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Cost accounting and public reimbursement schemes in Spanish hospitals

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Abstract The objective of this paper is to provide a description and analysis of the main costing and pricing (reimbursement) systems employed by hospitals in the Spanish National Health System (NHS). Hospitals cost calculations are mostly based on a full costing approach as opposite to other systems like direct costing or activity based costing. Regional and hospital differences arise on the method used to allocate indirect costs to cost centres and also on the approach used to measure resource consumption. Costs are typically calculated by disaggregating expenditure and allocating it to cost centres, and then to patients and DRGs. Regarding public reimbursement systems, the impression is that unit costs are ignored, except for certain type of high technology processes and treatments.

Keywords Spanish hospitals · Accounting · Hospital costs · Prospective payment system · Cost analysis

1 Introduction

The Spanish health care system is largely based on public financing, with public ownership also playing a prominent role as 40.5% of all hospitals are in public ownership being responsible for 68.1% of all hospital discharges in the country [1]. In the late 1980s and especially in the 1990s cost containment became the first priority, and the focus of the reform shifted towards changes in the financing, organisational and management models [2].

The reform of the health care system has been going on together with a political process of administrative and political decentralisation, which has markedly affected health reform. Since 1970s the Spanish health care system has undergone several types of decentralisation processes. The most important of these was probably the transfer of the responsibility of managing health services from the INSALUD (the social security agency formerly responsible for the financing and delivery of health services) to the Spanish Regional Governments (Autonomous Communities, ACs from now on).

The 17 ACs have nowadays the responsibility for planning, financing, and providing health care services, social and community care, and public health [3]. It has to be stressed that Spanish regions are very heterogeneous in size, which ranges from 300,000 population up to over 7 millions inhabitants. With a few exceptions, regional public bodies are in charge of the purchasing function also managing most of the inpatient and outpatient health care centres directly. Regarding allocation of public funds to health care centres, about 75% of health care expenditure is allocated to hospital and specialized services, while 25% is allocated to primary health services [4].

Most of the health services publicly financed in Spanish ACs preserve the system of budget allocation to hospitals and primary care centres that INSALUD

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applied before the devolution of competences to ACs. This system was based on a contractual relationship between the financing body and the health care provider (typically hospitals), the so-called "programme-contract." It has to be underlined that this is not properly a method of purchasing services, but a method to assign budgets to hospitals. Since there is not a clear separation between purchaser and provider, financial risk is not transferred to providers. Although the system is said to be prospective, the financing body assumes budgetary deviations through specific grants. A clear separation of purchasing and providing functions only exists in Catalonia, where the purchaser is a public body, the Catalan Health Service, and the providers are a mix of public and private institutions. Hospitals payment system in Catalonia became prospective in 1997, and unlike programme-contracts in the other Spanish ACs, the purchaser does not assume budget deviations, so the financial risk is indeed transferred to providers [5].

Other mechanisms of reimbursement apply when regional health authorities contract-out certain types of diagnostic or surgical processes as well as ancillary services with private providers. Contracting-out implies about 15% of public expenditure [6]. In these cases, payments are retrospective and providers are paid per case or per process. Prices are established with reference to official tariffs and are a result of bargaining, not connected to actual unit costs.

The present contribution provides a description and analysis of the main costing and pricing (reimbursement) inpatient health services systems employed in the Spanish National Health System (NHS). Section 2 describes the main inpatient reimbursement systems for Spanish hospitals. Section 3 provides a description of cost accounting methods, cost components, data measurement and accounting criteria usually employed by Spanish hospitals. And, finally, Section 4 presents a discussion on the main questions regarding how costing information is considered in the establishment of inpatient health service prices.

2 Price setting and reimbursement schemes in Spanish hospitals

2.1 Prospective payments: the payment system to hospitals in Catalonia

Health care system in Catalonia is a particular case in Spanish regional health systems, because of the clear separation between purchasing and providing functions. The Catalan Health Authority purchases health services from providers, regardless of whether they were publicly owned. Hospital care services are provided by a publicly financed network of hospitals (Xarxa Hospitària d'Utilització Pública, XHUP from now), which brings together roughly 80% of total acute health care activity in the system (77% of discharges, 83% of stays). Inside the XHUP, publicly owned institutions' share exceeds 60% of total discharges and 65% of total stays [7].

