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The Billing Process of a Surgical Service: A case study in the sector
of private healthcare services

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ABSTRACT

The Billing Process of a Surgical Service: A case study in the sector of private healthcare services

Resorting to process management approaches, particular the PEMM, the study focuses on the billing process of the surgery service of the six private hospitals from José de Mello Saúde. For that matter the process is described and evaluated in aspects such as process design, performers, owners, infrastructures and metrics. The analysis is complemented with the presentation of process performance in 2015. From the analysis six main recommendations emerge. In general terms, the recommendations presented aim to transform the studied process in a reliable, predictable and stable process.

Keywords: Process Management; Services; Healthcare; PEMM

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The following work project was developed in the field of Operations Management, on the first semester of 2016. The work tries to contribute for a better understanding of the reasons that justify that more than 50% of the invoices from the surgery services of JMS do not meet the management goal of being issued at the client's hospital dismissal date.

1. CONTEXT

1.1. José de Mello Saúde (JMS)

José de Mello Saúde is a Portuguese company operating in Portugal in the healthcare service sector. Part of a larger business group (Grupo José de Mello) , JMS was founded in 1945 with the opening of CUF Infante Santo Hospital. From this date until 2006 the company extended its services both with the opening and management of clinics and hospitals, mainly in the Great Lisbon area. From 2006 onwards JMS kept the growing strategy in this area but simultaneously enlarged its operations to other geographies, both in other parts of Portugal as well as in Spain.

Essentially the company runs two different businesses. One is related to the ownership and management of private hospitals and clinics, as well as all the healthcare services associated. The other is related to public hospitals' management, under a public-private partnership agreement. At the beginning of 2016, JMS operated exclusively in Portugal, owning seven clinics, six hospitals (and one in the pre-launching phase) and managing two public hospitals.

JMS Annual Report and Accounts of 2015 indicated that the services provide by the company were according with the quality parameters present by National Health Evaluation System (SINAS). In this same report was stated that JMS had a turnover of 560,2 million €, and an EBITDA of 63,5 million € in 2015 . Considering healthcare services, the company provided 2069,8 thousand consultations, 457 thousand inpatient days and served 84,7 thousand surgical patients (José de Mello Saúde, 2015).

1.2. JMS' Surgery Service (SS) in Private healthcare services

In the Beginning of 2016 the company run six private health units that provided surgical services. These units were: CUF Infante Santo Hospital (HCIS) – 9 Operating rooms (O.R), CUF Descobertas Hospital (HCD) – 10 O.R., CUF Porto Hospital (HCP) – 11 O.R., CUF. Santarém Hospital (HCS) – 2 O.R., CUF Torres Vedras Hospital (HCTV) – 3 O.R. e CUF Cascais Hospital (HCC) – 3 O.R.

According to management information from 2015, these six unit had a turnover of 313,8 million € of which 32,4% was related to the surgery service. Looking individually to each unit, the proportion of the SS in the overall turnover varied from 30,4% to 38,8 %. These six units together performed about 45,9 thousand surgeries from which HCD, HCIS and HCP represented 75%.

The SS provided services to a wide range of clients that include out-of-pocket clients, clients with a healthcare insurance and clients with healthcare sub-systems. In 2015, according to management data related to five of the six units (excluding HCS), the out-of-pocket clients presented 8% of the total surgeries performed, clients with healthcare insurance represented around 60%, and healthcare sub-systems represented 30%.

Finally, is also important to state that SS performed both programed and urgent surgeries. According to the management data related to five of the six unit (excluding HCS) the urgent surgeries presented 20 % of the total surgeries performed. However, this proportion was highly determined by HCD, HCIS and HCP. The other two remaining units had much lower proportions.

1.3. JMS' Billing Process of the Surgery Services (SS)

Given the significance of the surgery services in the overall turnover of JMS, the billing process of such service is a key process.

This process was managed at unit level and its start depended on the hospital dismissal of the clients. It included the issue of invoices, both for the client and the financial responsible entity (F.R.E.) (when applicable), and referred to the services provided to the client since the moment of his last entry in the hospital before the surgery - *excluding this way all the services related to consultations and previous medical exams.*

Although led by the Front-office Department (an administrative department which respond to the Customer Relations Direction) the billing process depends on the actions of many other departments, both internal and external to JMS. In order to have all the information required to issue an invoice is necessary to collect internally: clinical reports and records regarding drugs admission, consumables use, operations room procedures and inpatient. As for external information to the units, is necessary to collect information concerning the client's F.R.E. and, in some circumstances, the insurance Letter of Guarantee.

