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Hospital Information System and control of health costs

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Abstract :

Nowadays, the hospital information system has established itself as an essential tool for hospital management which should help change habits and improve the performance and financing of the health system. Hence, the present research aims to determine and study the contribution of the hospital information system (HIS) in controlling health costs, which generally results in better resource efficiency. The hospital cost analysis that was carried out on a sample of healthcare facilities located in the Wilaya of Tlemcen showed that these costs are not only an emergency in the construction of an information system but also a modern tool for efficiency measurement and decision support.

informations sur l'article

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- Hospital Information System,
- Healthcare Costs,
- Algerian Hospitals,
- Decision Support Tool.

1. Introduction

Today, it is widely admitted that the budget constraints imposed on all sectors of the national economy have not spared the health sector though it is supported by the National Charter and the Constitution (Benchikha, 2012; Guelil, 2013; Kara Terki, 2011). There is no doubt that the health sector is one of the strategic pillars of any nation. For any government, having a strong and reliable health system is of paramount importance. It should be noted that the main objective to be achieved by the authorities of any country is to gradually and perpetually improve patient care while providing reliable health data. As such, it should be noted that the health information systems (HIS) or hospital information systems (HIS) constitute the backbone of a healthcare system (Kara Terki, 2018). Moreover, since the hospital is the main provider of heavy-duty care to the entire population, it is imperative that this system be managed in an efficient manner. On the other hand, the management of the information circulating in all these care establishments is one of the new challenges that must be met. In order to improve the data management performance, a hospital information system must succeed in enhancing the management of information flows through the control of patient-related data (Gillet & Gillet, 2017). It must be recognized that these data are of fundamental importance for a correct and reliable processing of data. This certainly allows decision makers to rely on credible information, which contributes to transparent and sustainable funding. To this end, the present research work attempts to answer the following question:

What information collection system should be used with patients in Algerian public health establishments in order to control hospital costs?

2. The Hospital Information System (HIS)

Information plays a very important role in the functioning of every hospital; it circulates between various medical, medico-technical and administrative services. Inside the health care structure, there is an informal network between the different categories of staff, such as doctors, nurses, supervisors, orderlies, office workers and director, and also a formal network in which for example a nurse or a doctor may deliver a prescription to a patient who is supposed to follow a specific treatment (Degoulet&Fieschi, 1998; Reix et al, 2016). Similarly, outside the hospital, there is also an information flow network between managers and service providers, between directors and authorities, between physicians and their

colleagues in other health facilities. It should be noted that a patient's medical record, which includes all the information regarding the patient, is very important. The patient data is the medical information that is collected by the medical care providers about an individual patient. These data may include information relating to the past and current health status of patients, their treatment history, lifestyle choices and genetic data, results of diagnoses they may have undergone, medical treatment to follow, reports of medical consultations and operations, and all other formal information (Reix et al, 2016). It is also worth mentioning the information that is related to the management of these establishments; it is generally called managerial information. This information, which primarily concerns the bed turnover rate, absenteeism rate, number of patients treated, state of hospital equipment, state of drug stocks, list of rare drugs on the market, and supplier relationships, are collected by the administrators. The internal and external information of the establishment, linked to the managerial side, is also worth mentioning.

Financial information, such as budget status, hospital revenues and expenses, patient care costs, bills to pay and all external and internal financial information of the hospital, are collected by the financiers.

It is worth indicating that the information gathered can be viewed at three different levels[1]:

• A logistical level that supports the collection, circulation, conservation, quality and provision of medical and economic information.

• An operational level that involves the billing of hospital services (length of stay in hospital, number of consultation sessions).

• A strategic level that helps in the decision-making process, management, evaluation and planning. Therefore, it is imperative to master the collection, use and storage of information for good patient care and efficient hospital management.

