Med Intensiva. 2011;**35(2)**:68–74

medicina *intensiva*

www.elsevier.es/medintensiva

ORIGINAL

Is the permanent pacemaker implant more efficient in level 1 hospital?

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Received 12 April 2010; accepted 6 July 2010

KEYWORDS
Pacemaker;
Management;
Efficiency

Abstract
Objective: To determine if permanent pacemaker implants (PPM) interventions and change of generator are more efficient in small hospitals.
Design: A cost-effective analysis and retrospective, cross-sectional and observational study of diagnostic related groups (DRG).
Setting: The data was obtained from the national Minimum Basic Data Set (MBDS) for the year 2007 provided by the Health Ministry.
Patients: This includes the total number of patients who required treatment in all national hospitals for 5 DRG: 115 - bradyarrhythmic complication during the acute coronary syndrome, heart failure or shock; 116 - symptomatic isolated conduction defects; 117 - revisions, but without changing the battery, 118 - application of a new one, 549 - implementation or revision but with serious complications.
Principal variables of interest: Demographic, clinical (number of secondary diagnoses (NSD) and procedures (NP), mortality) and management (total and preoperative length of stay (LOS), access, discharge, hospital size), defining inefficient stays as those exceeding 2 days on the average.
Results: 23,154 episodes, 5.3% small hospitals. The comparative bivariate study between small hospitals and the rest, not discriminated by DRG, showed a mean LOS of 7.87±8.78 days vs 11.01±12.95 (p=0.005, 95% CI for mean difference [0.17, 1.65]) and also lower than preoperatively (3.62±6.14 vs. 4.22±6.68 days [p=0.015]) without greater comorbidity, as measured by proxy through the NSD (5.23±2.88 vs 5.42±3.28 [p=0.055]) and NP as proxy of diagnostic and therapeutic effort (3.79±2.50 vs 3.55±2.69 [p=0.002]). A total of 24.1% were inefficient, there being an association with preoperative stay, NDS, NP and emergency access.
Conclusion: Pacemaker implantation and generator change in small hospitals is more efficient, with internal consistency by subgroups.

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PALABRAS CLAVE
Marcapasos;
Gestión;
Eficiencia

¿Es más eficiente el implante de marcapasos permanentes en hospitales de nivel I?

Resumen

Objetivo: Determinar si el implante de marcapasos permanentes (MPP) y cambio de generador resultan más eficientes en hospitales pequeños.

Diseño: Análisis de costeefectividad. Estudio retrospectivo, transversal y observacional de cinco GDR.

Ámbito: Los datos son procedentes del conjunto mínimo básico de datos (CMBD) nacional del año 2007, facilitado por el Ministerio de Sanidad.

Pacientes: Son el total de los pacientes que requirieron asistencia en algún hospital nacional por 5 GRD: 115, complicación bradiarrítmica durante la fase aguda de un síndrome coronario, insuficiencia cardíaca o shock; 116, trastorno de conducción sintomático aislado; 117, revisión pero sin cambio de batería; 118, aplicación de una nueva, y 549, implantación o revisión pero con complicaciones graves.

Variables de interés principales: Se analizaron variables demográficas, clínicas (número de diagnósticos secundarios [NDS], de procedimientos [NP], mortalidad) y de gestión (estancia total y preoperatoria [Epo], forma de acceso y alta, tamaño de hospital), definiendo ineficiente una estancia superior 2 días a la media.

Resultados: 23.154 episodios (5,3% en hospitales < 200 camas). El estudio bivariado comparativo entre hospitales pequeños y el resto, no discriminado por GDR, mostró estancia media 7,87 ± 11,01 días vs. 8,78 ± 12,95 (p = 0,005, IC 95% [0,17; 1,65]) y Epo 3,62 ± 6,14 vs. 4,22 ± 6,68 días [p = 0,015]), sin mayor comorbilidad, medida como proxy por NDS (5,23 ± 2,88 vs. 5,42 ± 3,28 [p = 0,055]); y NP como proxy de esfuerzo diagnóstico-terapéutico (3,79 ± 2,50 vs. 3,55 ± 2,69 [p = 0,002]). 24,1% fueron ineficientes, encontrándose asociación con Epo, NDS, NP y acceso urgente.

Conclusiones: La implantación de marcapasos y cambio de generador en hospitales pequeños es más eficiente, con consistencia interna por subgrupos.