The current hospitals payment system in the XHUP was introduced in 1997 as a prospective method of purchasing hospital care services. In broad terms, the payment system encompasses two different blocks: *activity* and *programmes*. The *programmes block* includes health programmes that the Regional Health Department is especially interested in, as well as education and research. The Health Department chooses these programmes annually and allocates them specific funds. In the *activity block*, activities carried out by hospitals in four product lines are valued separately: *hospitalisation*, *outpatient consultations*, *emergencies*, and *specific techniques treatments and processes*. The purchasing of outpatient consultations to hospitals is based on contracting first visits, with a price paid for every visit that differs between hospitals according to their structure-related level (from level 1, geographically isolated hospitals, to level 4, high technology hospitals). The same classification applies to centres when emergencies line activity is contracted, on a per service basis. Specific techniques and treatments refer to certain activities for which a price per process is set on a DRG basis (ambulatory minor surgery, day hospital, and treatments and diagnostic procedures of high complexity like brachitherapy, radiotherapy, diagnostic angiography, etc.). A Health Department Order annually passes all these tariffs and prices. Although updating is normally linked to consumer price index changes, there is no systematic method or formula.

With regard to hospitalisation budget allocation (about 70% of total *activity* budget), Catalan hospitals are paid per number of discharges. In order to fix the volume, according to detected needs, the Catalan Health Care Service (Servei Català de la Salut—SCS) contracts a limited global number of discharges. The discharge price includes two adjustment factors: one associated with the hospital case-mix (RRI: *relative resources intensity*) and another derived from the characteristics of each hospital structure (SRI: *structure relative index*). Thirty-five percent of total resources are assigned by case-mix and the other 65% attending structural differences. There are no technical or theoretical reasons to justify these specific percent-

ages, but the aim of making an easier transition from the former structure-based system.

The total hospitalisation revenue that a hospital (h) will receive depends on its activity (n° of discharges), its case-mix adjustment factor (RRI) and its structure adjustment factor (SRI), as Figure 1 shows. Firstly, a case-mix index (average relative weight, ARW) is built as a weighted average of discharges according to their DRG-weights (US DRG-weights, because of the lack of information specifically referred to Catalan hospitals). Then, case-mix adjustment factor (RRI) results from dividing a hospital ARW into the ARW of the entire hospital network. Complexity-weighted discharges are then calculated for every centre by multiplying hospital discharges by its RRI, and summed up to obtain total complexity-weighted discharges. Finally, average RRI price is determined as a result of dividing the global hospitalisation budget (the amount of money the Catalan Health Authority is going to spend for hospitals) into the number of complexity-weighted discharges. When the payment system was introduced in 1997, the global budget was based on historical data of hospitalisation records and budgets. Real costs data were not used due to the lack of complete and reliable information. In the following years, prices were annually updated in different proportions, accordingly to consumer price index changes and political criteria.

With regard to the structure related factor, the system applies a continuous-scale classification of hospital structures resulting from a sort of multivariate analysis called *Grade of Membership* (GOM) [8]. Shortly, GOM analysis establishes groups of hospitals regarding structural and organizational parameters that in the latest version include up to sixty items (e.g., total number of beds, paediatric beds, intensive care beds, outpatient visits, etc. as well as the presence of certain type of technologies or devices (radiotherapy, for instance). The statistical method identifies some structure profiles or "pure types" of hospitals, which show similar characteristics, and each hospital is compared to those profiles in order to calculate its grade of membership to the different groups. As a result, a hospital may be totally or partially similar to one or more "pure type" hospitals. A regression analysis is conducted to calculate the average theoretical discharge price for the entire hospital network and for each centre. Finally, a *structure relative index* (SRI) for each hospital is calculated, which shows the relationship between discharge price regarding struc-

