Public Healthcare Logistics and Supply Chain Management (SCM): Why is it so difficult to optimize operations?

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Abstract
This paper describes three case studies of Logistics and Supply Chain optimization in public primary care networks and public hospitals and demonstrates the relevant role of Logistics and SCM in the simultaneous improvement of service levels and efficiency, so necessary to this industry. Opportunities, difficulties and key learnings are identified.

Keywords: Hospital Logistics, Healthcare Supply Chain, Service Operations

Introduction

In developed countries, the Public Healthcare Sector (PHS) is under great pressure to reform given the continuous rising on costs, the increasing percentage of GDP (gross domestic product) spent on healthcare, the growing customer dissatisfaction with the quality of care and value received, and the continuous technological progress.

Spending in healthcare has been increasing in most developed countries and it is expected to grow even more, in line with life expectancy increase, ageing population, rising healthcare prices and costly developments in medical technology. Healthcare total spending represented in 2011 about 10% of the GDP in OECD countries (6,7% of the GDP from public funding). Some countries spend much more, for example, the U.S. spent in 2011 about 17% of the GDP on healthcare (8,3% of the GDP from public funding) (OECD Statistics and OECD 2013). OECD estimates that public health care spending could increase by 3.5 to 6 percentage points of GDP by 2050 across the OECD countries (OECD 2010).

In Europe, generally speaking, we have a socialised medicine that provides universal coverage through hospitals and physicians (primary care) and where the state/government plays the simultaneous role of funding institution (payer) and employer institution (provider). The impact of the financial and economic crisis on public budgets has heightened pressures for reform. Public spending on health care is one of the largest government spending items – on average, for the OECD countries, it absorbs currently 15% of general government spending (6,7% of GDP), up from 12% in 1995 (OECD 2010).

The 3 case studies utilized in this article are based in Portugal, were the situation is no different. On the contrary, since for many decades the focus was on improving the infrastructures and

developing a healthcare system that could reach all citizens, efficiency and costs were somehow not on the top of the agenda for a long time. Portugal reached the maximum spending in 2009, with 10,2% of the GDP, and decreased it to 9,7% in 2011 (6,3% of the GDP from public funding), after sever cutting on public healthcare spending as consequence of the economic crisis. Only in the last ten to fifteen years, hospitals and primary care units/centres started to look upon to logistics in order to obtains gains in terms of capital expenditure, operational costs, as well as in order to improve customer service levels (internal and external).

This case study based paper places strong emphasis on the practical implications, opportunities, difficulties and key learnings.

Hospital Logistics and Supply Chain Management

In most European countries, the PHS is one of the last sectors of activity where the best practices in Logistics and SCM are yet at a very low level of maturity. Integrated logistics and SCM, EDI (Electronic Data Interchange), ECR (Efficient Consumer Response), VMI (Vendor Managed Inventor), QR (Quick Response), JIT (Just-in-Time) logistics, collaborative planning, etc., are practices rarely seen on the public hospitals and primary care networks.

If one looks at the typical expenditure breakdown on hospitals and primary healthcare networks, the human resources come at the top to no surprise, but supplies are the second leading cost for those organizations. The cost of supplies typically represents between 25% and 30% of a hospital's operating budget (according to Gartner and the Association for Healthcare Resource and Materials Management).

The analysis of the purchasing profile of more than ten Portuguese hospitals and networks of regional primary care units shows that pharmaceuticals represents around 60% to 70% of total value of supplies and medical equipment and devices represents 20 to 25% of total value of supplies. This two categories represent together around 80% to 90% of the total value of supplies.

There are many scientific papers and consulting reports giving visibility to the high level of inefficiencies and poor implementation of Logistics and SCM practices in the healthcare sector/industry (Wigglesworth 1998, McKinsey & Company 2012, Booz & Company Inc. 2011, Nachtmann and Pohl 2009, Su et al. 2011, Jarrett 2006, Natarajan 2006, just to name a few). In most cases, the high costs do not correspond to very high service levels to end users, such as nurseries, clinical units, operating rooms, etc (internal customers). On the contrary, purchasing, supplies and logistics departments are commonly seen by the healthcare professionals as part of the problem.

