ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
ECONOMIC STUDIES

ГОДИНА XXI, 2012, 1

Maria Costin[1]

HOSPITAL LOGISTICS, THE WAY TOWARDS ORGANIZATION OF EXCELLENCY. CAN THE FRENCH EXPERIENCE HELP MOLDOVAN HOSPITALS?

In France, hospital logistics is undergoing rapid change. Under the pressure of hospital reforms and market developments, leaders are reorganizing production services and building logistic centres. Hospitals are developing the concept of Supply Chain Management, designed around flows (purchase, supply, platform and transport, care production, distribution) with the setting up of innovative tools such as: purchase and supply management software, warehousing, ERP, RFID, etc.).
French hospitals have succeeded in changing their mode of organization and hospital logistic has been effectively implemented. This knowledge could be shared with other countries in search of solutions (for example, Moldova, an Eastern European country which is in search of solutions for a better performance of hospitals).
JEL: M15

Introduction

As in all areas of operation, the hospital sector is not only facing the challenges of cost reduction and quality of care, but also of performance. Today, the patient - if she/he can afford it - has the possibility of choosing from a wide range of medical care facilities. Nowadays, each hospital has rivals and must comply with the laws of the market and be competitive.

For many years in France, particularly since the new regulations (Plan "Hospital 2007" and "Hospital 2012"), the hospital sector has been constantly confronted with the new economic burden: cost containment. Hospitals are forced to reposition themselves and to conduct a comprehensive reflection on their own organization and functioning in order to improve the quality of care. The management leadership of hospitals, interested in finding solutions and continuing to improve the quality of care while reducing costs, found ways to bring quality and economic performance together. The goal of logistics is not just to make a product available to a service, but to meet a need in quantity and quality at a lower cost. According to Allard (2007)

[1] *MD PhD Maria Costin is Professor of Hospital Logistics in IAE Gustave Eiffel Creteil-University Paris-East and IAE-Lyon, phone: +33617146356, e-mail: costin_marcella@yahoo.fr.*

"The goal of logistics in hospitals is to provide the right product, whether it is a drug, a medical device or a hotel - at the right time and the right place, for the right service to the right patient and at the right price, and the whole perfectly planned".

Logistics is now considered a model of organization essential for hospitals through a diagrammatical representation of the overall structure of informational and physical flows and the sequencing of the supplier's activities down to the patient. Such an approach allows an overview of the different actors involved in an offer and be able to identify areas of resilience in the chain of activities (Chitou, 2010).

Indeed, hospital logistics today is part of the pursuit of improved overall performance whereby the activities are organized and structured, aiming at patient satisfaction in terms of quality, quantity, deadline, safety and lower cost. Here, we can talk of a culture of Lean Production, that is to say, providing an identical product with fewer resources, an intelligent move that can be adopted by hospitals in order to significantly improve the quality of care (a new approach based on concepts such as: automated stock management, supply management, informational and physical flows). It should be noted that the number of techniques and technologies that have demonstrated effectiveness in the industrial field are now adopted, adapted and mastered by hospitals (Costin, Chitou, 2005).

The purpose of our article is to try and highlight the process of reorganization of the overall activities of the hospital by the Supply Chain Management, a global optimization procedure of care and patient satisfaction production system. Observe how French hospitals are able to reorganize production services, manage global logistics through the introduction of modern management tools. Analyze the practice of logistics in Moldovan hospitals and demonstrate the importance of the latter in the process of modernization of hospitals, of optimization and rationalization of resources within the context of the new hospital reform in the Republic of Moldova.

This article has three parts: the first part is about the research methodology; the second part is devoted to the theoretical framework, the observations, and the analysis of the evolution and practice of hospital logistics. The third part is dedicated to discussions and the conclusion.

1. Methodology

1.1. Material

The definition of the object of research thus requires an immersion in the phenomenon under study and a more or less participative observation of it. The study in our case is devoted to hospital logistics, with the latter being considered as an effective organization tool, for resource optimization and cost reductions. The modernization of services necessarily requires logistics and the computerization of hospital services.

In the context of empirical field research conducted in four hospitals, we seek to understand the impact of hospital reforms on the modernization of management tools in recent years. How does the logistic service develop with those tools? How are flows developed? What are the performances and expertise in this area? Such an observation will allow us to better measure the importance of developing logistics and the evolution of the hospital nowadays.

The aim of our research has influenced the choice of hospitals. We decided to follow the experience of French hospitals and to explore the Moldovan hospital field (France as a developed country and the experience of a developing country such as Moldova). To analyze and understand the level of development of these hospitals, the selection was made between public hospitals of the Municipal Department of Health of the city of Chisinau (Moldova) and hospitals of the Public Assistance-Hospitals of Paris (APHP -*Assistance Publique Hopitaux de Paris*).

The study aims, therefore, to explain a number of behaviours and practices of hospital organization based on a questionnaire. We then use two successive samples.

A first sample has an exploratory purpose intended for a qualitative treatment, reserved for individual interviews with hospitals managers or their deputies, selected at random (ten managers in the case of APHP hospitals and ten managers of hospitals in Chisinau (pronounced Kichinau). The interview grid is created and designed to provide answers to our research questions.

A second sample is intended for a quantitative treatment aimed at completing certain data resulting from the interview grid and thus, confirm some information gathered from the managers. The choice of hospitals was not easy because of the demography of both cities and the size of the hospitals. A second difficulty is accessibility, because public hospitals, and especially the managers of French hospitals, are often reserved in these types of investigations. Finally, we obtained the agreement of four hospitals (two Moldovan hospitals and two French hospitals). The common point for all four hospitals is the diversity of specialties (emergency, medicine, surgery): the size of the hospitals is 552 beds and - 562 beds for the French hospitals and 300 beds and 530 beds for the hospitals in Chisinau.

The quantitative treatment is meant for the medical staff in these four hospitals, selected on the basis of the positive responses we got from the directors of hospitals in the Paris region and the city of Chisinau. Our goal is to analyze the different situations between public hospitals in the Moldovan capital city and public hospitals in Paris.