Although the billing process started right after the hospital dismissal and the management goal was to complete it within the day that the client leaves the hospital, all the six units registered a great variation in the process flow time.

1.4 Problem

Having as main input the great variation registered in the flow time of the billing process, the present work pretends to contribute to a better understanding of this conduct. To do so, this work discusses the design, the teams involvement, metrics and performance of the billing process. Since we will be looking at six units in simultaneous it will also be describe the degree of standardization of the process across units. With this extended analysis the study hopes to contribute for the answer to the following question:

Do the flow time of billing process of surgery services of JMS private hospitals has non-identified opportunities for improvement?

2. LITERATURE REVIEW

2.1 Process and service definitions

The processes of a company must derive from a company objectives and goals (Vyvas, Tripathi & Gupta, 2014) and are defined as the production and delivery of products by transforming inputs into outputs using capital and labour force. For a better understanding of such definition is useful to comprehend that inputs are considered to be any tangible or intangible item that flow from the environment into the process and outputs are information, material, energy, cash or satisfied customers that flow from the process back to the environment (Anupindi et al., 1999). There are four attributes associated to any process: cost, flow time, flexibility and quality. (Anupindi et al., 1999).

The products delivered by a process can either be goods or services (Anupindi et al., 1999). Since our analysis focuses solely on the latter, it is necessary to understand what they are. Services are tangible or intangible product experienced by customers (Anupindi et al., 1999) such as a consultation or a surgery. Like products, services can be described by its four attributes: costs, delivery-response time, variety and quality. But, opposing products, services are “inherently “experimental”, require close interaction between the process and the customer, are often delivery and experience simultaneously and can’t be produced in advance and stored for later consumption” (Anupindi et al., 1999).

2.2 Process management

Process management is a structured approach to perform improvement based on the disciplined design and careful execution of a company’s end-to-end business process (Hammer, 2002). It includes three major phases: the first one includes mapping routines, the second is related to process improvements (including rationalization of processes and

streamlining interfaces between organizational subunits) and finally, the third phase is associated to the acquisition of routines aligned with the best practices (Ding, 2015).

Among the benefits associated to process management, Ding (2015) highlights the following: reduction of process variation, increase of process control, reduction of operation costs, improvements in quality and better financial outcomes.

In order to develop a proper management of a company's processes is pertinent to begin by understanding the maturity level of the processes within an organization. In this context, Hammer (2007) through Process and Enterprise Maturity Model (PEMM), describes five process enablers of higher performance over time. Those are: i) Process design: a process must have a well-specified design, this is, a comprehensive specifications of how to execute it; ii) Performers: the people that execute the process must have the appropriate skills and knowledge; iii) Owners: there must be a process owner with responsibility and authority to ensure that the process delivers results; iv) Infrastructure: information and management systems, along HR systems, must support the processes; v) Metrics: it is necessary to develop and use the right metric to track the processes performance over time.

Within process management field, rose the Business Process Management (BPM) which is a framework where five main themes are addressed: process strategy, process architecture, process ownership, process measurement and process improvement (Smart et al., 2009).

On the following sections we will present the four of this five themes which most related to the goal of the present study.

2.2.1 Process design

The process architecture (here considered a synonyms of process design) is a key element in the process management, ensuring discipline, repeatability and constancy (Hammer, 2002; Smart et al., 2009). According to Ponsignon, Smart & Maull (2012) it includes the definition

of the resources, the tasks, the order, the circumstances, the information and the degree of precision to how a process is performed.

Focusing on the process design within service firms, Ponsignon, Smart & Maull (2012) warn that business process design principles don't fit all firms in the same way. They distinguish two main types of firms, the cost leader firms (who offer low price and standardised services) and the focus firms (who has a customized service to segmented customers). The authors state that design principles like elimination of non-value adding tasks and re-sequence tasks are applicable to both types. On the other hand, the principles of implementing automate tasks, use of specialists employees with low skill level and reduced customer contact are principles to be applied only the first type of firms. Finally, the principles exclusively adequate to the latter type of firms are the empowerment of employees and the use of generalist employees with high skill levels.

2.2.2. Process ownership

Process ownership is another basal part of the process management in which is defended the existence of a process coordinator: the process owner. A person holding this task must have an end-to-end authority of the process (Deenitchin, Dmitriev, & Hebenstreit, 2015; Hammer, 2002), must be responsible for defining the process design and ensuring that the people involved in the process: understand it, are trained in it, have the required tools and also that are executing the design specification according to what is determined. The process owner must also be responsible for evaluating the process and promoting the necessary improvements, by either implementing minor changes or launching a process reengineering project (Hammer & Stanton, 1999; Hammer, 2002).