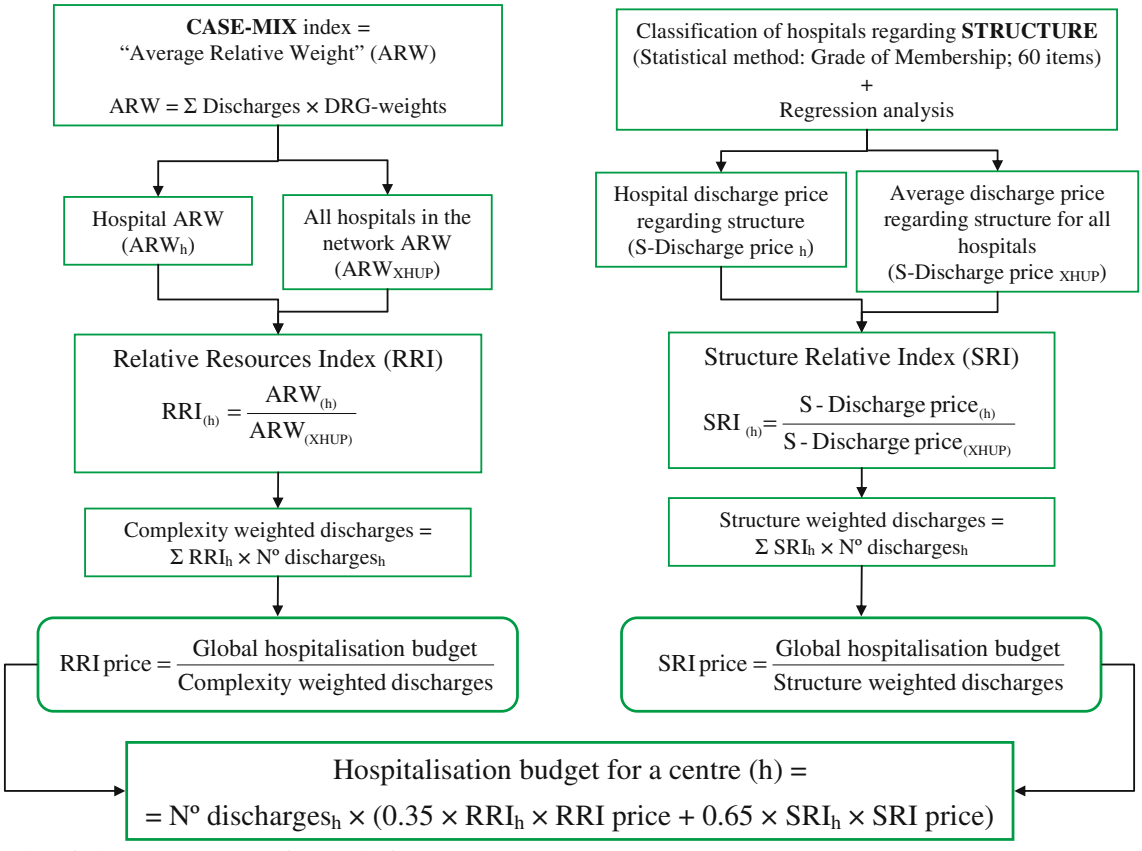

Fig. 1 The hospital payment systems in Catalonia

ture and the XHUP average discharge price (see Figure 1).

The above-described system is not relevant to the reimbursement of inpatient mental health care, and inpatient long-term care. In both cases health care centres are paid per "stay," and unit prices vary according to the type of service contracted and/or the type of patient treated.

2.2 Mixed (prospective–retrospective) payments: the programme-contracts

The programme-contract was the system of budget allocation to hospitals that INSALUD introduced in 1992 as a first stage towards the purchasing provision functions split. After the health care functions devolution to ACs, regional governments have preserved this reimbursement mechanism with minor changes, being Catalonia the exception to that rule. As it has been extensively pointed out [9–11], programme-contracts constitute a legal fiction, since they cannot be cancelled, and it is not possible to demand its fulfilment by any legal mechanism. In short, a programme-contract between the Health Service Department (fictitious purchaser) and a hospital (provider) contains the catalogue of services that the centre is obliged to supply to the patients belonging to a specific health care area during one year, as well as the volume of activity agreed and the quality objectives (length of stay in emergencies room, percentage of caesarean deliveries, surgical wound infections incidence, etc.).

At the first stages, the health production unit, and so the unit to be "purchased," in the programme-contracts was an ad hoc measure of the hospital product, slightly different in each AC. In all these measures a stay was set as the base unit and therefore it was taking a value of one, and the rest of the activities were defined in terms of it. These units of measure have evolved towards what have been called "second generation" units, which are obtained by weighting number of stays or discharges by hospital case-mix weights that are calculated through a DRG system. The "hospitalisation production unit" (UPH) or the "hospital complexity unit" (UCH) are examples of these second generation units.

Besides from the so-called "extracted procedures" (equivalent to the *specific techniques, treatments and processes* line in the Catalan model), that are paid on a DRG basis and involve less than 10% of the hospital expenditure reimbursement, the most important part of the budget is calculated through formulas of the following sort: Number of "Hospitalisation units" × Structure-related tariff = (Number of discharges × Case-mix weight) × Structure-related tariff. Where structure-related tariff depends on structural features of the centre that, unlike the Catalan model, are expressed on a discrete scale that distinguishes between general hospitals, basic general hospitals, medium and long stay hospitals, etc.