The questionnaire and interview grid were developed in two languages (Romanian and French) and were conducted between June 2007 and January 2008.

1.2. Method

1.2.1. Construction of a Theoretical Framework

Taking into account the principle of our research, the theoretical aspect is based on a review of the literature on the subject, while using the stated keywords.

Hospital logistics is a new concept and references are scarce; nevertheless, we were able to find a sufficient number of books and articles to deal with this study. Ultimately, we were able to select more than 40 articles or book chapters.

We tried to focus the research on organizational and operational aspects of hospital logistics. In particular, we sought empirical studies that deal with aspects such as: the supply, stock and flow management, management of technical services, etc., even though in this area as well the literature is quite limited.

1.2.2. Empirical study

The main objective is to observe how, in practice, this reorganization of hospitals has fostered the implementation of logistics and what is the actual practice of hospital logistics within hospitals in France and Moldova: Moldovan and French samples are built in the same way.

The choice of sampling methods is conditioned by factors inherent in the general spirit of the research. The study covers twenty hospitals, with the target population being restricted to interviews with twenty hospital managers; in four hospitals, we interviewed the medical staff (200 people: 19 heads of departments, 60 doctors, 24 nurse officers, and 97 nurses).

The standardized questionnaire is the central tool given to heads of departments and service officers who are responsible for distributing them to fellow doctors and nurses, with the average response rate being between 60-70% on whole.

The interview grid was sent by mail by name for making appointments. The response rate is 40% for Paris and 80% for Chisinau.

1.2.3. Data Processing Process

After collecting data from our questionnaire-grid submitted to hospital managers, we conducted a count as follows:

We have analyzed the responses: this consisted in summing up the meaning of the responses that can be formulated into many complex sentences in order to reduce them to one or more unambiguous concepts or themes.

We then proceeded to make an inventory of all the concepts that were then put together into various categories according to the research objectives and the degree of differentiation (or the number of categories).

In the method "a posterior", the definition of categories is done in the encoding process. In general, the various units identified are compared and grouped into categories according to their similarity. Simultaneously, units were classified while categories were being defined.

2. Observation and Analysis of Practices in Hospital Logistics

A few years ago, hospital logistics was an unknown field. Logistic activities were grouped in the technical department of the hospital, where one finds: purchases of hotel products, laundry, catering, transport, etc. To optimize the material, financial and human resources, hospital stakeholders process and create added value.

The main mission of the practice of hospital logistics is to provide hospital stakeholders with physical facilities to operate. The ASLOG Hospital Commission defines logistics as "the management of patients, products, materials, related services and information flows, from the supplier to the recipient, to a defined level of performance at the service of the quality and safety of care given to the patient."

The hospital logistics function provides care services with treatment and synchronization of physical and informational flows, which are optimal, means to provide care to patients at a lower cost. It is a comprehensive approach which runs across the functions of the hospital with patient satisfaction as the ultimate goal. The latter constitutes the structuring element of all hospital activities.

2.1. The Concept of Supply Chain Management in the Hospital Environment

In a moving economic context, the hospital has to face increasingly fiercer competition (Private Health Centres). The management of global logistics is a major strategic issue for the industrial sector as well as for the health care sector.

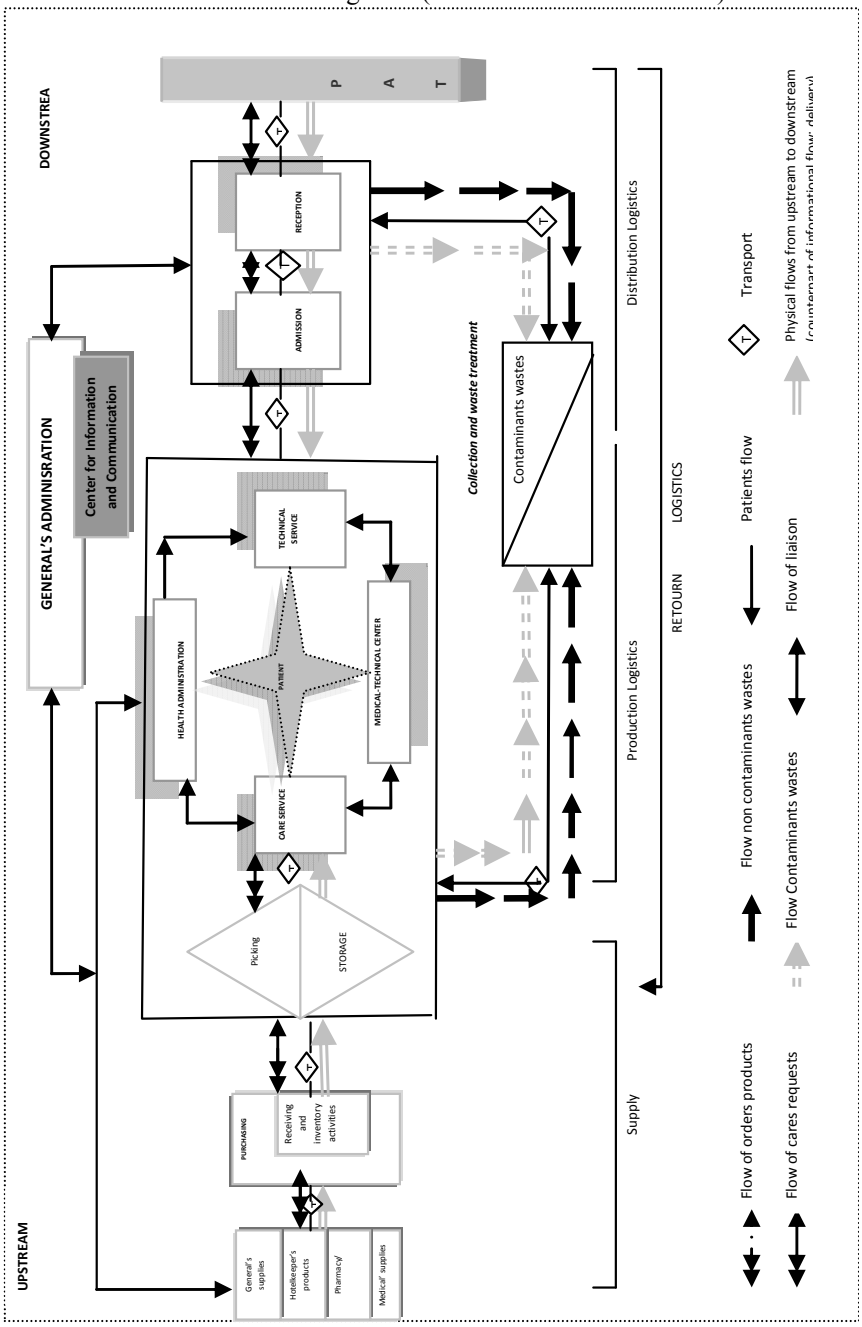
Indeed, the process of Supply Chain Management is an undeniable potential of value creation for the patient: quality of materials and products, improved flow management, better quality of health care, better performance, more availability for the patient, greater responsiveness and flexibility of the hospital. It is also a tool for profitability by streamlining costs associated with the supply chain, by concentrating sites and creating distribution platforms and by developing partnerships with other hospitals and companies. A better flow management is henceforth possible, thanks to new opportunities for the growth and development of technology and the information system.