For instance, “only” the application of global standards such as GS1 could save billions in inventory and in medication errors. A McKinsey & Company (2012) report points out that the implementation of global standards could enable inventory reduction of $60-94 billion and reduce the costs of managing and storing inventory by $10-14 billion. Furthermore, it could help reduce obsolescence by $19-27 billion. Also medication errors, that even in developed markets like U.S. and U.K., occur during 10-20% of all inpatient admissions (Poon et al. 2010), could be reduced by 50%. Implementing global standards across the entire healthcare supply chain could save 22-

43.000 lives, avert 0,7 to 1,4 million patient disabilities, and save $9-58 billion in healthcare costs on an annual basis (McKinsey & Company 2012).

If one compares PHS with the retailing industry, where they started to adopt global standards such as the European Article Number/Uniform Code Council of United States (EAN/UCC) almost 40 years ago, it is easy to understand the huge gap.

Several Efficient Healthcare Consumer Response (EHCR) initiatives also identified significant savings in the supply chain functions, including transportation and distribution, order and inventory management. As an example, a study from CSC Consulting Inc. (1996) identified supply chain savings of $11 billion in the USA (without considering the cost of goods).

In the USA, group purchasing organizations (GPO) for healthcare began four decades ago. In 1997, there were more than 550 GPOs in the US market that represented approximately $90 billion, 75% of all medical equipment and surgical supply value, and 85% of all pharmaceuticals supply value (Medical Economics 1998). Some studies point out potential price/cost reductions between 5-15% in the first years after the implementation of GPOs (Johnson 1999).

The PHS is probably one of the last sectors/industries to enter the information age. The degree of change and investments required are significant, however, the benefits of capable logistics management and integrated supply chain management are also extremely large (Wigglesworth 1998). These objectives should be pursued since they are definitively aligned with the expectations of governments, health professionals and patients.

Three Portuguese Case Studies

The selected case studies focus on how public hospitals and primary care centres/units dealt with purchasing and supply logistics and the way they transformed themselves over the last few years. The starting point shows a rather similar initial status, summarized in the next few paragraphs, before going into the details of the transformation process each one carried out.

Each institution had its own purchasing & supplies department that was responsible for all purchasing and most of the physical stock keeping and delivering. There was no separation between purchasing and supplies functions and the logistics function did not exist. The purchasing & supplies departments did not have a clear understanding of the logistics processes and tended to be overloaded with bureaucratic purchasing procedures, leaving very little time for physical stock keeping, inventory management and delivering materials to end users. Regarding the pharmaceutical products in all institutions, warehousing, picking and delivering of pharmaceuticals were independently managed by the pharmacy department.

The pharmacy and supplies departments received requests/requisitions from wards and clinical units/departments, and were responsible for picking and preparing such requests and, in most cases, for delivering these goods to wards and clinical units/departments. Wards and clinical units/departments also kept some stock in their own storage rooms and placed requisitions in order to replenish their stock. There was no visibility over stocks spread around on those storage rooms.

Urgent requests were dealt directly, on a one by one basis, with either the supplies or the pharmacy departments.

The proliferation of items/articles used in each organisation was also recognised and it was difficult to resolve without convenient specialisation and technical knowledge from staff of purchasing & supplies department. Purchasing departments at each organisation were staffed by ”specialists in bureaucratic purchasing procedures”. Therefore, they found it difficult to discuss with the health professionals about their real needs and they found it even more difficult to influence them towards cheaper alternatives.

In all organizations, warehousing was very poor in terms of layout and physical infrastructures, comprising a collection of very small depots spread around several buildings and levels, making it almost impossible to use appropriate handling systems and unit loads. There were no computer based warehousing management systems. The location system was managed manually, using fixed locations. Bar coding and automatic scanning systems were not used. Productivity and service measures were also not implemented.

In terms of the hospitals, the distribution service involved delivering the required goods to wards/departments weekly. Both hospitals already had implemented single-unit-dose delivery for pharmaceutical products, where the dairy intake of each individual patient is picked and prepared at the pharmacy warehouse. There were no electronic means of capturing consumption data, neither for planning/forecasting purposes, nor for quick replenishment situations.