Introduction

The Spanish National Catalog of Hospitals, created within the setting of Law 16/2003, relating to Cohesion and Quality of the National Healthcare System (*Sistema Nacional de Salud*, SNS), classifies the centers of the Spanish network according to their care profile and functional and structural dependencies, respectively, but also contemplates four models in relation to the existing capacity or number of beds, and specialized resources.[1] Nevertheless, there is a generalized tendency to classify hospital centers according to their geodemographic setting and services profile into three levels (I, II and III) —level I centers being identified as district hospitals offering basic specialties, and habitually possessing fewer than 200 beds.

The greater complexity of the patient series seen in higher level hospitals tends to generate management problems, complicating the activities centered around one same healthcare process. In this context, one of the tools used in measuring the healthcare product is hospital stay —generally evaluated as a proxy or surrogate variable of its direct cost. Comparing stay related to certain healthcare products thus implies comparison of the resources used in elaborating them. The management plan of an organization is technically efficient when based on a series of inputs it is able to generate a maximum output, or output is generated in less time. A productive activity in turn proves inefficient when the amount used in some input can be reduced without impairment of the result / outcome, or duration of the process.

Primary permanent pacemaker (PPM) implantation and replacement of the generator are two common techniques in hospitals, administratively classified into 5 diagnosis-related groups (DRG): 115, due to bradyarrhythmic complications during the acute phase of a coronary syndrome, heart failure or shock; 116, due to an isolated symptomatic conduction disorder; 117, due to revision without battery replacement; 118, with application of a new battery; and 549, due to implantation or revision, but involving serious complications.[2]

The Spanish public hospital network is prepared to attend patients requiring emergency and temporary placement of an endocavitary electrocatheter equipped with an external generator, but not all hospitals implant or revise PPM. Although in Spain there are different databases that control these interventions (Pacemaker Registries of the Spanish Society of Cardiology (SEC) and of the Spanish Society of Intensive and Critical Care Medicine and Coronary Units (SEMICYUC), respectively), they refer different number of implants and therefore different rates per million inhabitants.[3-5] The Spanish National Pacemaker Database (BNDM) came into operation in 1990,[6] though the registry of comparative parameters began in 1993, thanks to introduction of the "European carrier patient card", of obligate implementation.[7,8] Following the recommendations of the European Society of Cardiology,[9] there are differences among Spanish hospitals, depending on their size and the levels of services offered – with variability in their management, according to the mentioned registries.[3-6]

We have often asked ourselves why PPM are not implanted and revised in all Spanish hospitals, regardless of their level, considering of course the availability of professionals familiarized with the technique and of the infrastructure needed to offer a safe and quality product. In this context, we have raised the question of whether transfer to another center for pacemaker implantation implies or does not imply unnecessary risks and delays for the patients, inconveniences for their relatives, and cost increments based fundamentally on the prolongation of stay, between-hospital transport and expenses derived from travel of the accompanying persons.

There are two objectives in the present study: on one hand, to attempt to answer the above questions as an element for reflection and thought among clinicians, administrators and healthcare policy makers; and on the other, to analyze practices in primary PPM implantation and revision in relation to the type of hospital involved, classified into two groups (H1: <200 beds, and RH: rest of hospitals) - seeking possible differences in certain management (mean (Sm) and preoperative length of stay (Spo) (LOS) and need for transfer) and clinical indicators (complications, comorbidity and mortality), according to patient demographic factors (age and gender).

Methods

The information was obtained from the Minimum Basic Data Set (MBDS) of the Spanish Ministry of Health for the year 2007, facilitated by the Healthcare Information Institute,[10] and selecting the cases classified as DRG 115 to 118 and 549, with the exclusion of DRG 849 to 851 (implantation of defibrillators and resynchronizers). The coding of diagnoses and procedures was carried out based on the International Classification of Diseases 9th Edition – Clinical Modifications (ICD-9-CM), while the grouping of discharges was based on the DRG in its version 21. Using this information we designed a retrospective, cross-sectional observational study with an inferential component.

The study variables were patient age (expressed in years and recorded at the time of admission), Sm and Spo, gender, type of admission (emergency or programmed), type of discharge (home, transfer, death), number and type of secondary diagnoses at discharge (NSD), number of procedures carried out (NP), efficiency of admission and hospital level. A stay in excess of two days of the average for the DRG involved was regarded as inefficient, since on selecting the extreme cases based on the formula T2=Q3+1.5* (Q3-Q1)(where Q are the quartiles and T2 the stay cutoff value for these cases), the maximum length of stay (LOS) to be considered was 22 days, and the analysis of the no outliers sample showed percentiles 20, 25 and 30 to comprise stays of under two days. As a result, those cases in excess of this value were regarded as inefficient, following consensus among the authors in relation to the cutoff value.