Deenitchin, Dmitriev, & Hebenstreit (2015) also discuss the necessity of the process owner to have support from high operational management levels in order to reduce the risk of this role becoming merely formal.

2.2.3 Process measurement

Process measurement is the part of the BPM that “seeks to optimize the process performance against both customer requirements and economic targets” (Smart et al., 2009). The measurement of a process requires: top management involvement, a methodical and disciplined approach and a focus on the output of each process step (King, King & Davis, 2014). In order to perform it, is necessary a clear definition of the process metrics along with its purpose, target/ reference point, means of measurement, means of interpretation and reporting structure (Kerzner, 2011). Plus, when choosing metrics one must be sure that is going to use them, that they are informative – action oriented -, and that can train the team in its use and analysis (Kerzner, 2011).

Deenitchin, Dmitriev, & Hebenstreit (2015) describe the management of the process performance (MPP), along the process ownership, as a tool to deal with the processes uncertainties, “enabling to see and understand dependencies and consequences (...) in an continuous way”. Plus the authors present four key activities within MPP: data collection, development of dashboards or reports, development of both process and business review meeting with the team involved in the process and, finally, identification of improvement opportunities.

Among the several factors that can impact a process performance Vyvas, Tripathi & Gupta (2014) refer factors related to the input of the process, failures and inadequate training of the human resources, systems (technology) defects, overload of one activity along the workflow, poor interaction between units, inadequate quality control procedures, inadequate monitoring

and lack of metrics and/or establishment of benchmarks, delays in the service delivery and inadequate procedures to collect and implement improvement opportunities.

2.2.4 Process improvements

Many frameworks have been presented to conduct process improvements. Among the most popular methodologies is Six Sigma. Six Sigma is based on the DMAIC framework which is composed by the following five actions: i) define the problem, ii) measure the problem, iii) analyse the roots of a problem, iv) improve by implementing the identified solutions and iv) control to prevent recurrences (Hammer, 2002).

3. METHODOLOGY

The present work project lasted four months and resorted to four different research methods (Macintosh & O'Gorman, 2015): interviews, observation, data analysis and use of customized frameworks.

There were conducted 14 interviews within four of the six hospital units involved in the study, whose main purposes were defining and describing both the billing process as well as the surgical service process.

The observation lasted five days, in three units, and was mainly used to comprehend the circuit of information related to the surgical service process and the management of Letters of Guarantee process inherent to the surgeries performed under healthcare insurance.

Additionally, during the study two customized frameworks served as starting point: Six Sigma and Process and Enterprise Maturity Model (PEMM). The first four DMAIC principles were used to structure the results. In the first two phases it was bounded and quantified the problem which this study aimed to answer. Within the third phase – the analysis – the study focused briefly on the description of surgical service process, then - in greater detail - in the

description of billing process of the surgical service and finally, in a third section, on the performance analysis of the latter process. Both in the first and in the second section, were used the rules presented in Process Mapping and Management (Conger, 2011). In the second phase, the five process enablers of PEMM were followed to present the process status. During the last section of this phase the use of data analysis techniques allowed a description of the flow time of the billing process as well of a comprehension of its main determinants. Due to their link with the billing process, we also used data analysis techniques to characterize the flow time of two other processes. The data analysis was based in three samples. The first two extracted from the Management Information System of JMS. The third was a multi-sources sample (information systems crossed with observations) collected for “+ Cuidar Bloco Operatório” - *an internal project developed by JMS during 2015*. The first one included 45,5 thousand surgeries performed in 2015 from five of the six units that executed the billing process (HCS wasn't analysed). The second sample included 2,7 thousand surgeries performed in 2015 from two units (HCD and HCIS). Finally the last sample included 77 surgeries performed between March and April of 2015, all of them required the management of Letters of Guarantee process, and was exclusively extracted from HCIS.

At the end, in the discussion, improvement opportunities are presented.

4. RESULTS

As mention in the methodology the results follows the DMAIC structure, thus in the define phase we set our problem as being the inability of the hospital units to issue the billing of the surgical service in the day of the hospital dismissal of the client and set as main research question whether or not the flow time of billing process had non-identified opportunities for improvement.

In order to first measure the problem, we resort to management information for the Sample 1 and determine the percentage of surgeries (in the overall of each unit) which issued the

invoices on the client's hospital dismissal date, until five days after and at least five days after.