The actual profits achieved through logistics are well presented by Christopher (2005) in his book. He also shows that the concept of Supply Chain Management is

considered as the most important process in organizations. The matter here is about the overall management of the logistic flows of the institution, but also about its suppliers and its patients. Hospital logistics, then, becomes an advantage through costs as well as a key element of the strategy of the hospital.

Figure 1

Chain of Global Logistics (Authors Costin and Chitou)



To analyze the evolution and development of hospital logistics, we take the model of the Supply Chain Management (SCM). We believe that SCM is a concept that promotes a more open organization whereby the hospital is designed around flows (purchases, supply, platform and distribution, care production, transmission and distribution).

In Figure 1, we present in a general way the organization of flows around the various components of the chain of trades and activities in the offer process from upstream to downstream, knowing that the whole is controlled by the patient who is the structuring element in the chain. All these functions (administrative, logistics and health) are controlled by Center for Information and Communication.

2.2. Purchases as a Strategic Tool for the Hospital Organization

In the process of resource optimization and rationalization of costs, the purchasing function in the hospital has a strategic character. Taking into account the importance of purchases in the domestic economy in France, it accounts for 72 billion Euros for hospital expenses (in 2006, excluding investment) or the equivalent of 4.2% of GDP (*Gross Domestic Product*). This expenditure, designated as "Care and Medical Goods Consumption" (CMGC), represented 8.7% of the GDP (Legouge, 2008).

Hospital purchases also represent a considerable challenge at the level of the world market: medical devices valued at 166 billion Euros (hospital beds, anaesthesia, intensive care unit, Imaging, wound dressings, cardiovascular, technical aids, orthopaedics, edibles, and medicines). According to the HFF (*Hospital Federation of France*), the distribution of purchases in hospitals is as follows: drugs 22%; medical equipment 17%; food 16%; hotels 12%; waste processing 9%; laundry 9%; medical devices 8%; fuel 2%; others 6%.

The purchase function is a crucial element in maintaining financial balance, as it is a large component of the budget of a hospital. Note that purchases represent, on average, more than 20% of the operating budget and 70% of the investment budget of a public health establishment. Purchase is the second largest expenditure point after the hospital staff, and its expenses tend to rise steadily.

Note, also, that a better management of the purchase function can make an overall saving of 5% to 10% on purchase budgets over five years. The introduction of Activity Pricing precisely leads UTH (*University Teaching Hospitals*) in France to reconsider their funding to focus on innovative projects related to the modernization of their purchases and logistics. Hospital purchases firstly concern drugs, medical devices, and medical equipment, but also housing supplies, food, laundry, and various services such as waste treatment, etc.

The quality of care provided to patients depends on the quality of products purchased. The reorganization of hospital purchases allows greater control of quality, costs, deadlines and procedures, based on feedback from experience. The optimization requires the mutualization of purchases and supplies for several

hospitals. What is new is that specialized internet portals are set up to enable hospitals or services to directly place their orders, and to manage their relationships with suppliers. That is what allowed about fifty UTH and large hospitals in France to save 12 million Euros. Another example: about ten hospitals have established a buying group of common drugs, as the hospital of Villefranche-sur-Soune, which targets a 225 000 Euro economy through this type of group purchasing.

2.3. Streamlining of Logistics and the Problem of Stock

Stock management is a basic problem that has always been the concern of officials of hospital logistics. A medical care institution cannot operate without stock – material products needed for the production of care – as this may endanger the safety and even the lives of patients. Indeed, we know that historically, hospitals have a tendency to multiply stocks, which then often become too expensive for the hospital to manage. According to industrial experience, too much stock does not ensure availability and quality, which are virtues expected of an optimized logistic system.

Hospital logistics is a major fiscal challenge to hospitals because improving its features is a real source of savings for the hospital sector and a very good tool in the fight against waste.

In health care institutions, there are two types of stocks: "centralized" and "decentralized" stocks. The first category aims at the supply of medical services and indirect support logistic activities. This includes the central pharmacy, medical and surgical equipment stores, food stores, cleaning products stores, workshop stores, miscellaneous equipment shops, etc. "Decentralized" stocks consist of materials or products provided by central stores or ordered directly from suppliers by the services, but accumulated over time as protection against unpredictable circumstances (Aptel, 2000).

The results of our research show that 66% of the staff interviewed believes that hospitals have "centralized" stocks, against 35% who think that these stocks are "decentralized". The automated stock management, according to the respondents (36%) is still not frequent.