In a first phase we carried out a descriptive analysis of the variables contained in the MBDS, employing the usual position and dispersion measures (mean, mode and median), with their respective standard deviations, for the quantitative variables, and frequencies, percentages and distribution tables in the case of the qualitative variables. The Shapiro-Wilks test was used to determine adhesion of the variables to a normal distribution. In the second study phase (bivariate analysis), the quantitative variables were compared using the Student t-test for independent data. Comparisons between nominal variables, distributed into more than two categories, were carried out using analysis of variance (ANOVA) with the Tukey *post hoc* maximum significant difference test. In the case of the categorical variables, we used the chi-squared test, no continuity corrections being required. Lastly, for evaluating the independent association between efficient stay and the different study covariables, we constructed a binary logistic regression model, with the Hosmer-Lemeshow test to check goodness of fit – the results being interpreted as odds ratios (OR) with their respective confidence intervals (CI). As independent variables in the model, we introduced those that proved significant in the bivariate model, along with those which according to the literature were considered to be possibly associated to the dependent variable. The SPSS version 15.0 statistical package was used, accepting statistical significance for $p<0.05$.

Results

A total of 23,154 episodes were studied (1% of the total 2,232,568 individuals over 45 years of age). The distribution according to hospital group is shown in Figure 1, where it is seen that only 5.3% of all PPM are implanted in H1 centers. Table 1 shows the clinical and administrative indicators analyzed (Sm, Spo, NSD, NP, type of admission and discharge), as well as some of the demographic variables (mean age, percentage patients over 70 years of age, gender), according to the designated DRG and globally corresponding to PPM implantation. Of note is the higher

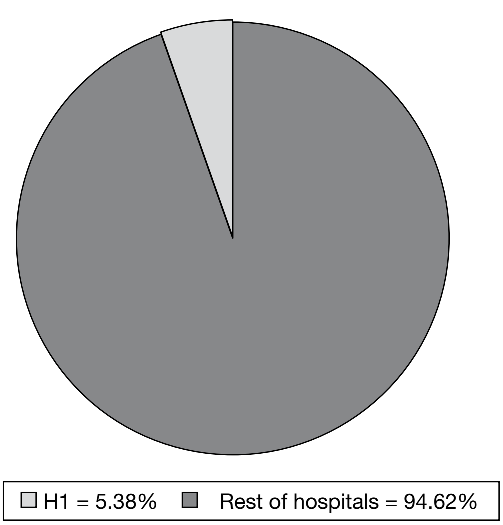

Figure 1 Distribution of the permanent pacemaker implantation episodes according to hospital size.

Table 1 Clinical, demographic and administrative indicators of the DRG in reference to pacemaker implantation, Spain 2007

	Total	115	116	117	118	549
Episodes (N and %)	23,154 (100)	813 (3,5)	14,432 (62,33)	1068 (4,61)	3280 (14,16)	3561 (15,38)
Age (x ± SD)	75.55 (9.64)	72.21 (10.13)	76.66 (8.14)	75.26 (9.44)	77.31 (9.51)	70.29 (10.42)
> 70 years (%)		61.8	79.0	73.2	80.6	55.3
Males (%)	60.8	68.9	57.6	59.3	55.6	77.5
Stay (x ± SD)	8.74 (12.85)	9.77 (9.74)	6.26 (5.81)	5.62 (6.34)	3.26 (3.68)	24.51 (24.53)
Preop. stay (x ± SD)	4.17 (6.64)	5.25 (7.04)	3.77 (4.57)	2.65 (4.31)	1.58 (2.28)	7.63 (11.49)
Emergency (%)	59.5	55.6	66.8	47.6	19.7	70.8
H1 (%)	5.3	3.3	5.7	8.7	3.9	4.3
NSD (x ± SD)	5.42 (3.28)	6.39 (3.27)	4.99 (2.82)	4.70 (3.11)	3.42 (2.50)	8.94 (3.03)
NP (x ± SD)	3.55 (2.69)	3.52 (2.70)	3.49 (1.89)	2.09 (1.73)	1.66 (1.25)	6.03 (4.26)
Death (per 1000)	45.0	15.0	4.0	18.0	5.0	268.0
Transfer (per 1000)	14.0	10.0	9.0	18.0	5.0	42.0
Relative impact		4.6014	3.6694	2.1114	2.0597	6.9436

H1 = level I hospital; NSD = number of secondary diagnoses; NP = number of procedures; Healthcare Information Institute, Ministry of Health, 2007.
(x ± SD) = mean and standard deviation.

incidence (62.33%) of DRG 116, related to pure conduction disorders without complications, seen in older individuals, with a predominance of males and of emergency admissions. In turn, DRG 549 (15.38% of the total) is found mainly in males (77.5%), with very long Sm and Spo (24.51 and 7.63, respectively) and important comorbidity (8.95 secondary diagnoses), diagnostic-therapeutic interventions (6.03) and mortality (268.0 per thousand).