In terms of the regional primary care network, the service provided by the regional health authority to the local centres/units was very similar to the 2 hospitals. In this case, the only significant difference is that local health centres/units are geographically spread over a given region, requiring some delivery vans to be used on a regular basis. In particular, the delivery frequency was very poor (every other month), there was no visibility of stocks at the local centres/units, and once materials left the warehouse it was given as “sold”/consumed.

This starting point analysis shows very basic logistics operations, little understanding of differences between purchasing and logistics activities, contracts based on price (not on total cost and service), unsynchronized product flows, high inventory levels, poor customer service, little use of information technology, paper based information management, no co-ordination or collaboration along the supply chain.

a) Case Study A and Case Study B

Case study A corresponds to a major Local Health Network, including a 432 bed General Hospital and four local primary care centres/units, in the north of Portugal, part of the National Health Service, with a Corporate Public Enterprises status (management autonomy under an agreed budget and contracted activity programme).

Case study B corresponds to a major 517 bed General Hospital Centre in the north of Portugal, part of the National Health Service, with a Corporate Public Enterprises status, including several wards/extensions in the radius of 20 km.

In both cases studies, in the first phase, the design of the new logistics system was carried out in four main dimensions: the physical logistics infra-structures, the logistics processes, the informations systems and the organizational structure. In the solution designed for both cases, the clinical units/wards would register consumption and the central logistics department would replenish local stock with a given frequency using a up-to-par level stock model.

The second phase involved the implementation of those four dimensions over a period of time:
- In Case B, the main warehouse was expanded and the layout and physical conditions were improved. The pharmaceutical products warehouse layout and physical conditions were also improved;
- In Case A, the warehouse was expanded and the layout and physical conditions were improved in order to cope with all families of products, including pharmaceutical products. This is quite innovative, since the traditional approach involves segregating pharmaceutical products from the other.
- Implementation of fully redesigned logistics processes, including ordering, warehousing, picking, delivering to the clinical units, returning and planning/stock management, was carried out;
- Implementation of the logistics function, including the appointment of the Director, embracing central warehouse, pharmaceutical products warehouse, picking, and distribution, local stocks in the clinical units/wards, integrated planning and stock management, was carried out;
- Development of the information systems was also carried out, in order to include stock management of the storage rooms in the various clinical units/wards, the utilization of PDAs – Personal Digital Assistants and/or touch screen terminals, the utilization of dynamic two-tear stock management methods, the possibility to work with consigned stocks, and a number of performance reports.

All objectives were achieved in both case studies in terms of cost, efficiency, working capital and service levels. The opportunity for future improvements are very dependent on:
- deeper integration of pharmaceutical staff into mainstream logistics processes;
- changing the purchasing strategy and implementing collaboration with the suppliers in order to achieve even lower stocks and faster response to hospital requirements.

b) Case Study C

This case study corresponds to a regional authority responsible for the main network of primary care units/centres in the north of Portugal, part of the National Health Service, with a Public Institute status (full civil servant, dependent of the health ministry).

This network includes more than 200 primary care units/centres, spread geographically over the north of the country that were rearranged from five sub-regional networks into 25 functional groups of primary care units/centres. Previously, each one of the five sub-regional networks were independently responsible for purchasing, storing, managing inventory, and delivering every other month to the primary units/centres. Each one of the sub-regional networks used several and non-integrated informations systems.

The rearrangement into 25 functional groups of primary care units/centres created the right context to fully redesign the system, including the network of distributions centres (physical infrastructure), the logistics processes, the informations systems and the organizational structure. The optimal design established two DCs and fortnight delivery frequency to primary care units/centres.

After three years of implementation/transformation work it was possible to achieve the following:

- two new central DCs were designed and built, implementing the best warehousing practices and processes in order to cope with all families of products, including pharmaceutical products. Once again, this is quite innovative, since the traditional approach involves segregating pharmaceutical products from the others.
- delivery vans with multi-temperature bodies were subcontracted to a logistics operator;
- a new state of the art information system was implement and all corresponding IT infra-structure in order to connect all primary care units/centres with the central DCs and central offices;
- a VMI like model was implemented, where the primary care units/centres only had to register the consumption while the central logistics function/team was responsible for managing and replenishing stock to each primary care unit according to agreed service levels;
- this model was implemented in a number of pilot local care units, and then rolled-out to the other units/centres. Each implementation involved stock counting, refurbishing the local storage room(s), implementation of computer terminals and IT infrastructure, training on the new methods, etc, before moving to the next one;
- an integrated planning function was implemented;
- a central ordering process was implemented as part of the logistics function and integrated with the planning function;
- the organization was designed according to the best practices, a new Director was appointed, and the structure staffed with people that were previously in other functions;
- finally the purchasing department needed to be redesigned, in terms of responsibilities and organization. Category managers were implemented and a contractualisation support team was repositioned.