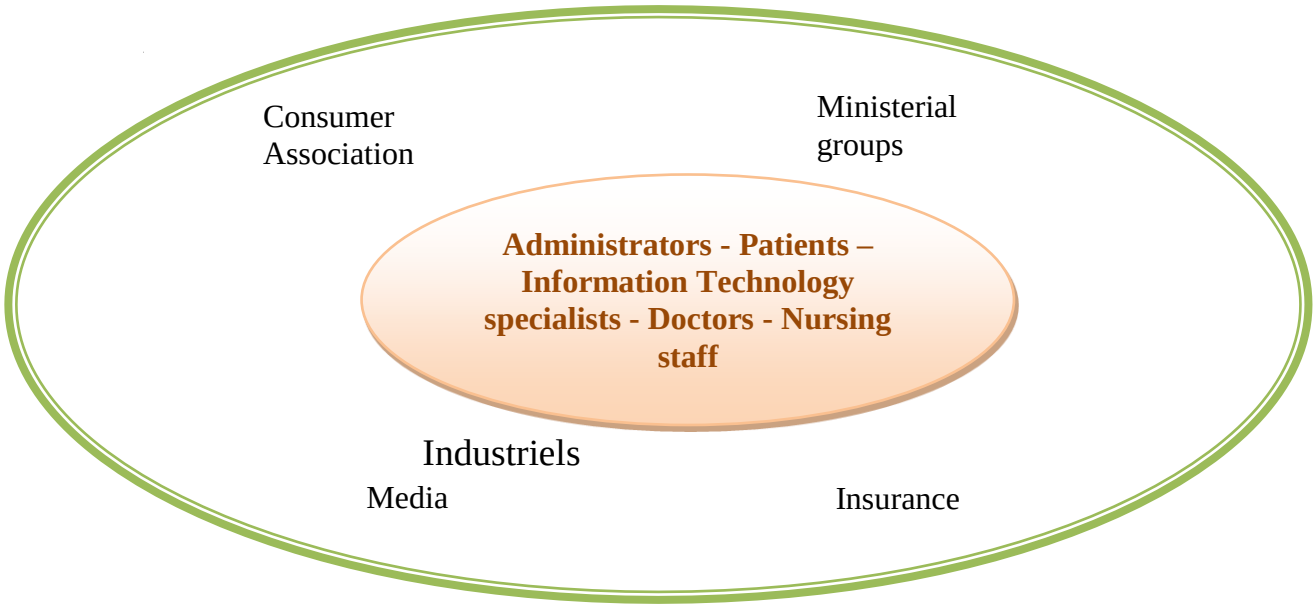
The actors involved, directly or indirectly, in the information system may be:

- External actors who belong to the supervisory bodies, but also to insurance, industrial and media services.

- Internal actors that are found within the hospital; these are healthcare staff (doctor, nurses, paramedics, pharmacists and biologists, biomedical engineers, etc.) and administrative and logistical staff.

Figure 1 illustrates the different actors directly or indirectly involved in the hospital information system.

Figure N°1.The actors involved in a hospital information system



Source: ***DegouletP, Fieschi. M. Informatique médicale 1998.3ed. Paris, Masson. 246pages***

3. The Contribution of the Hospital Information System

3.1. Collection of Medical Information

The model proposed by R. Fetter that was used to set up the Information System Medicalization Program (ISMP) made it possible, for the first time in the field of health economics in France, to bring together two opposing views on costs, namely medical cost and economic cost (Fetter, 1986).

Until now, this system has been viewed as very efficient given the quality of information collection. Indeed, this system defines each case of hospitalized patient according to very specific characteristics; it also determines the cost of the patient's pathology according to his health status (Gillet & Gillet, 2017). Therefore, each patient is considered as a special case. However, medically, he may share some common healthcare consumption characteristics with other patients. In this case, they are allplaced in a single homogeneous patient group (HPG). Note that the patients belonging to the same group should incur identical medical costs. The composition of homogeneous patient groups (HPGs) is generally not the same; it

varies over time and from one hospital to another. This system gives information not only on the amount of care provided, which is measured by the number of HPGs approached or treated, but it also identifies all the pathological cases treated in a hospital environment (Halgand, 2000).

Data collection system: To set up an information collection system, it is necessary to urgently create a medical information department. For this, it is highly recommended to create in each hospital a department specializing in collecting information on nosocomial diseases. This department should be responsible for providing weekly status reports.

The first information must concern the patient himself in relation to the care received. In addition, another report must relate to hospital hygiene and the equipment condition. Likewise, the government must set a maximum allowable rate beyond which the hospital will be subject to sanctions.

4. Hospital Costs as a Central Point in the Construction of the Information System - An example taken from the cost analysis of some hospitals in the Wilaya of Tlemcen

The costs practiced represent a good source of information on hospital management; they are seen as a perfect element for measuring and analyzing hospital activities. The present section aims to give an overview on the current hospital costs through a very small sample of hospitals in the Wilaya of Tlemcen.

Furthermore, the purpose is also to show that health expenditures in hospitals must be made in a rational manner in order to find explanations for certain differences in costs and also to lead to adequate decision-making.

4.4. Choice of Sample and Cost Calculation Method

Our choice fell on three hospitals, i.e. the University Hospital Center of Tlemcen (UHCT), the public hospital establishment of Maghnia and the public hospital establishment of Ghazaouet. The last two health units were selected because they offer the same patient reception capacity (150 beds), provide various medical care services, and share identical characteristics of the medical technical platform. The three selectedhealth facilities are located in the same geographic region and share many economic and social characteristics such as number of inhabitants, dominance of agricultural activities, etc.