In the comparative bivariate analysis between H1 centers and the rest of hospitals corresponding to higher levels (RH), without discrimination according to type of DRG, PPM implantation was seen to require 7.87±11.01 days versus 8.78±12.95 days in RH (p=0.005, 95%CI [0.17; 1,65]), and Spo was also shorter in H1 than in RH: 3.62±6.14 versus 4.22±6.68 days (p=0.015). This shows that on taking both Sm and Spo as proxy or surrogate variables of efficiency, the H1 centers generated fewer stays, and thus would be more efficient (Table 2). In assessing whether the complexity of the patients was similar (based on the evaluation of NSD and NP), we found that there was no clearly significant difference (p=0.055) in NSD (5.23±2.88 versus 5.42±3.28) - in contrast to NP (3.79±2.50 versus 3.55±2.69) (p=0.002). Therefore, comorbidity among the patients in H1 centers was no different from that seen in patients admitted to RH, though there was a clear tendency to perform more diagnostic-therapeutic interventions (Table 2).

Table 2 Differences between stay and preoperative stay, NSD and NP between level I hospitals and the rest

	H1	RH	p
Stay	7.87 ± 11.01	8.78 ± 12.95	0.005
Preop. stay	3.61 ± 6.13	4.22 ± 6.68	0.015
NSD	5.23 ± 2.88	5.42 ± 3.28	0.055
NP	3.79 ± 2.50	3.55 ± 2.69	0.002

H1: level I, RH: rest, NSD: number of secondary diagnoses, NP: number of procedures. Source: Healthcare Information Institute, Ministry of Health, 2007.

Table 3 shows the principal indicators evaluated, according to the type of hospital center and for each DRG. The stratified analysis shown in the table yielded statistically significant differences (p<0.001= in all cases and for all variables, except mortality (nonsignificant [NS]).

Table 4 shows the variables found to be associated to inefficiency, according to the developed binary logistic regression model; in this context the probability was seen to increase 1.38-fold for every Spo day elapsed, 1.098-fold for every new diagnosis, and 1.069-fold for every new procedure. In addition, inefficiency proved 1.7 times more likely when access took place on an emergency basis and 1.4 times more likely when in the RH. Globally, 24.1% of all cases met the criterion of inefficiency.

Table 5 reports the indicators of the patients discharged home (93.4%) and of those who died (4.5%); statistically significant differences were observed (p=0.001), the values corresponding to Sm, Spo, NSD and NP being lower among the former.

Discussion

Patient classification based on diagnosis-related groups (DRG) is carried out to define clinically comparable groups, and is very useful for evaluating and measuring the quality of the resources used in the management of a given healthcare process. In this context, comparisons can be made of the effectiveness and efficiency (benchmarking) of a concrete clinical service or intervention, establishing in which cases resource consumption exceeds the established reference or norm, with a view to introducing corrective measures.[11]

DRG are based on the grouping of processes with similar uses and costs, evaluated through proxy or surrogate variables (stay and relative impact) used as predictors of consumption, though this model does not document the

Table 3 Principal indicators evaluated, according to type of hospital and DRG, Spain 2007