Relevant savings in inventory and operating costs were achieved. More frequent and much more robust delivery services were implemented, achieving a very good service level. The traceability of products and the control of temperature also become also possible.

The opportunity for future improvements are very dependent on:

- more flexible contracting with the suppliers, in order to achieve more frequent and reliable deliveries;
- collaboration and integration with the suppliers, in order to achieve fast response and lower stocks;
- analysing opportunities of more complex outsourcing;
- continuous improvement of processes and stronger interactions with health professionals.

Difficulties

Common to all these case studies, there were present in some extent the following difficulties:

- Original physical storage/warehousing conditions were very limitative of any process and cost optimization, so they had to be revamped or built from scratch.
- Legacy informations systems and poor reliability of data were always a major barrier to move into higher levels of control and optimization. New information systems had to be implemented in all cases;
- Lack of common standards on product identification, catalogues that were not aligned and large product/materials complexity were issues also presented in all cases;
- Hospital wide cross-functional integration was never easy, especially one those interfaces between non-health professionals and health professionals. Physicians/Doctors have enormous influence, being the initiators of most of the procedures and processes that activate the supply chain. However, many physicians do not see themselves as part of the chain;
- In the case of the pharmaceutical products, pharmacists tend to react to the logistics/SCM attempt to control those stocks and physical flows;
- External integration with suppliers was almost impossible (apart from very confined situations) given a number of limitations: the IT/legacy systems infrastructure; the lack of ownership of the processes, the limitations imposed by the public acquisition's legislation in Portugal; the internal organization of the procurement/purchasing department;
- Getting the health professionals to register the consumption at the clinical unit/centre required high persuasion over;

Key Learnings

From these three case studies (and a number of other case studies not here described), some learnings can be identified:

- PHS is not all that different from other industries in terms of logistics and supply chain management. For instance, there are huge similarities with large retailers and their situation in the 80's of last century. PHS should be even more demanding in traceability, temperature control and product location, but unfortunately it is lagging 30 years in adopting the best logistics and SCM practices. It also means that Logistics and SCM knowledge, methods, and tools are applicable with little adaptation;
- Firstly, one should get right the basics, making sure the hospital can be run in a reliable way, with a reasonable service level and at a reasonable cost. This is the **first stage of maturity** ("Infancy") were the physical infra-structures (warehousing space, delivery vehicles, storage devices, etc), information systems and IT infrastructure, as well as warehousing, delivery and replenishment processes should all be implemented to a level that allows control over the stocks across the organization and the internal logistics flows;
- Secondly, one should optimize the internal logistics in order to reduce costs, increase efficiency, reduce inventory carrying costs and improve service levels. This is the **second stage of maturity** ("Internal Logistics Optimization"), where the focus should be on hospital/network wide optimization, from prescription/bed/care unit to inbound activities. It involves strong interactions between health and non-health professionals, the implementation of a single responsibility for logistics and SCM across the organization,

the implementation of an integrated planning function, and the implementation of lean principles. Data availability and reliability becomes even more relevant than before, as well as consumption registration at the bed/care unit level becomes necessary. VMI can be implemented with client units that have more autonomy and/or are geographically distant. The Purchasing/Procurement department is an area that requires major change, since it has to move from a bureaucratic and formal public legislation compliance focus, to a category management and total cost of ownership focus. Some outsourcing of basic supplying/SCM activities becomes then possible. Some initiatives regarding supplier integration such as VMI becomes possible to reduce stock handling and ownership;

- Thirdly, one should optimize the supply chain in order to reduce Total Cost of Ownership (TCO), including suppliers (external integration), and add value in terms improved clinical protocols/outputs and patient safety. This is the **third stage of maturity** ("supply chain optimization") and it involves strong interaction with suppliers, namely full VMI, CRP, and Just-in-time collaborative approaches based on TCO, direct delivery to services/care units, automation of operational procurement/purchasing processes, integration of IT systems across hospital and suppliers.
  Standards such as GS1 and the alignment of catalogues are fundamental to this third stage. Hospital purchasing/supply departments have to be completed reengineered and refocused towards providing value added services to their internal customers. This level of maturity makes it possible to consider more complex outsourcing options.

