PHARMA 4.0

New operations and logistics models for drug management in healthcare organizations.

Background

Nowadays, in most occidental countries, hospitals and healthcare organizations in general are forced to optimize expenditures and increase the efficiency and effectiveness of their services due to the growing economic pressures, cuts to public healthcare budget, and the demand for ever-better services from citizens. For these reasons, managers and researchers are trying to improve the outcomes from health expenditures, whose largest items right after personnel are represented by materials (Pinna et al., 2015). In fact, this sector is under increasing pressure in order to reduce wastes, eliminate unnecessary costs while improving the quality and consistency of the patient care. As the healthcare sector becomes increasingly complex, a key driver of cost and quality is the drug logistics process: the drug management is critical in ensuring high standards of patients care and providing adequate supplies (Colletti, 1994; Ross and Jayaraman, 2009; Kazemzadeh et al., 2012; Smith et al., 2012).

Hospitals are complex logistic systems that include personnel and material flows. The drug logistics process has a key role in ensuring the efficient healthcare operational functioning (Pinna et al 2015). The literature and several hospital cases show that the traditional system of drug management is highly inefficient and results, directly or indirectly, in a low service level, service quality and high costs for the hospital (Jarrett, 2006; Cagliano et al., 2007; Persona et al., 2008; Cagliano et al., 2014). It is evident how the technology and, in particular, the introduction of robotics and automation represent a useful lever for healthcare organizations to redesign the drug management processes and achieve a meaningful increase of efficiency in the short-term.

This research project aims to i) scrutinize the scientific literature on drug logistics management and related topics; ii) develop new operations and logistic models for drug management in healthcare organizations, resorting to digital (or *"4.0"*) technologies; and iii) test the developed framework within different hospitals, in order to improve and validate its efficiency.

Research Objectives and Approach

The literature analysis and the several interviews carried out with the leading industries in the healthcare sector have shown how the drug logistics management in hospitals is becoming a very dominant topic, but how its actual implementation and results are still very far from the desired ones. Indeed, there are gaps in the handling of the hospital resources and materials, impacting meaningfully the costs and the quality of the services provided to the patients. In addition, it is evident how the technology and, in particular, the introduction of robotics and automation can represent an useful lever for the healthcare organizations to redesign the processes to have an meaningful increase of efficiency in the short-term.

As a consequence, the objective of this PhD project is to develop new operations and logistic models for drug management in healthcare organizations, resorting to digital (or *"4.0"*) technologies. This goal will be achieved defining the cost structure in the drug logistics, the main levers capable of improving drug logistics management, and the automation effect on logistics activities in healthcare organization.
The cost structure must consider the capital expense (CapEx) and the operation expense (OpEx) related to the drug logistics management in a hospital.
The managerial and technological levers that will be analyzed in this project concern:

1) The adoption and use of *inventory management* techniques and decision support tools;
2) The mapping and improvement of *key processes* in drug management in the hospitals;
3) The adoption of *automation* (e.g. automated warehouses for the hospital pharmacy and wards; automated carts for the drug transportation within the department; …);
4) The adoption of big data analytics;
5) The integration of *information flows*;
6) The adoption of *new technologies* that can more effectively support drug management in the hospital (e.g. Artificial Intelligence);
7) The development of specific *competences* on logistics themes (e.g. demand forecasting and planning; stocks; …).

Consequently, this research project aims to answer the following three *Research Questions*:

- **RQ1**. How can the cost structure of drug logistics in a hospital be modeled?
- **RQ2**. What are the major levers for a hospital to reduce the impact of drug logistics cost?
- **RQ3**. How the adoption of automated technologies can help hospitals and healthcare organizations to reduce the impact of drug logistics cost?

The research framework will be including the major levers to act on in order to make the whole drugs logistics process more effective and efficient in a hospital. In order to achieve this scope, it is important to create awareness on the overall cost and the cost structure of the drug logistics in hospitals, providing a clear view on the material and process flows, not only for the individual entities but also for the overall system. In this way, it is easier to identify and implement some improvement actions. This framework will also include quantitative and qualitative methods able to assess the implementation of the levers. In addition, this research intends to provide support for potential investments in drug management related, in particular, to robotics and automation.

If you are interested in this topic or you want to have more information about this research, please contact Daniela Bonetti at daniela.bonetti@unibs.it.