We notice a significant presence of local stocks in hospitals (medical services, technical facilities). It is obvious that for health care institutions, these stocks are necessary and stock shortage should be avoided. To avoid such incidents, caregivers accumulate reserves of care products (often in services), and this creates serious problems of congestion and additional cost to the hospital. Stock shortage in supplies or medication in the operating room may, for instance, make the work of the care staff difficult or impossible and threaten the health of patients, but the absence of formal rules and procedures can cause waste and generate significant costs to the hospital.

In the management and the organization of hospitals, there is still much progress to do in order to improve the quality of care while reducing costs. The objective of the hospital is to put in place mechanisms to supply at the least cost. How to reduce the cost of storage (stock as few products as possible)? How to reduce the cost of the order (without creating supply stock shortages)? The solution to that problem is the automation of logistic services, that is, the establishment of supply and storage routes. It is also interesting to set up appropriate strategies with suppliers for continuous replenishment via the EDI system (*Electronic Data Interchange*).

2.4. Stocking Means the Function that Consists in Supplying Production Sites

The supply function is one of the most important functions of logistics, because it allows a better coordination of decisions related to material flow. It affects the provision of medico-technical, caring, hotel, pharmaceutical, administrative, etc. services. For patient safety, care cannot be ensured without reserves of medicines, care products, and medical devices.

To minimize the overall stocking cost, the hospital must stock up on all sorts of products and services required for its activity. Each health institution is obliged to respect, at the time of purchase, the exact quantities to be purchased and the deadline for each order., in order to ensure traceability of orders that are placed, ensure receipt of supplies, monitor quality, and ensure lowest cost and the best conditions of service and security.

The main objectives of the supply department are (Benanteur, Rollinger, 2000):

- Determine by consensus indicators for assessing the quality of products and the weighting assigned to each indicator based on its importance;
- Systematically impose integration of logistical criteria (cost, in-market or off-market, quality of relationship with the supplier if it is already known to the institution);
- Rate products in order to select the most satisfactory;
- Standardize products and reduce the diversity of managed references.

One of the most employed supply methods in hospitals to manage the stocks of pharmaceuticals and medical devices is the method of Full-empty. This method is characterized by one or two allocations of products by reference. Medical departments that have provisions, therefore, have cabinets called “full-empty”. They are metal cabinets with double compartments where products are stored. When the provision or one of two provisions is exhausted, the person who takes the last product places the corresponding label of the provision on a board to trigger the replenishment request. That tool allows the nurse to save time, to optimize stocks in the cabinets of the hospital departments, and to improve safety through a codified

storage known to everyone. When - a cabinet is empty, a label that indicates it is scanned, which triggers replenishment (Guillaume, 2006).

Such a stocking tool is effective when the central warehouse is nearby, and the time between the supply order and the delivery is short, because the critical and maximum threshold is one hour. In order to make that tool operational, it is necessary to create proximity platforms. These platforms operate as a classical logistic warehouse with conventional distribution in pull systems (see Figure 1) with a supply dock, a shipping dock, and orders preparation amid mass storage, all driven by a software package. Information relating to the shipment goes back to the information system, which allows care units to recognize the batch numbers as well as the expiration dates of the products they have just received. So, the heart of the business consists of the warehouse, which manages the stock in the store: namely hotel products, office supplies, or groceries, as well as non-sterile devices, and beyond the pharmaceutical business, including drugs and sterile medical devices. Around the warehouse, the following systems are located in the Central Kitchen Production Unit (CKPU), which distributes meals to patients in cold -chain; the transport sector, hosting the fleet of heavy and light vehicles starting at the beginning of the Center, as well as a garage; the pharmacy purchase and economic services sectors; and finally, emergency medical service & intensive emergency medical service, and the emergency care teaching Center.

Remember that the field of hospital logistics and technical services differs from one institution to another, depending on the size, capacities and activities, but the logistic organization principle must remain the same.

2.5. The Organization of Flows

A key issue in the organization of care institutions is the reduction of flows. The question that arises is how to eliminate structural barriers by creating a more exact operation and this, make flows smoother. To understand this problem, we take the example of a patient who arrives in a Counselling Center for an appointment with his/her doctor fixed one or two months in advance. The doctor, often late (due to an excessive of work load), examines the patient and prescribes tests to be done. To have these tests done, once again, she/he must wait: waiting lists, waiting in the corridors of appointment, and waiting for the result. The story continues, because she/he has to wait for another appointment to see a specialist and then continue the circle... so that finally, the patient can have her/his treatment. If the patient must be hospitalized, she/he is doomed to start a new process of waiting, which becomes increasingly complex.

Indeed, if one considers the time actually spent on the patient's medical care, it is only a tiny fraction of the total time spent at different stages in the "process" of care.

Appling the flow principle to the full range of human activities is not easy, but it is applicable to any activity and the results are always spectacular. According to

Womack and Jones (2002), "human effort, time, space, tools and stock necessary to create and deliver a product or service can usually be quickly reduced by half".

Moreover, physical flows provide information that accompanies the movement of materials and people, to integrate a state of change in the hospital information system or to trigger a transfer order or an order of production (Hassan, 2006). Medical imaging and telemedicine can also be added to these flows of information. To maximize the chances of healing a patient and reduce the length of hospitalization, the hospital must have the necessary equipment, facilities and know-how, all information about her/his pathology and its medical history. Thus, medical information (records treatments, imaging, lab, etc.) that moving from one department to another, starting with the patient's admission until her/his discharge, gives rise to flows whose containment turns out to be indispensable to the support to hospital output (Aptel, 2000).

To improve the quality of care, the functioning of institutions must first be improved. "Unlike clinical services that treat the person who suffers, dies or gives birth, the logistical and technical sectors are the easiest to rationalize, with the special feature that requires good management of the sick, injured or parturient, logistical and technical sectors deal on their side with the matter, energy, products, equipment or buildings, all areas where quality requires optimization procedures" (Benanteur, Rollinger, 2000).