Table 1- Invoices by emission date

	Issue at hospital dismissal day		Issue between hospital dismissal and 5 days		Issue at least 5 days after hospital dismissal	
	% invoices	% €	% invoices	% €	% invoices	% €
HCD	44%	34%	31%	34%	25%	32%
HCIS	36%	31%	31%	30%	33%	39%
HCP	48%	46%	29%	30%	23%	24%
HCC	41%	<i>No data</i>	30%	<i>No data</i>	29%	<i>No data</i>
HCTV	61%	<i>No data</i>	17%	<i>No data</i>	22%	<i>No data</i>
HCS	<i>No data</i>	<i>No data</i>	<i>No data</i>	<i>No data</i>	<i>No data</i>	<i>No data</i>

As it is possible to observe in table 1, only 36% to 61% of the invoices were issued at the hospital dismissal date. Using data for the larger units (HCD, HCIS and HCP) we can also state that this represent between 31% to 46% of the overall value (€) of surgeries. We can also verify that between 22% and 33% of the invoices are only issue at least 5 days after dismissal.

We then proceed to the analysis phase. In the first moment we looked for an understanding of the context of the billing process. To do so we designed the process of the surgery service, identified the activities in it which concur to the billing process and, for this activities we described which teams were involved. The result of such work can be consulted in diagram 1 – *in appendix* - and table 2. Finally, also for the surgical service process, we identified four rules: i) surgery scheduling is independent of the timings of the management of Letters of Guarantee process; ii) unless the client determines so, the surgery can be realized before the arrival of the Letter of Guarantee, iii) invoices are only issued when the management of Letters of Guarantee process is finish, except if the client is responsible for the delay and more than 30 days have passed since the hospital dismissal date and iv) the issue of partial invoices is avoided unless there is an error in the initial invoice or the hospitalization period is very long.

Table 2 –Description of SS’s activities that implicate with the Billing Process

Activity	Team responsible	Variation among units
C 1 -Surgery scheduling		
C 1.01 Opening of a new surgery proposal	Surgical management	Small units - Billing team Larger units - in some medical specialties - clinical secretariat
C 1.02 Schedule of the operation room (O.R.)	O.R. secretariat	Small units - Billing team HCD – Outpatient surgery – Outpatient room secretariat HCD and HCP - Obstetrics surgeries - Birth room secretariat
C 2 - Management of Letters of Guarantee		
C 2.01 First submission of the Letters of Guarantee request	Programed surgery - Surgical management Urgent surgery - Billing team Surgery of a F.R.E. that interacts exclusively with the client - Client	Small units - Billing team
C 2.05 Receive of additional information request	In preoperative status - Surgical management In postoperative status - Billing team Surgery of a F.R.E. that interacts exclusively with the client - Client	HCP – If the client is still admitted in postoperative – Briefing, member from Billing team
C 2.06 Collection of the requested information		
C 2.07 Additional submission of the Letters of Guarantee request		
C 2.08 Completion of the management of Letters of Guarantee process		
C 5 - Surgery performance		
C 5.01 Drugs admission debits	O.R. Nurses	Small units - O.R. Nurses and Procurement team
C 5.02 Consumables debits	Inpatient surgery - Procurement team Outpatient surgery - O.R. Nurses	Small units - Always - O.R. Nurses HCP - Weekends - O.R. Nurses
C 5.03 Consumables debits status	Procurement team	Small units - O.R. Nurses HCP - Weekends - O.R. Nurses
C 5.04 Surgical procedures, teams and time validation	Inpatient surgery - O.R secretary Outpatient surgery - O.R. Nurses	Small units – Always - Billing team HCD and HCP - Obstetrics surgeries - Birth room secretariat
C 5.05 Recovery room debits	O.R. Nurses	-
C 6 - Postoperative inpatient		

C 6.01 Drugs admission debits	Pharmaceutics	Small units – Nurses
C 6.02 Accommodations expenses debits	System	-
C 6.03 Physical and Rehabilitation Medicine debits	Physical and Rehabilitation Medicine Technicians	-

Secondly we followed PEMM framework principles to describe the billing process. A summary of the findings can be read in table 3.