On the other hand, regarding the University Hospital Center of Tlemcen (UHCT), it was selected due to the availability of information and also to the possibility of comparing the healthcare quality and healthcare costs.

Table N°1.Summary of hospital activities(Year 2018)

Medical services	University Hospital Center of Tlemcen		Public hospital establishment of Maghnia		Public hospital establishmentof Ghazaouet	
	Number of Patients	Number of hospitalization days	Number of Patients	Number of hospitalization days	Number of Patients	Number of hospitalizationdays
SurgeryA	2271	14342	2483	10138	1485	5874
SurgeryB	434	2608				
Paediatrics	5013	16031	2924	8239	1710	3264
Obstetrics and gynaecology	12896	46101	5438	10662	1919	6142
Hemodialysis (sessions)	/	97924	8169	8169	0	0
***Medico-surgical emergency* services**	7118	9046	2039	2039	10277	7101
Medicine	1231	17344	6008	13112	1333	7247

Source: Directorate of health in the Wilaya of Tlemcen

Table N°2. Hospital costs for a sample of medical services

	Year 2018								
Medical services	**University Hospital Center of Tlemcen**			**Public hospital establishmentof Maghnia**			**Public hospital establishmentof Ghazaouet**		
	Total expenses(DA)	**Number of WorkUnits**	**Unit laborcost**	**Total expenses(DA)**	**Number of WorkUnits**	**Unit laborcost**	**Total expenses(DA)**	**Number of WorkUnits**	**Unit laborcost**
Surgery A	17466.12	3 672	17147.40	114211921	10138	11266	120350 310	5874	20489
Surgery B	53342.52	497	70413.58						
Paediatrics	86555261.2	16031	5399.24	46459353	8239	5639	35247 379	3264	10799
Obstetrics and gynaecology	268570249	46109	5824.68	80818148	10662	7580	70357 950	6142	11455
Hemodialysis (sessions)	11784.97	2 019	11967.57	82043877	8169	10043	75783 543	5063	14968
***Medico-surgical emergency* services**	1196.02	81 572	1117.95	156437678	118500	1320	143793 504	43646	3295
Medicine	9062.58	4 385	9178.22	7512573	1741	4315	80813 701	7247	6096

Source: Directorate of Health in the Wilaya of Tlemcen

4.2. Method Analysis

The figures displayed in the previous tables were provided to us by the Directorate of Health of the Wilaya of Tlemcen. It is worth mentioning that the cost calculation was made compulsory in all hospitals by the ministerial instruction N ° 15 OF 10/03/2001. The figures presented for the three health establishments under study were carried out by the cost calculation services of each establishment, and are therefore real and accurate.

Our investigation was limited to the synthesis of two tables. Other figures, like those regardingpersonnel expenses, are not included but were analyzed nonetheless.

The work unit was set by the Ministry of Health. The medical services shown in the two tables were assessedon the basis of the number of hospitalization days. Also, in the dialysis service, the number of dialysis sessions is used as the unit of measurement.

Note that the unitlabor cost is obtained by dividing the grand total by the number of work units; this gives the price or cost of a service.

Since 2004, all hospitals have been equipped with a computer program which serves to standardize the methods and procedures used for the calculation of costs.

The calculation method used is the method of homogeneous sections. This method makes it possible to distribute the indirect charges of the secondary sections over the main sections using what is called the distribution key and also to measure the activity of the main sections using the work unit. The final cost is obtained by dividing the overall cost of each main section by the number of work units in each section. Ultimately, the cost of the work unit corresponds to the cost of one day in each service during a given period which in this case is one year (the year 2018).

4.3. Interpretation of Results

The cost analysis in the three health facilities led to the following results:

4.3.1. Costs and Details of Medical Care Production

It should be noted that many details on medical care production are not shown when the calculation method in question is used, because the measurement criterion retained is the hospitalization day, which makes it very difficult to give logical explanations for certain

expenses. In the same medical service, the variability and diversity of care processes showed that there were different medical examinations whose costs are normally very variable. As such, it is worth citing radiology, CT scans, and other services. Therefore, the cost of a patient's stay in the hospital can vary widely. Note that most of the time, the expenses are high at the beginning of hospitalization and then start decreasing towards the end. In addition, it is very difficult to distinguish between the hospitalized patients requiring intensive care and those that need only an observation or a routine medical check-up. As a result, the distribution of the costs of support services over all medical services gives a biased analysis of the hospital costs.