DRG	Indicator	H1	RH	p
115	Stay	9.69 ± 9.76	12.04 ± 8.86	0.001
	Preop. stay	5.21 ± 6.42	5.25 ± 7.08	NS
	NSD	4.93 ± 2.54	4.99 ± 2.83	NS
	NP	3.98 ± 2.31	3.46 ± 1.86	0.01
	Mortality	10.5	10.8	NS
116	Stay	5.87 ± 5.62	6.29 ± 5.82	0.01
	Preop. stay	2.75 ± 3.67	3.86 ± 4.62	0.001
	NSD	4.93 ± 2.54	4.98 ± 2.83	NS
	NP	3.98 ± 2.31	3.46 ± 1.86	0.001
	Mortality	10.7	11.8	0.01
117	Stay	3.77 ± 3.97	5.79 ± 6.50	0.001
	Preop. stay	1.49 ± 2.65	2.82 ± 4.48	0.001
	NSD	4.16 ± 3.22	4.76 ± 3.11	NS
	NP	2.17 ± 1.73	2.09 ± 1.73	NS
	Mortality	10.3	10.7	NS
118	Stay	3.19 ± 3.58	5.09 ± 5.15	0.001
	Preop. stay	1.53 ± 2.14	3.26 ± 3.44	0.01
	NSD	3.86 ± 2.51	3.42 ± 2.50	0.05
	NP	2.73 ± 1.84	1.63 ± 1.21	0.001
	Mortality	10.5	10.9	NS
549	Stay	22.58 ± 22.27	24.59 ± 24.32	NS
	Preop. stay	7.51 ± 11.42	10.17 ± 12.55	0.04
	NSD	8.33 ± 2.65	8.94 ± 3.03	0.01
	NP	4.48 ± 3.17	6.09 ± 4.28	0.001
	Mortality	23.6	19.5	0.05

Preop. stay: preoperative stay, NSD: number of secondary diagnoses; NP: number of procedures; Mortality (per 1000); Healthcare Information Institute, Ministry of Health, 2007.

Table 4 Variables associated to pacemaker implantation inefficiency, Spain 2007

	B	SE	Wald	df	Sign.	Exp (B)
Age	0.000	0.003	0.004	1	0.951	1.000
Preop. stay	0.321	0.008	1535.046	1	0.001	1.378
NSD	0.093	0.010	91.920	1	0.001	1.098
NP	0.066	0.011	34.053	1	0.001	1.069
Emergency adm.	0.578	0.067	73.970	1	0.001	1.782
H1	0.335	0.066	25.922	1	0.001	1.398
Constant	−3.846	0.255	228.153	1	0.001	0.021

B: estimated parameter (inefficient implantation; Preop. stay: preoperative stay; SE: standard error; Wald: regression method used; df: degrees of freedom; Emergency adm.: emergency admission, H1: level I hospitals; OR: odds ratio; Sign: statistical significance; NSD: number of secondary diagnoses, NP: number of procedures; Healthcare Information Institute, Ministry of Health, 2007.

Table 5 Differences in age, stay, preoperative stay, NSD and NP between the survivors and those patients who died

	Number	Age	Stay	Preop. stay	NSD	NP
Survivors	22,118	75.65 ± 9.60	8.40 ± 12.29	4.05 ± 6.38	5.23 ± 3.16	3.41 ± 2.48
Deceased	1036	73.30 ± 10.12	15.88 ± 20.36	6.45 ± 10.04	9.21 ± 3.13	6.71 ± 4.30
p	—	0.01	0.001	0.001	0.001	0.001

Preop. stay: preoperative stay; NSD: number of secondary diagnoses, NP: number of procedures; Healthcare Information Institute, Ministry of Health, 2007.

existence of unnecessary days of hospital stay, which should be identified in order to optimize quality and efficiency. The standards of stay per process do not detect inadequate use in the episode, with cases that clearly differ in terms of resource utilization —reaching different costs or giving rise to longer stay; as a result, this variable may be taken to represent a surrogate of these costs (at least of the direct costs), with length of stay (LOS) being the MBDS indicator that best explains its important internal variability.[12,13]

In constructing DRG, use is made of the principal diagnosis, the secondary diagnoses and the procedures employed — thereby measuring the complications (during stay) and the comorbidities (from admission) that influence the duration of stay, surgical outcomes, the presentation of added comorbidity, end functional state and quality of life, hospital readmissions and mortality. Complexity is represented by the DRG itself, through relative impact and stay. The complications are explained by the NSD and NP, and the socioeconomic and demographic characteristics are assumed on the basis of patient age and gender, while the characteristics of the healthcare process are evaluated using specific variables such as the type of admission (emergency or programmed) and readmissions.[12,13] The greatest complexity of the patient circumstances would correspond to an increase in Sm —hence the importance of its evaluation and measurement in the context of a given process. Furthermore, the case of surgical interventions, it is important to assess both global Sm and Spo (the latter clearly being related to the former).[14]

Resource assignation to a given activity implies the opportunity cost of not being able to use such resources in other activities. This justifies the need to offer services with effectiveness and efficiency, consuming only the minimum resources necessary. In this sense, the use of indicators as a management tool proves essential (relating to process or outcome), offering great advantages for both administrators and clinical supervisors. Thus, the process indicator measures efficiency by comparing it with a standard, while the results or outcome indicator measures the impact upon patient health.[15,16]