Case study C can be classified as in the transition from maturity levels 2 to 3, while Cases A and B can be classified in maturity level 2.

Next Steps

Only when level 3 of maturity is achieved, one should be looking to redesign and optimize the extended supply chain, considering key suppliers and cooperation with other players as part of it, in order to further reduce costs, find economies of scale and share capital expenditure. Using the analogy with other maturity models (The Performance Measurement Group 2001), this is a **fourth stage of maturity** ("extended supply chain optimization") where considering options such as group purchasing, centralization of stocks, distribution centres and inbound logistics across several organizations, and fully outsourced logistics and supply chain management are natural.

Group purchasing in the Public Healthcare Sector is an option that should be considered towards more effective purchasing. The type of organisation could be either a consortium or a co-operative arrangement between hospitals, regional health authorities and other public health providers (Guedes 2000). Naturally, the basic principles of public finance such as transparency and equal opportunities in supplier selection, cost efficiency and cost control should be guaranteed.

The level of control over the inbound flows is another option that should be discussed in order to accomplish integrated logistics and supply chain management. Two possible directions are more likely to emerge (Guedes 2000):

A. The Public Healthcare Sector players take over the control of the inbound supply chain and implement their own centralised logistics operations in order manage the entire pipeline together with centralised/group purchasing. This new organisation, or organisations, should be

responsible for providing a total supplies service, including not just supply, storage and distribution of goods to their members, but also negotiating contracts on their behalf. The NHS Supplies Authority, set up in 1991 by the UK National Health Service (NHS), represents the most typical example of this type of strategy. More recently, part of the operations were even externalized to DHL.
This approach is quite similar to the movement followed by most large retailers about 3 decades ago, when they centralised their purchasing departments and their logistics operations, in order to gain control over their inbound supply chain, to achieve economies of scale and to guarantee the right service levels to their stores.

B. The Public Healthcare Sector players recognise that distributors/wholesalers of pharmaceutical products and medical devices/equipment will play a stronger role as supply chain integrators, and use their infrastructure in co-ordination with PHS own centralised/group purchasing organisations. In this case, public healthcare services should develop contracts with a small number of large national distributors/wholesalers to run the logistics operations, including inventory management, transportation, direct delivery to hospital wards, VMI, etc. This strategy assumes less control over the upstream movements and is similar to the one implemented by most private hospital chains in the USA.

The choice of one of these alternative strategies depends on the level of control and ownership desired by National healthcare authorities, the size and geographical coverage of distributors/wholesalers, the legal framework and the National health regulations.

Conclusions

Why is it so difficult to optimize the logistics operations and SCM in the PHS? The following factors are definitively part of the answer:

- A key difference between healthcare and other industries is the role of government, especially on those regions like Europe, where the Public Administration is simultaneously the main provider (employer) and the main payer/funding institution;
- The purchasing and public contract's legislation is a huge constraint. Transparency and equal rights should be present in public contracting, but not to the point where it makes it almost impossible to set up any long term relationships with suppliers that involves risk sharing;
- Resistance to change, mainly from health professionals, is present to a level not so common in other private sectors/industries;
- Civil servant's carriers are "vertical", focused on technical and scientific specialization, giving little importance to management experience and to cross functional activities;
- Lack of standards such as GS1, EDI, etc, across the supply chain is a limitation, and any significantly changes will take years to be implement;
- Since for many decades the focus was on improving the infrastructures and developing a healthcare system that could reach all citizens (e.g. Portugal), efficiency, costs and rigorous management have not, somehow, been in the top of the agenda for a long time.

The pressure to reduce operational costs and to improve efficiency has never been so high. The degree, type and pace of change possible in each country is strongly conditioned by the National

funding arrangements, evolving social system, political environment, regulations imposed by health authorities and community attitudes towards the role of government and the application of concepts of access, equity and universality.

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