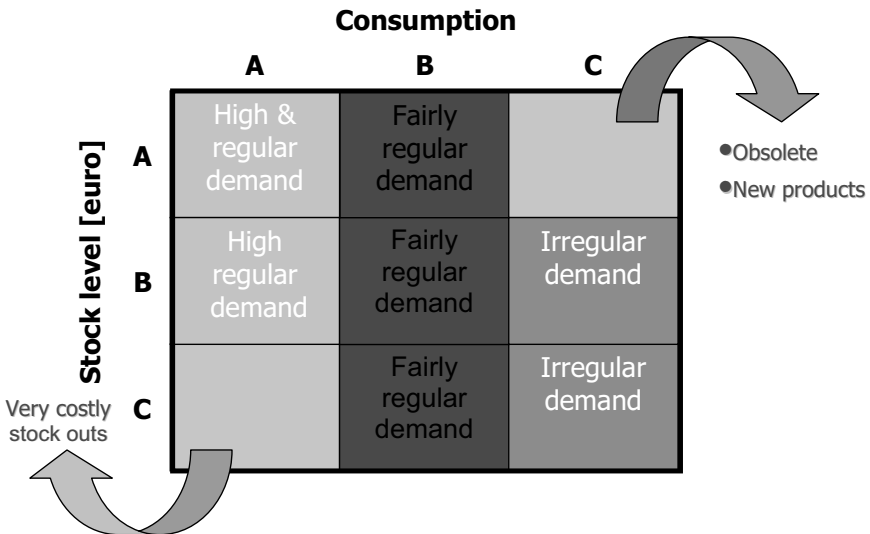We adopted the Kralic matrix to classify items considering consumption and stock level.

Fig. 3. Kralic matrix

In the A-C cell we found may products which were forgotten by everybody. For example, the medical doctor started using a new (and maybe less expensive) product,

and nobody took the job of cancelling automatic reorders when stock fell under the set limit, and make sure that all remaining stock were consumed.

Starting from items with the highest value we could highlight about 300.000 euros of material which was about to become obsolete, with virtually no consumption.

We could even find items with no consumption and purchasing orders, and other materials with such a low consumption it would take years to finish stock (again risking to become obsolete befor being used).

This allowed not only to identify these items and arrange for a consumption, or a sale to other hospitals, but, most important, allowed to identify broken processes which allowed this situation to happen.

Repairing those processes will make impossible to have obsolete items again (and stocks remain low).

We found very few items in C-A cell. In a hospital there are many alarms and procedures to protect from stockout, or to react urgently in case of stockout, so to minimise the impact. But there are no procedure or alarm to highlight extra stock.

With an increased confidence in out methods, gained from the people of the hospital through the fast and clear results of our first analysis, we performed a second step considering all items in cells A-A, A-B, A-C, B-B and B-C and taking a few as an example, we questioned the stock management policy, the reorder point, the safety stock levels, the lot size, the frequency of orders etc. Lot size in many cases came out as constraint by the supplier. Thus on the one hand we invited to question with the supplier the constraint, on the other hand we sorted out all items which have been ordered in different quantities throughout the year: all purchase orders could be done with the minimum quantity ordered, how came it had been ordered in larger quantity?

4   First results

First result from this attack to inventory has been a tremendous decrease in overall inventory:

Pharmacy + wards :   45% reduction
Other materials: 24% reduction
for an overall reduction of   35%, out of the 6 million euros initial inventory.

This was not enough. The hospital was continuously decreasing inventory by fixing broken processes which were actively sought after, and by improving suppliers delivery. We found out that there was no formal records about supplier delivery performances. Probably suppliers knew this too, and both speed and on time delivery were low (from a sample we could witness). As a reaction, Pharmacy and wards increased the safety stocks and the ordering points. Now this has changed and there is a closer monitor of supplier performances and the hospital is questioning supplier constraints (if lot size is affected by the desire to have minimum delivery quantity, let's put together not larger quantities of a single item, but consider the whole bunch of materials the hospital orders from the supplier. Next step will be to pool with other hospital in the same region and reach a milkrun model).