Table 3 – Billing Process description according to PEMM items

<p>Design</p> <p><u>Purpose:</u></p> <p>The goal of the process is to issue invoices both for clients and financial responsible entities (F.R.E) within the moment the most near possible to the client’s hospital dismissal date. In operation terms, this goal is transmitted by the indication of issuing the invoices within the hospital dismissal day.</p> <p><u>Context:</u></p> <p>The process suppliers are the different team that support the inputs of the project.</p> <p>The inputs are the activities: C 1.x1, C 1.x2, C 2.08, C 5.x1, C 5.x2, C 5.x3, C 5.x4, C 5.x5, C 6.x1, C 6.x2, C 6.x3 (- see table 2 for further description of the activities).</p> <p>The process resources are the Billing team (operation terms); Customer Relations Direction (management control terms) and Business Assurance department (in strategic terms).</p> <p>Once the process its completed, its clients are: the hospital client that was operated, the Commercial Direction and the Financial Direction.</p> <p>The outputs are the two invoices issued (client and, when applicable, the F.R.E.) and, also when applicable, the proof of payment and clients signature collection.</p> <p><u>Documentation:</u></p> <p>There were no updated neither exhaustive documentation about this process. Nonetheless during the present study it was design the map of the process and was done a description of each activity, their responsible and variations across units. The map ca be found in appendix – Diagram 2. The description of the activities is presented in the table 4.</p>
Performers

Knowledge

The teams can identify the main activities of the process, are aware of its great importance but do not know the way each activity impact the overall result. Each unit has only a general knowledge on how the remaining units work.

Skills

Teams are skilled in the use of the platform used to performed the billing process but doesn't seem to be skilled both in accessing and using /analysing the management information available to monitor the process.

Behaviour

There is a great proactivity which, aligned with the lack of documentation about the process, tend to be transformed in performing overlapping tasks. Such behaviour seems to helps to solve problems in the short-run but tends to mask the places where there is need for improvement. There is little coordination among teams of the different hospitals.

Owner

Identity

At JMS level the owner of the process is Customer Relationship Direction; at unit level is the Front office coordinator. We will denominate the first as process management expert, and the second as process owner.

Activities

Regarding the latter one (unit level), it is responsible for monitoring the process and identifying changes for improvement. Neither of them are performed with a layout or frequency predetermine. Also, this person participates in the human resources evaluation and presents quarterly the main results associated to this process.

Authority

The front office coordinator is the line manager of the billing team, thus it has the necessary level of authority to coordinate the process. The same cannot be said regarding the input activities of the billing process.

Infrastructures

Information systems

There are three information systems which collect relevant management information regarding the billing process. Together the systems provide information relevant to describe the process performance. Nonetheless, in order for the information extracted to be relevant

for management decision it is required some data crunching exercises, for instance grouping certain data in categories or excluding some non-representative situations. This type of exercise is not described and standardized, thus is dependent on the user.

Human Resources systems

Both the process owner and the teams involved in the billing process have part of their remuneration depended on process performance.

Metrics

Definition

The process is controlled by three metrics. The first is assigned automatically by the system and labels the invoices as one of five categories according to the date of the emission. This categories are: “no issue”, “issue at the hospital dismissal data”, ; “issue in 24 hours after the dismissal”; “issue within 5 days after the dismissal” and finally “issue at least 5 days after the dismissal”. A second metrics is inserted by initiative of the billing team and, resorting to twelve different descriptions – *all most all related to the absence of one of the inputs activities* - attempts to identify the causes of all the invoices not issued at the client’s hospital dismissal date. Finally the third metric is also assigned by the system and refers to the total amount that each units has pending, this is, the clients already left the hospital but the invoice hasn’t been issued.

Uses

The third metric is used on almost daily analysis and also presented in quarterly reports. Is also relevant to state that the second metric has a use limitation. The systems can only extract the causes of the delays when the invoice hasn’t been issue. So there is limited space to study the causes. Some units overcame this problems with monthly backup files.

Table 4 – Description of the Billing Process activities

Activity	Team	Variations among units
C 8.01	Billing team	HCD and HCP - Obstetrics surgeries - Birth room secretariat
C 8.02		HCP – some physician do it themselves
C 8.03		Large units – Outpatient surgeries – Outpatient room secretariat HCD and HCP - Obstetrics surgeries - Birth room secretariat HCP – If the client is still admitted in postoperative - Briefing - member from Billing team
C 8.04		Large units – Outpatient surgeries – Outpatient room secretariat HCD and HCP - Obstetrics surgeries - Birth room secretariat
C 8.05		Large units – Outpatient surgeries – Outpatient room secretariat