3 Cost accounting systems in Spanish hospitals

The extent to which cost accounting methodologies are used by Spanish hospitals does not seem to be uniform. Unfortunately, only a few studies have addressed this topic [12–15]. As data analysed by them is older than 2002, the year in which health care responsibilities were transferred to ACs, it is necessary to be cautious judging on the use of cost accounting methodologies. Indeed, it should be taken as a 'lower bound' of the scope that cost accounting methodologies have reached within the Spanish hospital sector.

Monge [12, 13] reported the results obtained from a survey among 115 Spanish hospitals. Overall, 75% out of the interviewed hospitals stated that they were using some sort of cost accounting methodology, whereas the remaining 25% were using none. Within these hospitals, the majority of them were privately owned (72%). It is interesting to note that one of the reasons argued by hospitals to justify the lack of a cost accounting methodology was that it was not compulsory. Table 1 shows the different costing information systems existing in Spain and the percentages of both public and private hospitals using each type.

Only the last three systems depicted in Table 1 were developed by private companies. The remaining systems were provided to hospitals by different public authorities throughout a period of time ranging 1990–1998. In this way, SIGNO and GECLIF systems were introduced by INSALUD [16, 17] covering the set of

Table 1 Cost accounting systems followed by public and private Spanish hospitals in percent [13]

Name	Total	Publicly owned	Privately owned
SIGNO I	3	100	–
SIGNO II	6	88	12
GECLIF	6	88	12
COANh	5	92	8
SCS	2.6	67	33
SIE	5.6	88	12
ALDABIDE	1.5	100	–
Own system	43	33	67
Full-costing	0.6	100	–
ORACLE FINANCIALS	0.8	–	100
GEN F2 DIMONI	0.9	–	100

public hospitals under its authority. Similarly, four of the ACs with competences on health care services introduced their own systems: SIE by the Valencian Health Service [18], COANh by the Andalusian Health Service [19], ICS by the Catalan Health Service [20], and ALDABIDE by the Basque Health Service [21]. It has to be noted that the systems promoted by INSALUD are those most intensively used by public hospitals. This conclusion is supported by a report published by INSALUD in 2001 [14] asserting the GECLIF system was completely introduced into 51 publicly owned hospitals.

Since Catalonia is the only AC in which purchasing and providing functions are clearly separated, it is interesting to check the scope of cost accounting systems within Catalan hospitals. That is what Amat [15] tries to do with a sample of 98 private and public hospitals. Of the interviewed hospitals, 74.2% were following some type of costing methodology, 25.8% were not using anyone. Again, there are more public hospitals using a cost accounting system (78.6%) than private ones (70.6%).

All the systems described use a *full costing* approach in order to allocate costs to intermediate outputs (e.g., tests) and final products of health care (e.g., discharges). The way costs are allocated to products requires three stages. First, *cost classification*: costs are classified by economic categories (e.g., salaries) covering two broad groups, namely: staff or labour costs, and running costs. Second, *cost accumulation*: direct (e.g., drugs) and indirect costs (e.g., rents) are allocated to responsibility units or cost centres (e.g., coronary care unit). In general, direct costs are allocated on the basis of direct resource consumption (e.g., number of radio-diagnostic tests), whereas indirect costs are apportioned in proportion to the volume of activity units (e.g., rents are allocated in proportion to squared meters of each centre). And, third, *cost imputation*: costs accounted in centres that provide services to other centres but not directly to patients (intermediate centres) are imputed to those centres that provide services that can be traced to a specific patient (final centres). For example, laboratory tests costs are imputed to the different centres on behalf of which tests were performed. However, the way in which costs are allocated to final centres is not the same in all systems. For example, while SIGNO allocates costs in a *step-down* process, ALBABIDE allocates costs to final cost centres *directly*.

The methodology just described, shared by all the systems, would a priori allow the following cost calculations: *cost per service* (i.e., a collection of cost centres that provide homogeneous products) and *cost per cost centre*; *cost per intermediate product* and *cost per final product*, both calculated using a *top-down* methodology; *cost per DRG*, by using ad hoc DRG-weights or, alternatively, imported from other settings; and, *cost per patient* and *process*, by using patient-level utilization data (*micro-costing*).

However, the fact is that not all hospitals are able to calculate cost per process by means of direct allocation to individual patients. Such calculations require resource consumption information based on patient-level data, and this is not the case for a large number of Spanish hospitals. For example, according to INSALUD data [14], only 20 out of 51 hospitals in which the GECLIF system was set were able to perform micro-costing.