The reorganization of the concerned departments or units must be made through the organization of flows in order to make them smoother. A solution to this problem is certainly the tracking of information through the establishment of the MRP *(Methods of Management and Planification of Production system*) of medicine, a method that will allow better planning and management of information and flows, reduce unnecessary time, and create value for patients. The latter is the focus of the hospital and must be placed at the heart of this change. Time, quality, safety and comfort factors must be included among the key measures of the system performance by holding the patient's route through the system in continuous flow.

2.6. The Field of Logistics and the Technical Departments of the Hospital

For many years, the hospital has been confronted by the research for "productivity" and the use of increasingly automated techniques. The production process is structured by a set of operations that are ordered and integrated and constitute themselves interdependent trades from upstream to downstream. These trades are more or less coordinated and integrated, depending on whether the hospital is facing the need to optimize its production or not.

Among the production sites of hospitals, we have hotels, catering, pharmacy, care services, laboratories, etc. To optimize their production costs, hospitals had to engage in the transformation and reorganization of their general services (particularly catering, laundry, heating, building maintenance ...). Hospital

managements should adopt a relevant managerial move by ensuring the redeployment of resources needed for such hospital missions. (Hubinon, 2004).

2.6.1. Catering

This is one of the most productive functions of the logistic chain. It provides a full range of meals to patients and staff. Production and distribution of the dishes is done either on hot or cold chain[2]. Food in the broadest sense includes enthral and parentheral diet nutrition which belongs to a logic shared by doctors who prescribe pharmacists, dietary staff and logisticians.

"The catering function is crucial for the hospital logistician, and this is for several reasons. On the one hand, the food budget is important both in absolute and relative terms. On the other hand, the correlation between the organoleptic quality of food and the level of expenditure on food is often not clear, implying that it is possible to improve the delivery at constant cost. Finally, catering, like other hotel services of EPS, provides intuitive criteria for evaluation by the patient; indeed, while it is still difficult for the patient to measure the quality of medical services or care, her/his ability to judge the meals that are served to her/him is obvious." (Benanteur and all., 2000). So, in the overall care given to patients, catering proves to be very important.

For the catering function of the hospital, the cold chain is a considerable asset. This is a new technology of oven that combines heat and steam; it largely replaces the existing ovens which involve much longer cooking time and even loss of weight of the foods. It can be reduced to less than 5% against an average of 30% in traditional cooking, which represents a gain in terms of flavour, vitamins minerals, and nutrients. The time savings provided by the combined oven can help reduce the storage period. The cook receives details about the meals and the quantities to prepare, he cooks and puts them in trays that are packaged and kept in the fridge. One major advantage of the cold-chain is its high level of hygiene and safety, as well as the conservation of the organoleptic quality of the products and flexibility in managing meals.

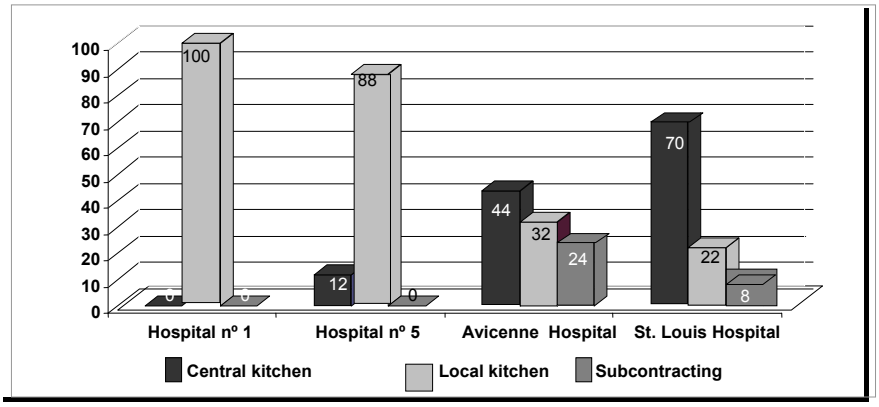
[2] The decree "new approach" of 29 September 1977 establishes performance requirements in terms of food hygiene in collective catering. In the context of the expansion of the cold link and central kitchens in France, the legislator deemed it appropriate to complete the directive-framework 93/43 of June 1993.
The cold chain, very little spread abroad, is a French specialty, and shunned by Americans. Development, in the early 80s, rapid cooling of cells, used by such companies as Friginox, Bonnet, Electrolux, Hobart, has opened new horizons in reducing the risk of surface freezing of products (-20/-30°C in mechanical refrigeration instead of -80°C for liquid nitrogen). The refrigeration link offers the opportunity to adapt menus to the diversity of needs. This is particularly relevant to nursing homes and hospitals, including special and dietary menus. The recent development of autonomous carts for the rethermalization enhances this flexibility for the delivery of meals. The organoleptical amount is also improved through the reduction of the waiting time in-between rethermalization and consumption.

Regarding the transport of food, it should also be noted that the essential tools and high technology in the context of delayed catering are the meal delivery carts. These are actually robots that take the carts from the kitchen and carry them throughout departments. There are currently different types of materials that meet the performance requirements and compliance with new regulations. From one institution to another, the structure of the building, kitchen, and distribution network are not alike, and yet the requirements are the same. The service of meal-trays thus meets the same needs: to serve the dishes while ensuring food safety. This implies that the material ensures the conservation of dishes prepared according to strict hygiene rules.

Figure 2 shows that the Paris hospitals (70% at St. Louis Hospital against 44% for the Avicenne Hospital) have adopted the operation of the refrigeration link that is outside the establishment, so in a central kitchen. Moldovan hospitals have not yet reached that degree of development. We hope that our lessons will make hospital decision makers consider a new form of organization of catering.

Figure 2

Preparation of in Hospitals (in %)[3]



As shown by Cremandez (1987) "Traditional logistic services (kitchens, laundry ...) belong to the administrative universe". They are in a dynamic of quest for profitability, which separates them from the Operational Centers (Care Departments), while close relationships are needed daily to ensure optimal quality to the patient. However, the effectiveness of this policy, which is translated into the certification process, also requires contracting with health care services that must undertake to perform certain tasks in exchange for the provision of better logistic services.