	HCD and HCP - Obstetrics surgeries - Birth room secretariat
C 8.01 Inpatient consumable debits <i>(only applicable to inpatient surgeries)</i>	Concerns the registration on the hospital management platform (HMP) of all the consumables and exams which the client access to during the inpatient postoperative period.
C 8.02 Visits accommodation expenses and additional medical consultations debits <i>(only applicable to inpatient surgeries)</i>	Concerns the registration on the HMP of all the accommodation expenses from persons visiting the client and also all the medical consultations performed during the inpatient postoperative period (excluding the visits from the surgeon).
C 8.03 Validation of the invoice	Refers to the analysis of all registrations made in the HMP for each surgery according to the agreements establish with each F.R.E.
C 8.04 Invoice emission	Concerns the invoice emission and, in absence of the client, the contact to the client to inform him that the process is complete.
C 8.05 Collection of the proof of payment and clients signature <i>(only applicable to clients with a healthcare sub-systems)</i>	Concerns the collection of the clients proof of payments as well as its signature on an invoice copy.

The last part of this section was focused on the analysis of three samples of management information. During the analysis of the Sample 1 and 2 we observed separately three types of surgeries: inpatient programmed surgery (IPS), outpatient programmed surgery (OPS) and inpatient urgent surgery (IUS). Excluding a situation presented in table 9 (in appendix) – where the samples are described - this three types of surgeries represented between 96% to 99% of the total surgeries of each unit.

Using sample 1 we characterized the three types according to its relevance (%) in the overall number of surgeries and the relevance (%) on the delays register both in the total of the unit as well as within the type of surgery. The results can be consulted in table 5.

Table 5 - Percentage of delays by type of surgery

	IPS	IPS delays		OPS	OPS delays		IUS	IUS delays	
	% total	% total	% in IPS	% total	% total	% OPS	% total	% total	% IUS
HCD	41%	26%	63%	36%	11%	30%	22%	18%	82%
HCIS	52%	31%	59%	28%	16%	57%	19%	15%	80%
HCP	47%	23%	48%	30%	13%	42%	19%	13%	70%
HCC	0.3%	No sign.	No sign.	59%	48%	82%	0.2%	No sign.	No sign.
HCTV	0.2%	No sign.	No sign.	98%	30%	31%	0.1%	No sign.	No sign.
HCS	No data	No data	No data	No data	No data	No data	No data	No data	No data

In order to understand the causes of the delays, we used sample 2. To do so we classified the motives according to table 13 - in appendix. Table 6 presents the results according to the process implemented in the delay.

Table 6 – Delays by type of surgery and reason

	IPS			OPS			UPS		
	Management of Letters of Guarantee % total	Informations registration % total	Signature collection + Others % total	Management of Letters of Guarantee % total	Informations registration % total	Signature collection + Others % total	Management of Letters of Guarantee % total	Informations registration % total	Signature collection + Others % total
HCD	20%	6%	0%	8%	3%	0%	17%	1%	0%
HCIS	17%	9%	4%	6%	6%	4%	13%	1%	1%
Others	No data	No data	No data	No data	No data	No data	No data	No data	No data

Here “Management of Letters of Guarantee” stands for all the delays related with C 2, “Information registration” stands for delays related to all the inputs activities mentions for C 1, C5 and C6 and “Signature collection + others” stands for delays related to the billing process itself (C 8). Plus, it was possible to determine which causes had, among the C 2 related, an internal delay as reason. Then we separated those and aggregated them to the causes related to C 5, C 6 and C 8 in order to identify all the causes related to the JMS operations. The results can be observed in table 7.

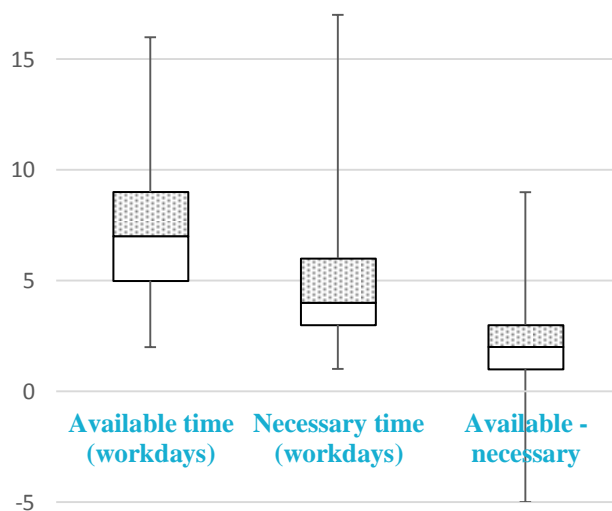
Table 7 - Delays by type of surgery and responsible