Table 2 shows the different ways in which costs are decomposed by each programme. Some conclusions can be derived from it. First, it is noticeable that COAN and SIGNO are the programmes with the highest number of cost components. Second, staff costs is the only category that can be found in all programmes. Third, amortization is assigned in the same way as the remaining type of costs; with the sole exception of the SIE programme. And, finally, no programme includes capital costs in the calculations.

The second step of the full costing approach requires that costs are allocated to cost centres, characterized by the provision of homogeneous services. Although those centres receive different denominations (see Table 3), the structure is quite similar for all cost accounting systems. According to COAN, cost centres are those

Table 2 Cost components by accounting programme [12]

COAN	SCS	SIE	SIGNO	GECLIF	ALDABIDE
Staff	Staff	Staff	Staff	Staff	Staff
Supplies	Supplies	Supplies contracting	Supplies	Goods and services	Supplies
Pharmaceuticals	Repairs	Services	Maintenance	Amortization	Contracting
Contracting	Amortization		Food		Amortization
Maintenance			Working capital		Others
Services			Pharmaceuticals		
Amortization			Inventory difference		
			Amortization		

Table 3 Cost centres used by different cost accounting systems [12]

Programme	Denomination	Cost centres
COAN	Responsibility centres	Cost centres Benefit centres
SCS	Activity centres	Structural Intermediate Final
SIE	Activity centres	Structural Intermediate Final Non-allocated
SIGNO	Homogenous Functional Groups (HFG)	Structural Intermediate Final
GECLIF	Homogenous Functional Groups (HFG)	Structural Intermediate Final
ALDABIDE	Services	Structural Intermediate Final

that support the other centres activity (e.g., laundry, clinical tests). Benefit centres instead, are those that provide direct services to patients (e.g., cardiology, emergencies). Both cost and benefit centres are further disaggregated. In this way, cost centres are grouped into basic centres and central centres, whilst benefit centres are classified as either clinical centres or external centres. Basic centres are those characterized by providing non-care services to the whole hospital structure (e.g., housekeeping, admission). Central centres provide diagnostic tests and treatments (e.g., pharmaceuticals, radio-diagnostic) to benefit centres. Regarding benefits centres, clinical ones match specialized care (emergencies, intensive care), and external centres involve primary care institutions depending on the hospital. Although structural centres do not provide direct services, they hold hospital structure such as maintenance, etc. Intermediate centres provide services to final centres, transferring costs to them (haematology, medical biochemistry). Final centres provide direct services to patients. They are responsible of clinical episodes occurred at the hospital. Examples of final centres are radiotherapy, ambulatory surgery, etc. As a result of primary cost allocation, each cost centre receives both staff and running costs. Next, through further allocation, accumulated costs are imputed from intermediate and structural centres to final centres.

Methods of *cost imputation* differ across programmes. Briefly, we can identify three different procedures: SCS and SIGNO systems allocate costs by using a *step-down* procedure; both COAN and GECLIF programmes use the method of *reciprocal imputations*; and, SIE and ALBABIDE programmes apply a *mixed* rule. A limitation of this procedure is that once costs from a structural or an intermediate centre have been imputed to another one, the former centre cannot receive costs from any other centre.

In contrast to standard step-down procedures, COAN and GECLIF methodologies use a procedure of *reciprocal imputations* based on the application of a simultaneous equations system that allows a cost centre whose costs have already been imputed to another one to receive costs from another centre. In this way, consultations between final cost centres (e.g., allergology vs. pneumology) can be correctly imputed. In contrast, traditional step-down costing cannot capture this type of activity.

To estimate the average cost per DRG, DRGs relative weights have to be used. Until 1999 DRG-weights used in the Spanish health care sector were those estimated by the US Health Care Financing Administration. The US DRG-weights have been used to weight discharges and to reimburse services provided in hospitals. However, in 1999 the Ministry of Health (MoH) published a set of DRG-weights estimated from a sample of 18 Spanish hospitals [22]. These hospitals were selected according to three main features, namely: to have a cost accounting system adapted to that promoted by the MoH (i.e., SIGNO or GECLIF systems); to have a percentage of coded discharges higher than 90%; to be a representative hospital of the NHS according to the beds number, case-mix, etc. Quality of data for DRGs estimations was ensured by several procedures like, for example, by removing wrong DRGs (e.g., DRG 469: main diagnosis not valid as discharge diagnosis). The report published by the MoH showed that, in average, US DRG-weights were 40% higher than Spanish DRG-weights. These weights were also recalculated in 1999, 2001, and finally 2002 using the same sample.