Inventories were reduced much more in the central stores (mainly the Pharmacy) than in decentralised locations (i.e. wards). Therefore the next step has been to tackle the relationship (material and information flow) between the pharmacy and the wards.

5   Pharmacy – Wards relationship

Pharmacy and wards inventory management were carried out independently: both were looking at their own situation, and tried to improve their local performance.
We approached the problem for a different perspective. Once more the lean one.
We looked at the flow. Medicines had to flow from the supplier to the patient. Stocks at Pharmacy and at ward had only to cope with the fact that neither the Pharmacy nor the supplier were delivering every day, and with the fact that there is always a certain degree of uncertainty.
We made clear that Pharmacy was the one responsible for coping with uncertainty. Not the ward. Therefore, only the Pharmacy had to keep safety stock, the ward had to behave considering all medicines managed in stock, as always present at the Pharmacy.
The following actions have been undertaken with the sisters of two pilot wards:

⇒ get rid of all medicines that are not common use, by giving them back to the Pharmacy. A list of all non common use medicines that are requested by the ward, and that are not been used completely is passed to the Pharmacy every month. In case another ward needs a non common use medicine, it asks the Pharmacy which check on the list is another ward has any.

⇒ 5S intervention for the positioning of the medicines

⇒ code coding medicines on the base of the type of use: Green for medicines that are common use (demand is high and regular), Yellow for medicines that are sometime used (demand is low and depends a lot on the number of patients treated with that medicine in that period), Red for medicines that are not common use. Have been ordered for a specific need of a specific patient, but it is quite improbable someboby else using it will arrive in the following weeks

⇒ revise reordering approach. Instead of lot ordering, when a certain stock level were reached, the following procedure was adopted: Green medicines were ordered twice a week (i.e. every time the Pharmacy was delivering), asking for the needed amount to replenish the stock to the desired level. Yellow medicines were ordered every time there had been a consumption (due to the low and irregular demand it may not be consumed for weeks), and the quantity was what needed for replenish the stock to the desired plus the amount needed to threat the patient that came in and started the consumption till the next delivery from the Pharmacy. Red one were not to be checked for reordering.

6 Results from the pilots

Here again we found scepticism. In particular the proposed method was perceived as leading to more time and effort devoted to medicine ordering (not perceived as an interesting activity).

But again we had the full support of top management, and as a first action we involved the sisters of the pilot wards in a run of the beer game. This helped them in seeing the impact of their actions on the Pharmacy (unpredictable demand also for high volume medicines) and how this was causing high inventory. Moreover, regular meeting with the sisters and the Director of the Pharmacy as the project was going on, allowed everybody to see a common objective and helped in destroying the walls and the wrong beliefs existing between Pharmacy (wards always keep a lot o stock) and wards (Pharmacy takes a long time to deliver, and not always has what has been ordered).

Inventory in wards was reduced by 10-15% (stock is decreased in Pharmacy also but this has not been quantified yet).

Space needed has been reduced by 15%.

Time required to check date on medicines dropped by 80% (much less medicines and faster turns).

To their surprise, the expected bad impact of more frequent orders did not arrived. On the contrary, making orders much more regular (an order is placed every Tuesday and Thursday), a good portion of the order is always the same (Green medicines) with small changes in quantity, so also receiving the medicines is more easy. Every time there is more or less the same amount, for a large portion it is always the same medicines, therefore more easy to check, and faster to put in place...

People in the Pharmacy's storehouse also were happy (a complaint was expected for more frequent orders of common use medicines): "when the order arrives we know already what you need". A large portion of the order is no surprise. They can more easily organise their activities.

Making orders more regular helped in standardise activities, and in reducing surprises (e.g. if one day a large quantity of medicines is ordered because many of them have reached the ordering level, then a lot of time is occupied in receiving, checking, storing these medicines. Then the following week very few medicines are ordered and much less time is occupied. Every week is different. It is much easier to allot every Tuesday and Thursday a defined amount if time, which with the new method will be constant, for these activities.)

For further decreasing stock at the wards, the Pharmacy illustrated again a procedure, made simpler than before, to get medicines from the Pharmacy in case an urgent need arises, so to make clear there is no need to have materials in the wards "just in case".

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