	IPS		OPS		UPS	
	Internal cause % total	External cause % total	Internal cause % total	External cause % total	Internal cause % total	External cause % total
HCD	9%	11%	2%	6%	9%	8%
HCIS	10%	7%	2%	4%	8%	5%
Others	No data	No data	No data	No data	No data	No data

Knowing that the billing process can only be performed at the day of dismissal if all the input activities are previously performed, and given the fact that (according to table 6) most of the

delays are due to the non-conclusion of the C 8.08 activity we resort to information available in the Sample 3 (n=77), that only included surgeries which demand a Letter of Guarantee, to comprehend the flow time of the surgical service process from the start until the hospital dismissal and also the flow time of the management of Letters of Guarantee process. To do so we counted the number of workdays between the activity C 1.x1 and - in the first case - the activity C 7, and - in the second case - the activity C 8.08. To the latter we called it necessary time to complete the management of Letters of Guarantee process. To the first we have called it the available time to complete the management of Letters of Guarantee process. For the three distributions we only considered the values within the interval: $\mu \pm 2\sigma$. We then analyse, which surgeries had the available time greater than the necessary time. The distribution can be observe in the Chart 1. The first distribution show us that 75% of the surgeries have at least 5 workdays available. On the second distribution we can see that for 75% of the surgeries are need up to 6 workdays. The third distribution show us that more than 75% of surgeries have more available time than the one necessary. Moreover, in this sample the average necessary time were 5,3 workdays. If we would only focus on the three F.R.E. with greater number of surgeries (which represent 73% of the total of the sample) we would have an average of 5,4 workdays.

Chart 1 – Available and necessary time distribution



5. DISCUSSION

In overall terms is considered that the process observed is what the PEMM considered a P-0 level, which Hammer (2007) describes as the “natural state of affairs when organizations haven’t focused on developing their business processes”. In this section we will present

several recommendations in order to i) transform it in a P-1 level, which is describe as a reliable, predictable and stable process, and ii) identify where are the most relevant opportunities to increase the process performance:

Recommendation 1 – Improve the process documentation

It is recommended that the six units combine efforts in order to collect, validate and maintain updated the documentation of the process. Is also suggested that this documentation includes the following topics: i) identification of the process goal; ii) process map; iii) description of the team involved in the process and each one responsibility; iv) procedures manuals to guide the use of the work instruments (there is a version from 2014); v) digital form related to the billing rules (already exists); vi) list of past projects on which the process was involved; vii) list of improvements implemented in the past and their main results; viii) main considerations and recommendations for the use of the management information available to monitor the process.

Recommendation 2 – Reinforce the Briefing role

Comparing the percentage of delays in each type of surgery, focusing particularly in two types of inpatient surgery (IPS and UPS) (table 5) it is possible to observe that HCP has a small percentage of delays than the remaining units with data. Since HCP was the only unit which referred the existing of the briefing role – which is in charged of the daily analysis of the management of Letter of Guarantee of the inpatients - is recommended that is evaluated the possibility of implementing the same role in the HCD and HCIS (the two others units where this type of surgeries has a big prevalence).

Recommendation 3 – Empowerment of the Process Owner

It is suggested that the main goal of the process owner be defined as assuring that the billing process reaches the annual performance goals defined annually by the process management expert. We also recommend that the following eight activities become his/her responsibility:

Table 8 – Process owner activities

(Annual) Together with the process owners of the other units, participate in the update of the documentation that supports the process
(Annual) Be aware of the main process variations between units
(Monthly) Monitor the metrics of the process and know the potentials and limitations of the management information.
(Annual) Together with the process owners of the other units, identify improvement areas and coordinate and evaluate its impacts.
(Annual) Participate on the evaluation of the human resources involved in the process
(When necessary) Participate on the training of the human resources involved in the process
(Semimanual) Meet with the process owner of the remaining units
(Semimanual) Present the process results, both to the process management expert as well as the teams involved in the process.

Recommendation 4 – Improve the Information System

In order to better support the analysis of management information we suggest that is evaluated the investment necessary to i) make the system capable of extracting the data related to metric 2 even after the invoice emission; ii) 24h after the hospital dismissal, if no cause is attributed to a non-issued invoice, to trigger a request for a cause identification.

Plus it would be also relevant that the process owners analysed the management information using categories that could segment the data and clarify the areas that request improvements. Examples of such categories can be found in appendix – Table 11 and 12.