Technical inefficiency is generally due to excessive input use, in that assignation takes place in incorrect proportions. One of the indicators of the former is the analysis of ratios which, while having important limitations particularly at hospital level (demographic factors such as aging, or geographical factors such as center location), remains an adequate control mechanism.[15,16]

We have seen that our results, obtained through the BMDS[10] are concordant with those reflected by the BNDM[6]: thus, the distribution among primary implantations (74.61%) and replacements (25.39%), and the mean ages (76.12 years for the former and 76.96 for the latter) of the mentioned registry are very similar to our own distribution: activities (77.81% implants, 22.19% replacements) and ages (76.66 and 77.31 years), respectively.

According to the BNDM, 75.54% of the interventions take place in the 70-89 years age interval, and 5.17% in patients over 90 years of age. Our results show the former age interval to account for 75.40% of all the interventions, while only 3.58% involve patients over 90 years of age.[6] The PPM rate according to the BNDM is 680.4 per million inhabitants, versus 526.6 in our study, though without evaluating the pacemakers implanted in individuals under 45 years of age.[6] In our series the DRG showing the largest number of complications and comorbidities —and therefore higher levels of complexity and mortality – were DRG 115 (which is logical, since these are subjects with acute coronary syndrome, heart failure or shock, accompanied by conduction disorders) and DRG 549, which concentrates the complicated PPM with comorbidities. Since DRG 549 comprises implantations and revisions accompanied by major complications, it exhibits more complex indicators and has a greater relative impact (6.9436) and higher mortality (268.0 per thousand). Both DRG (115 and 549) likewise show inefficiency values (30.8% and 32.7%, respectively) in excess of the average (24.1%). The H1 centers only cover 3.3% (115) and 5.7% (116) of the implants and 8.7% (117) and 3.9% (118) of the replacements. This shows their scant activity in this production area, and should cause administrators and healthcare supervisors to reflect upon the situation. Curiously, the H1 centers concentrate only 5.3% of the PPM implantation activity, but while DRG 117 (control without replacement) reaches 8.7%, these hospitals only place 3.9% of the new generators.

With the exception of 549, all the DRG analyzed show significantly shorter Sm and Spo values in the H1 than in the rest of the hospitals (RH), with practically equal NSD in both cases. These results indicate that primary implantation in level I centers is more efficient, despite similar comorbidity, and that we could avoid the need for transfer to another hospital —with the consequent delay in intervention, which could cause serious complications, discomfort for the patients and their relatives and, of course, greater costs for one same activity. Generator replacements (DRG 117 and 118) offer similar parameters, and are likewise more efficient in these level I centers.

Mention also should be made of where implantations and revisions are to be made. According to the literature, the differences between the availability of a surgical structure or of hemodynamics and arrhythmia units dedicated to these activities on a multidisciplinary basis are very few.[17-19] Although the literature mentions the possibility of performing these interventions in the context of ambulatory major surgery programs, the fact is that there are no disparities in terms of clinical results or morbidity-mortality.[20-24]

There are evident limitations in our study. Firstly, its design as an observational study makes future analytical explorations necessary. Likewise, information is lacking in the MBDS on the infrastructure possibilities of H1 centers: the existence of an operating room or specific room for implantation, surgical pressure, and adequate personnel for addressing the work load (consultation, implantation, postoperative period). On the other hand, the use of DRG as a tool for the measurement of activities implies inefficiency transfer to all the implicated healthcare units, not only to the unit responsible for pacemaker implantation.

Conclusions

According to our study, organizational strategies should be impulsed in level I hospitals to manage PPM implantation and generator replacement (with the corresponding followup) —performing both techniques in all patients who need them, independently of the hospital model involved, and focusing more on the technical qualification and preparation of the professionals in the center. This would contribute to avoid delays and transfers that are absolutely unnecessary when the necessary specialized resources and structures for ensuring safety and quality intervention are available.

These data give rise to a very interesting hypothesis which nevertheless cannot be confirmed by means of an observational study such as our own: the existence of a causal relationship between the efficiency variables and the factors studied. Nevertheless, our findings reinforce the existence of greater efficiency in relation to this process in the smaller hospitals, with internal consistency by subgroups. The comparison of PPM implantation in patient cohorts of similar comorbidity between hospitals of different levels remains as an objective for future studies of an analytical nature.

Funding

The work has not been financed by any public or private institution.

Conflict of interest

The authors declare no conflict of interest.

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