[3] Hospitals N°1 and 5 are hospitals in Chisinau while Avicenne and St Louis Hospitals belong to the APHP (*Public Assistance-Hospitals of Paris*).

2.6.2. Linen

The linen function, together with supplies and catering, constitutes one of the basic logistic provisions, as it provides the best conditions of hygiene and protection for patients and staff with regards to risks of infections. The staff uniforms, sheets and the clothes of the sick, disposables, etc. are part of the linen function, the mission of which is to meet the nee 12 ds of both the patient, but also of the entire hospital structure. The management the linen treatment includes a set of logistic activities (reception, storage and sorting of dirty linen, washing and drying of laundry, transportation, delivery, allocation services, use of clean laundry, etc..) that weighs upon the budget of the hospital. The latter varies depending on the activities of the institution; for example, the budget for laundry treatment is much more important to a geriatric hospital than for an acute care hospital. According to the Chamber of Commerce and Industry of Epinal, the textile function takes up to approximately 5% of total allocations in hospitals.

Over time, hospital laundry has become a true industrial tool in the service of patients and care units personnel. The average size of production units is steadily increasing; automation enables significant productivity gains, the introduction of tracking technology allows a very strict management, and officials have generalized quality procedures, particularly around good practices that promote hygienic quality. The treatment of hospital linen is part of the quality procedures.

The High Authority of Health recommends health care facilities to "treat linens appropriately". To comply with safety standards and treat the linen at a low cost, hospitals employ specialized companies outside the institution. As an internal centralization of the linen function, laundry can allow hospitals to make real savings, like reducing water and energy consumption, which are essential components for the proper functioning of laundry, the price of which will increasingly weigh in cost price. Other indisputable advantages include: the better treatment of wastes and the improvement in the health and safety of patients and laundry staff. Automation and computer control of machines significantly reduces the level of nuisance, making staff more efficient and giving them a sense of security.

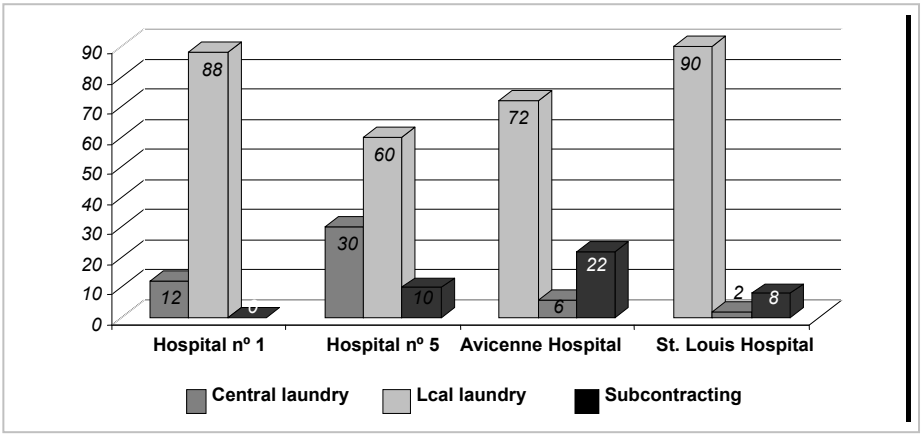
In our results (figure 3), we notice that French hospitals have realized the advantage of a central laundry, because most hospitals have adopted this practice.

Regarding Moldovan hospitals, the managers can only but feel "jealous" of the French hospitals, as in Moldova, such an industry does not yet exist. Over 90% of health institutions are forced to make do with their own means: therefore, linens are treated in old laundries.

Within the hospital, hygiene is the first step towards quality care. Currently, cleaning and bio-cleaning are part of the hygienists' plan. Linen and wastes must follow specific protocols established by the Operational Hygiene Team (OHT) (Bertha, 2006).

Figure 3

The Laundry Treatment in Hospitals (in %)



A series of activities such as surface cleaning, disinfection, disposal of hotel, septic, chemical, radiological, nuclear wastes, the sterilization of reusable medical devices, the fight against nosocomial infections are the primary concern of health facilities and are at the heart of patient safety. Together with the logistics department management team, the Committee of Fight against Nosocomial Infection (CFNI) must develop means, methods and techniques for preventing transmission of infections.

2.6.3. Technological Innovation as a Solution to Traceability

The managing of the Supply Chain cannot be possible without the development of innovative computer tools. Today, in order to ensure traceability, French hospitals have opted for RFID (Radio Frequency Identification), the most adequate solution to ensure traceability of flows, products, and people within the hospital, and to communicate with the world outside the institution, as well as with suppliers. Indeed, RFID allows quick and accurate exchange of information, regardless of the software being used (Poncon, 2000).

RFID has found its place in various stages of production such as: laundry, sterilization, catering, laboratories, distribution of medicines and blood, etc. In the health sector, the traceability of physical flows allows to monitor and control operations, but also to know what happened, how and why. The automation of these processes allows the improvement of the patient's health safety, as it ensures reliability of the production process since all steps are indicated, and we can therefore go back to the history in the case of a problem. RFID also provides certain productivity gains, while eliminating, for instance, tiresome and time-consuming tasks. The use of RFID allows an economic gain for the institution as there are less technical accidents, a better management of dosage (serialization or pharmacy),

better management of linens, assurance of repair for medical or nonmedical devices, and finally the almost perfect management of the Supply Chain Management.

3. Discussion

Despite the economic importance of hospital logistics, in some hospitals, the concept is still poorly developed or poorly known. During our interviews with the managers of the Paris hospitals, 90% of them claimed to have in their hospitals a well developed hospital logistics, while there is only 47% of hospital medical staff who affirmed the existence of developed logistics.