Irrespective of what relative weights are used, cost per DRG attached to a final cost centre is calculated as follows: Cost per $\text{DRG}_{(i,j)}$ = (Hospitalization $\text{costs}_{(i)}$ × $\text{DRG-weight}_{(j)}$) / ($\text{Discharges}_{(i)}$ × average $\text{weight}_{(i)}$), where subscript i denotes the cost centre, subscript j stands for a specific DRG, and the average weight of centre i is calculated in the following way:

$$\frac{\sum_{k=1}^{n} \text{Discharges}_{(i,k)} \times \text{DRG-weight}_{(i,k)}}{\sum_{k=1}^{n} \text{Discharges}_{(i,k)}},$$

where $k = 1, \ldots, n$ denotes the set of DRGs attached to the cost centre.

4 Discussion and remarks

If the term "price" is used in a broader sense (as a synonymous of payment or budget), the impression is that the methods of payment between public agents generally ignore unit costs, both, average and marginal costs. The exception could be the budget allocations to hospitals based in the programme-contracts, but in these agreements, unit prices (i.e., price per assistance unit or any other hospital production unit) are calculated from historical costs data.

Catalonia is the only Spanish Region in which purchasing in a strict sense, and therefore pricing, has become common practices. Nevertheless, in the Catalan payment system, product line budgets were set in 1997 according to actual payments in the previous period. That is, costs were not taken into account, because of the lack of reliable and sufficient information. Obviously, costs are likely to differ from historical payments and this fact would be a sort of birthmark of the payment system. Since then, no measures have been undertaken to get budgets closer to real costs. Financing authorities argue that, except in the case of high technology processes, the providers do not know the real costs of their services, therefore it is not possible to determine prices and costs differences. However, some studies [23] indicate discrepancies between the payment structure by product line and the distribution of real costs by activity line. Furthermore, the Catalan system suffers from a series of additional shortcomings. Its main weakness perhaps is the enormous power that the system attributes to the Catalan Health Service, which is the only client for most of the providers. On the other hand, the split between purchasing and provision functions often stands formally, but not in practice, since the Health Authority is co-owner of some health care provider centres.

Finally, prices paid by public purchasers to private providers in the context of contracting-out agreements neither reflect unit costs. The official tariffs which work as a reference-point in the contracts negotiation are based on historical patterns and not on cost accounting estimations. The regional health authorities act as monopsonies and prices agreed usually depend on factors that have nothing to do with unit costs, but are related to institutional features of the market, such as the providers' power of negotiation or the degree of competition between them.

Probably, the most important obstacle to cost assessment in Spain lies in the separation between costs and prices. As this report describes, the process of setting prices for health services is far away from reflecting cost information. The paradox is that, although there are costing systems promoted by health authority enabling public hospitals to calculate true unit costs, payments to hospitals are based on public tariffs, which are not aimed to reward unit costs. Indeed, in many cases tariffs remain invariable in some value established in the past, not being updated systematically. Hence, although the availability of cost information is not still generalised in Spanish health care institutions (e.g., 25% of hospitals might lack of some type of costing system), incentives from the provider's perspective to develop such systems are scarce.

It is obvious that both methods and information available are susceptible of being improved in Spain. Reliable information on costs can allow for identifying best practices (*benchmarking*), which could be used as an efficiency pattern in comparing hospitals. This possibility was tentatively explored by INSALUD by means of two studies [14, 24] in which several economic indicators were calculated for several public hospitals. However, since INSALUD disappeared as a consequence of the devolution of health care competences to ACs, no similar report to those has been published. The only attempt in Spain for setting best practices within the hospital sector is carried out by a private firm (IASIST). Every year IASIST selects the 'top-20' Spanish hospitals [25]. Cost per "Hospitalisation Production Unit" (UPH) is used as one of the criteria for selecting the best hospitals in Spain. Another criterion is the percentage of invalid DRGs. This is only one of the many potential advantages that costing information can yield.

Three plausible improvements could be undertaken. First, the project initiated by INSALUD for estimating relative weights for DRGs based on cost data from Spanish hospitals could be followed up. Cost per DRG has not updated since 2002. Prospective budgets and cost based payments could be used to reward productivity improvements. Second, new cost accounting procedures like Activity-Based Costing could be used as a norm towards which all hospitals should aspirate. And finally, accounting information systems should be developed to integrate primary and hospital care at the patient-level.

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