Recommendation 5 – Metrics: Monthly reports

For accurate control of the billing process we would recommend monthly reports (dashboards) where the analysis is segmented in the three main types of surgery here described: IPS, OPS and UIS. For each of this types it would be useful to control the

percentage of surgeries for which was required the performance of C 2 and, for those the percentage of it who had less available days than necessary. This percentage of surgeries would be the acceptable % of surgeries with invoice emissions delayed. This is, it would be considered as target (% of invoices issued at the hospital dismissal day) all the invoices that did not required C 2 or that required it but for which the available days where greater than the necessary ones. The report should also present the actual delay in order to compare the two. This way the process would be measure within its own area of influence. The distribution of the available and necessary days would also be relevant to include.

Please note that to identify the surgeries that required C 2, two criteria could applied: the first one would include all the surgeries which involved F.R.E. that required a Letter of Guarantee. The second hypothesis would be to include the ones for which is required the Letter of Guarantee and also that it is the unit (not the client) who performs the C 2 Process.

Recommendation 6 - Outpatient surgeries in HCIS and HCC

Although within this study it was not possible to identify its roots, we would also like to highlight the fact that, in percentage of the type of surgery, HCIS and HCC reports a much higher proportion of delays, respectively 52 % and 87% (table 6) that the remaining ones. For that reason we would suggest a deeper analysis of this situations, namely by comparing this two units procedures with the ones from the units with similar dimension.

6. CONCLUSION AND DIRECTIONS FOR FUTURE RESEARCH

This study tried to contribute for a better understanding and control of Billing Process of SS which can only be useful if implemented with careful monitor and adequate training of the teams involved. Due to the relevance of the management of Letter of Guarantee process it is suggested that, in the future, a similar exercise is done for this process.

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APPENDIX

Diagram 1– Map of the Surgical Service

Note that the map here presented describes the programmed surgeries. In an urgent surgery C1 is not performed and C4 is performed right after the start.

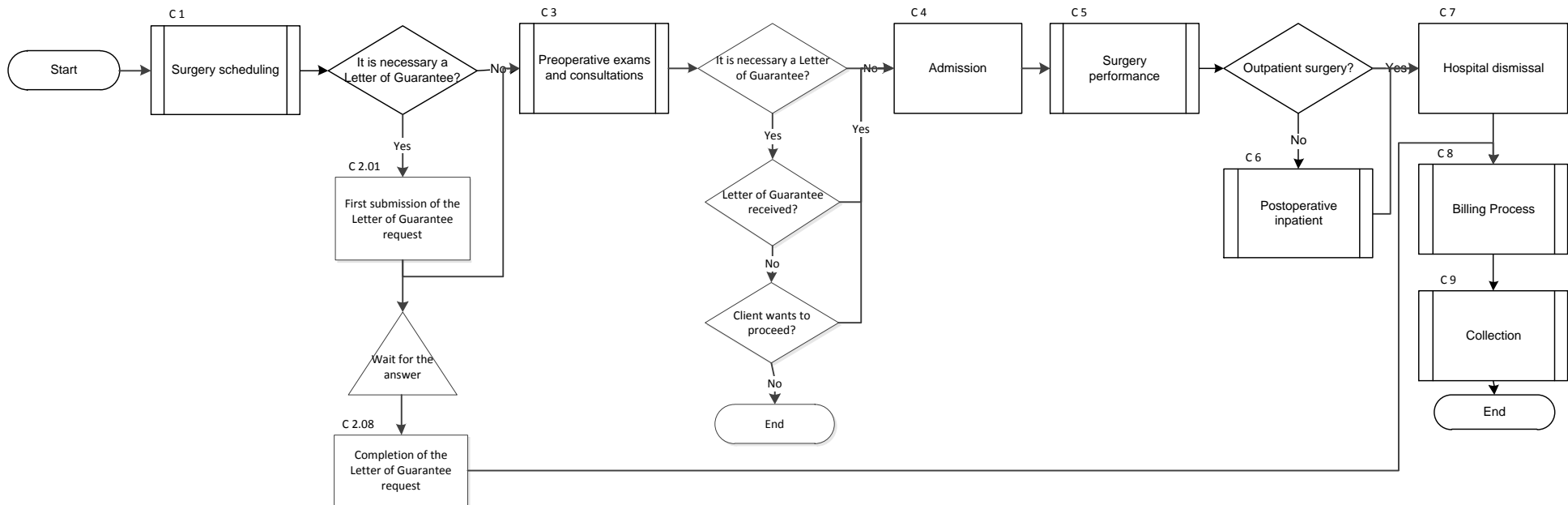


Diagram 2– Map of the Billing Process