With a lack of information among qualified personnel and the dilapidated state of infrastructure and technical equipment, logistic services have been neglected for too long at the expense of patient care. This is, once again, the experience of Moldovan hospitals, where the results of our investigation reveal the extent to which hospital logistics have not yet been developed. 80% of interviewed hospital managers are not familiar with he concept of "logistics". They are still talking of economic and technical services, of purchase regulation, supply, and distribution. Each service has a manager who has the responsibilities of a logistician, but in reality she/he does not know that they are doing logistics.

In addition, activities said to be "logistics" are largely accomplished by "non-logisticians", that is, by staff outside the department of supplies or materials management, such as caregivers. A reorganization of logistic activities presents an obvious interest, particularly in terms of impact on caregivers, as too often, care giving personnel has to perform various administrative tasks rather than providing care to patients.

Regarding the care-giving staff in hospitals, several studies show that they are complaining of an increase in the workload. According to a survey conducted in the Quebec region in Canada, three out of four nurses said they did not have enough time to do their job and the nurses spend only 29% (572 hours per year) of their time giving care to patients (Labreche, 1998). Such a situation was also observed in the United States. As a matter of fact, since 1995, medical errors caused directly or partly by the increased workload have killed over 9,000 people (Berens, 2000).

According to data from our quantitative survey, the medical staff interviewed (53%) believes that a caregiver should not spend time performing logistic activities. Nearly 70% of the respondents say that to perform these activities, a manager who is a specialist in this field is needed. The development of more efficient practices of hospital logistics generates a source of time saving that will enable health care professionals to focus their efforts on the quality of care provision, as revealed by the staff interviewed in the hospitals of Paris in 90 to 92% of cases.

3.1. The Benefits of Hospital Logistics

The survey conducted among hospital medical staff and the meetings with hospital managers have allowed us to have a much broader view on the functioning of hospitals in France and Moldova. This study has enabled us to understand and become aware of the reality on the ground and the management of public hospitals in both countries.

Within the hospital, hospital logistics is still in its infancy, and its scope for growth is still largely important. Its level is an intermediate step in the search for quality and economic performance. To meet the expectations of the patient, while controlling expenses, the hospital must quickly adapt to changing market conditions, find the best suppliers, compare prices to performance, plan their purchases, optimize transportation costs and control flows.

The quality of logistic services is highly valued by the hospital actors. Our quantitative study shows that quality in this area is the source of an economy of time and finances; it ensures better care, patient safety, as well as the quality of work for the hospital staff (table 1).

Table 1

The Benefits of Hospital Logistics (%)

Description	Hospital nº 1	Hospital nº 5	Avicenne Hospital	Saint. Louis Hospital
Source of time saving	56	72	90	92
Fund saving	66	66	90	94
Better quality of care	76	52	84	80
Improvement of the quality of work	60	62	88	82

Indeed, logistics must have its rightful place in hospital management. It must allow, through an opening up of all services, to meet demand as close to the actual need in relation to the health goals and budget of the hospital. To do this, it must be supported by a comprehensive information system covering the entire logistic chain, from the determination of need, the purchase of products, their reception, storage, processing, down to their use in services.

To meet new challenges in terms of safety and quality of care, hospitals are obliged to establish policies and strategies of organization, in order to find the human and financial resources to integrate modern technologies of management of patients (see the impact of ICT on value creation Porter (1982) and the Impact of ICT on the organization and strategy (Helfer and all, 2006). International experience shows that innovative solutions of automation of hospitals (e.g. in the US, Canada and even France) allowed to restructure and improve the distribution process of care products and medicines, to improve the safety and efficiency of the supply chain. The computer program based on the technology of bar coding reduces medication errors and ensures patient safety at all levels of care.

"Automation results in industrial growth and productivity increases significantly" (Mayrand and all. 2006). In the hospital environment, automation makes it possible to improve the management of the institution while promoting the flexibility and even the responsiveness of the entire system. The computerized system includes tools for relevant planning for human resource management and optimization of technical platforms of orders, stock reduction, and management of traceability as well as administrative tasks related to supply, etc. Under these conditions, caregivers will have more autonomy and can devote more time to care. The development of new methodologies and the establishment of management control data programs now allow hospitals to quickly analyze their strengths and weaknesses, and act accordingly to make the best decisions in order to improve care to patients. The introduction of new technologies for diagnosis and care, computerization and efficient logistic system ensures the best performance and quality indicators, and obviously, good clinical practices at the level of care provision.

In Moldovan hospitals, lack of financial resources and human expertise in the field greatly delays the development of logistics, while in French hospitals, as we have seen, its activities keep on increasing (for example: the administration of cooked meals, the linen, medicines, sterile and non-sterile materials, transportation, gardening, etc.) Thus, hospitals are becoming important customers of large companies and the latter promote economic development. Moldova should take into account the French experience and integrate modern logistics in its hospital system as quickly as possible.

Given the need to modernize, we consider that for Moldovan hospitals the next change should focus on improving performance through the establishment of a new automation system. This involves developing the computerization system in process and setting up hospital logistics, in order to generate productivity gains and value-added. To achieve this, we consider that the hospital management officials should use the benchmarking principles and import effective methods of flow management (Esnault, Maige, 2001). The creation of an efficient logistic chain in an institution will be developed through the use of a computerized system, which will be a real tool of management. It is high time Moldovan hospitals adopted hospital logistics to serve the patient.

Conclusion

Nowadays, hospital logistics is an indispensible management tool. French hospitals have reorganized their services for delivery of care and have created logistical centers. The introduction of innovative technical tools, information systems, and supply chains allow today's hospitals to optimise their resources and reduce their costs. This growth ensures patient satisfaction in terms of quality, price and security.

The goal of quality for which hospitals strive is not the absence of problems, but the continued improvement of the flow of both physical processes and information. Indeed, hospitals have put in place the necessary tools to maximise the logistical potential of their services and to create added value to every step of care. The

development of such activities optimises resources and allows care providers more time to devote to patient care.

