Clinical information systems: cornerstone for an efficient hospital management

Christian LOVIS^{a1}

^aDivision of Medical Information Sciences University Hospitals of Geneva, Geneva, Switzerland

Abstract. The university hospitals of Geneva are the largest consortium of public hospitals in Switzerland. This organization is born in 1995, after a political decision to merge the seven public and teaching hospitals of the Canton of Geneva. From an information technologies perspective, it took several years to reach a true unified vision of the complete organization. The clinical information system is deployed in all sites covering in- and outpatient cares. It is seen as the cornerstone of information management and flow in the organization, for direct patient care and decision support, but also for the management to drive, improve and leverage the activities, for better efficiency, quality and safety of care, but also to drive processes. As the system has become more important for the organization, it has required progressive changes in its governance. The high importance of interoperability and use of formal representation has become a major challenge in order to be able to reuse clinical information for real-time care and management activities, and for secondary usage such as billing, resource management, strategic planning and clinical research. This paper proposes a short overview of the tools allowing to leverage the management for physicians, nurses, human resources and hospital governance.

Keywords. Hospital management; clinical information system

1. Introduction

Implementing and deploying a clinical information system in a care organization should be one of the most disruptive changes ever [1, 2], if they understand the need for improving processes and culture, the need for improved efficiency and quality of care. Thus, implementing such a system is only possible with deep changes in care and management processes. The high human and economic cost of inefficient care and errors has been well documented and has received a lot of attention [3]. One of the most striking facts is that, while care providers are daily using technologies of the 21 century, the healthcare system is often working and managed with paperwork and processes of the 19th century [4]. Unfortunately, deploying information technologies in healthcare organization is an important challenge, and the road is a large cemetery of failures and painful experience [5]. Success factors are, however, well described. Clinical leadership; strong involvement at the highest decision levels of the

¹ Corresponding author ; Christian Lovis, University Hospitals of Geneva, Division of Medical Information Sciences, 1211 Geneva 4, e-mail : Christian.lovis@hcuge.ch

organization; long and sustained financial and human investments; reliable infrastructure; added-value for all actors and updated decision-support are key factors.

This work at presenting some aspects of what has been developed at the University Hospitals of Geneva to leverage the return on investment of the clinical information system in the domain of decision support for the management.

2. Background

The University Hospitals of Geneva (HUG) constitute the major public care providing consortium and teaching hospitals in Switzerland. It covers primary, secondary, tertiary and ambulatory care. HUG are using an in-house developed clinical information system (CIS) that integrates commercial systems and covers all clinics and care. The system is Java, service-oriented (SOA) and has a component-based architecture with a message-oriented middleware. It has a full paperless computerized provider order entry (CPOE) coverage, it supports workflows, clinical pathways and complex decision-support. The system builds a complete transversal support for physician and nursing orders, for planning and execution of all care activities.

3. Decision support for management

Only some examples are shown to illustrate the various type of secondary usage of clinical information to support and leverage the management in a hospital. These examples are grouped according to the various professions in the hospital.

3.1 Medical management

Several support for the medical management has been developed. Some of them are about standards and quality of care, such as whiteboards to see the way clinicians use clinical pathways or how fast discharge letters and reports are signed. Other are more devoted to patient flows, such as synoptic views of the activity of the emergency department (Fig 1).



Figure 1: Realtime emergency department activity

The Figure 1 illustrates one of these tools. The dashboard can be seen in all terminals and is shown on large screens. It is automatically updated in real-time with

activities in the ER, including display of admission-discharge-transfers, diagnosis, infectious status and numerous other clinical information. It helps the management of the ER and the proactive preparation of wards that will have to admit patients later.

3.2 Nursing management

One of the challenges in our hospitals is to manage in a clever and proactive manner our nursing staff. This means achieving a good adequacy of staffing and needs in each ward. Figure 2 illustrates two reports used daily to organize human resources in wards. The left image shows the consolidated load per patient in a ward, and the right images displays the daily detailed load for one patient, for each type of care



Figure 2: Predictive nursing load in a ward

. Because the complete nursing activity is planned and computerized, it is possible to know in advance the exact care planned for each patient individually, and to compute the global care requested for each ward, by care, by group of patients, and thus to allocate resources accordingly. Because all care is validated after execution, the nursing management can then measure the adequacy between what was requested and what has been really produced.

3.3 Hospital management

There are numerous whiteboards and indicators used by various people in the administration of the hospital, from logistics such as the pharmacy, the billing center and the top management.

The figure 3 illustrates one of the consolidated views, that displays a "radar" view of a department with each branch being one of the institutional wide indicator. These indicators include high level information, such as: Satisfaction; absenteeism; bed occupancy; patient cost weigh; outpatient clinics revenue; percentage of discharge letters signed 7 days after discharge; evolution of the number of FTE's; number of inpatients; length of stay; etc. That is, indicators about satisfaction, revenues, costs, means and resources and efficiency.

These indicators are computed using the information existing in the hospital information system and have been built in order to bring a real added-value for the management of the departments.



Figure 3: Global view of institutional indicators for the management of departments

4. Conclusion

Hospital and clinical information are cornerstones to build management decisionsupport. Daily routine information, from demographics to direct patient care, can be reused to provide decision-support at all management levels of hospitals. The real challenge is to have a tightly interoperable system, with common and shared semantics and definitions. Without these, the large data warehouses will not be able to provide high added-value knowledge with consolidated sources, such as logistics, human resources and care. Providing this kind of decision-support is a very strong incentive for sustained investment in this field and brings healthcare management to the 21st century.

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