4.3.2. Anomalies in Cost Formation

The cost calculation results in the three health facilities under consideration made it possible to detect anomalies in the expenses made in certain services of the hospitals of Maghnia and Ghazaouet where the number of patients is much lower than that of the hospital of Tlemcen,but the final costs in the first two hospitals remains relatively high. This can apply, for example, to the general surgery services in all three hospitals. Even if this can be explained by the predominance of certain costs, such as personnel costs in particular, it is legitimate to think that other forms of unnecessary costs can be at the origin of these additional expenses. In fact, though the healthcare establishment of Tlemcen is a University Hospital Center, it still performs surgical activities that are much more delicate than those conducted in the other two hospitals of Maghnia and Ghazaouet. Note that this can still require high expenses. Therefore, the costs presented later in the different services do not reflect exactly the types of therapeutic treatments carried out in those services.

4.3.3. Absence of Depreciation Charges

The cost calculation, as presented in the three health care structures, does not take into account any depreciation charge, whether for material or equipment, which suggests that a significant part of the expenses has not been recorded. The depreciation charges make the calculated costs closer to reality; they can provide additional information on the methods used for equipment selection, the payback period, and the policy for equipment replacement. This would offer a clearer vision to managers and decision-makers (Kara Terki, 2011).In the case of all three establishments, the non-introduction of depreciation

costs is justified, by those in charge, by the fact that the investment budget is independent from the equipment budget; each budget is managed and treated separately. From an analytical point of view, this is not justifiable because costs must include all the charges, whatever their nature (fixed or variable, direct or indirect charges) and that the depreciation charges concern also the renewal of the used equipment,during a certain accounting period.

4.3.4. Predominance of Fixed Costs

The cost calculation carried out in the three healthcare establishments clearly shows the predominance of personnel costs; they represent about 70% of all expenses. These are, in terms of management, the most difficult to control since they do not change according to care production; they are supported by the healthcare structure regardless of the quantity of care achieved. This means that the remaining 30% of costs fluctuate, depending on the quantity of care offered, in other words,according to the number of patients treated in the hospital. The remaining charges provide additional information on the medical care costs in terms of drugs, imaging, catering and other expenditures that have a great effect on the quality of care. To achieve better rationality, it then becomes urgent to carry out detailed studies on the productivity of health personnel, to set production standards and to link part of the personnel salary to the cases treated; this will certainly motivate the search for additional learning and further training.

5. Analysis of the Method Used

The figures displayed in the previous tables were communicated to us by the health services of the Wilaya of Tlemcen. It should be noted that the cost calculation was made compulsory in all hospitals by the ministerial instruction N ° 15 OF 10/03/2001. The figures provided by the three establishments are therefore real; they were supplied by the cost calculation services of each establishment. Our work was limited to the synthesis of the two tables. It should also be noted that other costs, such as staff salaries, were not included but were stilltaken into account and analyzed. The unit of work was set by the Ministry of Health. In addition, the number of hospital days for medical services are shown in the tables. The unit of measurement used in the dialysis service is the number of dialysis sessions. The cost of one unit of work is calculated by dividing the grand total by the number of work units,

which would help to obtain the costs for each service. Since 2004, all hospitals have been equipped with a computer program that is used to standardize the methods and procedures for calculating the costs. The calculation method used is the method of homogeneous sections. This technique makes it possible to distribute the indirect charges of secondary sections on the main sections through the use of the distribution key; it also allows assessing the activities of the main sections in terms ofwork units. The final cost is obtained by dividing the overall costs of each major section by the number of work units in each section. In the end, the cost of one unit of work represents the cost per day in each service during a given period of time (the year 2018).

6. CONCLUSION

This article attempts to show that it is important to set up an efficient information collection system in order to ensure good patient care safety and to guarantee good cost control. In addition, today, it is highly urgent to set up a national hospital information system (HIS) in order to achieve greater rationality and higher efficiency in the health care sector. Information regarding hospital productivity and profitability in Algeria can greatly contribute to introduce the competitive aspect in research, training and medical development. It can also encourage care producers to adopt appropriate treatment protocols and techniques allowing them to treat more serious, rarer and more expensive cases. Health care financing depends on all these issues.

Finally, as the country's economic and social situation is becoming more and more complex and the pathology of the population is undergoing rapid transformation, it has become urgent today to thoroughly review all the management and financing regulations and to develop new funding sources and opportunities. It can therefore be concluded that the hospital information system (HIS) remains the best means for the management and control of health care activities within the hospital.

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