The results of our research allow us to conclude that today, logistical activities in French hospitals seem well organized. Unfortunately, in Moldavian hospitals the state of logistic and technical systems remains insufficiently developed. It is therefore vital that health care facilities achieve the necessary means to efficiently respond to the needs of care services. In Moldavia, management currently continues to underperform globally. However, directors are not failing to demonstrate that they have the intelligence to improve these results and to advance hospital management towards excellence. We hope that the French knowledge in the realm of logistical organisation will serve as an example for the Moldavian directors in the journey to lead their health care system to the standards held by the countries of the OCDE.

Reference

Allard, P. 2007, «La logistique en milieu hospitalier», *Stratégie logistique,* nº 98, sept, p. 42.

Aptel, O. 2000, «Le Rôle de la logistique dans la connaissance du niveau des stocks: le cas du secteur hospitalier». Les troisièmes rencontres internationales de la recherche en logistique, RIRL, [online] Available at: http://www.uqtr.uquebec.ca/rirl2000/APTEL.PDF [Accessed 10 mai, 2007].

Benanteur, Y., Rollinger R., Saillour J.-L. 2000, *Organisation logistique et technique à l'hôpital*, Rennes, ENSP.

Berens, M. 2000, Nursing accidents unleash silent killer, Chicago Tribune, Sept 11 p.1.

Berens, M. 2000, Nursing mistakes kill, injure thousands. Chicago Tribune, Sept 10, p. 1.

Berens, M. 2000, Problem nurses escape punishment. Chicago Tribune, September 12, p. 1.

Berthe, F. 2006, «Hôpital: le grand nettoyage», *La Gazette Santé sociale*, mai, p. 30-34.

Born, E., et all. 2001, Le médecin-chef face a la problématique de la qualité de l'activité médicale. Revue Hospital Bruxelles, p. 245-250.

Breuzard, J.-P., D. Fromentin. 2005, *Réussir la logistique des activités de services,* Paris, Ed. Demos.

Campagne, J.-P. Burlat, 2001, *Maîtrise et organisation des flux*, Paris, Ed. Hermès Lavoisier.

Chitou, I. 2010, «La logistique organisationnelle: une nouvelle architecture du fonctionnement opérationnel de l'entreprise», Colloque international Université nationale de Tavrida de Vernadski, Simferopol, p. 18-35.

Christopher, M. 2005, *Supply chain management, créer des réseaux à forte valeur ajoutée,* Paris, Éd. Village Mondial.

Cohen, Sh., J. Roussel. 2005, *Avantage Supply Chain*, Paris, Ed. d'Organisation.

Costin, M., I. Chitou, C. Etco. 2005, «Logistique hospitalière: une nouvelle politique d'optimisation des ressources dans le milieu hospitalier», *Revue Économie de la santé et Management,* Chisinau, N°3, mai, p. 5-11.

Cremadez, M. 1987, «Les clés de l'évolution du monde hospitalier», *Les cahiers de gestions hospitaliers,* n°266, mai, p. 285-306.

Djellal, F., C. Gallouj, F. Gallouj, J. Gallouj. 2004, *L'hôpital innovateur – De l'innovation médicale à l'innovation de service*, Paris, Éd. Masson.

Dornier, P.-P., M. Fender. 2007, *La logistique globale*, Paris, Ed d'Organisation.

Durieux, P. 1997, *La démarche qualité dans un établissement de santé* ; Paris, Ed. AP – HP.

Esnault, N., C. Maige. 2001, *Le manager équilibriste*, Paris, Ed. Dunod.

Falise Mirat, B., D. Alain, M. N. Billebot. 2010, «TIC et Performance des organisations de santé», *Gestion hospitalière*, n°495, avril, p. 245-249.

Guillaume, J.-Ph. 2006, «Les prémices d'une révolution», *Supply Chain Magazine,* Nº 6, p. 38-46.
Hassan, T. 2006, "Logistique hospitalière: organisation de la chaîne logistique pharmaceutique aval et optimisation des flux de consommables et des matériels à usage unique", Thèse de doctorat: Informatique, l'Université de Lyon 1, 247 p.
Helfer, R, M. Kalika, J. Orsoni. 2006, *Management: stratégie et organisation*, Paris, Vuibert.
Hubinon, M. 2004, *Management des unités de soins. De l'analyse à évaluation de la qualité*, Bruxelles, Ed. De Boeck Université.
Husson, J. 2005, «Gérer les risques à l'hôpital»: de l'inquiétude des acteurs à la méthode, Thèse de doctorat: Sciences de gestion, l'Université de Lyon 3, 452 p.
Labreche, S. «Les infirmières consacrent seulement 29% de leur temps à soigner les patients», Les Affaires, 21 novembre 1998, p. 10.
Legouge, D. 2008, *Les achats hospitaliers, vers une nouvelle gouvernance*, Paris, Ed. Berger-Levrault.
Leteurtre, H. 1998, *Traité de gestion hospitalière*; Paris, Ed. Berger-Lavrault.
Leteurtre, H., V. Vandenmersch. 1997, *L'accréditation des services hospitaliers médico-techniques, techniques et logistiques,* Paris, Ed. Berger-Levrault.
Mayrand Leclerc, M., P. Delmas. 2006, *Sortir du management panique, Le savoir et l'art de décider. Gestion des ressources humaines,* N° 2, Paris, Ed. Lamarre.
Poncon, G. 2000, *Le management du système d'information hospitalier. La fin de la dictature technologique*, Rennes, ENSP.
Porter, M. 1982, *Choix stratégiques et concurrence*, Paris, Economica,
Ribaut, M., C. Aromatario. 1991, *L'hôpital entreprise*, Paris, Ed. Lamarre.
Souvignes, D. 2007, *Le guide de recommandation des bonnes pratiques de la logistique hospitalière*, Bordeaux, Éd. Hospitalière.
Tourreilles, J.-M. 2004, *Système d'information hospitalier: 1, 2, 3, ... Partez* !, Rennes, ENSP.
Vilcot, C., H. Leclet. 2006, *Indicateurs qualité en santé*, Paris, Afnor.
Womack, J., D. Jones. 2002, *Penser l'entreprise au plus juste*, Paris, Village Mondial.