The use of pathology-related parameters in explaining the variation of public expenditures on medical imaging.

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OBJECTIVES

In order to allocate public resources on health care more efficiently, lump sum based payment systems are introduced in the Belgian hospital sector. This study investigates the influence of pathology-related parameters on the consumption of medical imaging. A regression based method (ANCOVA) is used to define an explanatory model for the expenditure on medical imaging.

METHODS

A representative sample of 30 general hospitals was withdrawn from the national data. This sample contains 277.521 inpatient stays (19,0 % of total), of which 189.773 (68,5%) received at least one provision medical imaging during hospitalisation. All inpatient stays are related to data on utilisation of resources (in euros) as well as data concerning the pathology. The pathology-related data consist, amongst others, of Diagnostic Related Groups (DRG), severity of illness, risk of mortality, sex, stay in the intensive care unit, type of admission, age, comorbidity and number of procedures. Regression analysis was used to estimate the impact of these pathology-related parameters on the total expenditure on medical imaging as well as on the expenditure according to the several techniques (regular x-ray, CT, echography and percutaneous interventional procedures).

RESULTS

Figure 1 shows that all pathology-related parameters, except age ($P<0,064$), have a statistically significant impact on the total consumption of medical imaging.

57,3 % of the case wise variation in utilisation of resources can be explained by the different parameters. However, the interaction of DRG with the severity of illness in itself explains 46,7 % of this variation, which confirms the goal of these two variables, initially developed as a tool to perform resource studies.

The explanatory power of the model decreases when consumption of medical imaging is analysed according to the several techniques. This goes especially for CT (23,2%), echography (31,9%) and percutaneous interventional procedures (30,4%). On the other hand the model explains almost 50% (49,2%) of the variation in expenditure on regular x-ray.

CONCLUSIONS

Pathology-related parameters, especially the interaction of DRG with the severity of illness, can be used to determine a lump sum fee that could partly (+/- 50 %) replace the fee for service based payment system for medical imaging, currently used.

Fig 1: Analysis of covariance (ANCOVA) for the total expenditure on medical imaging as well as the expenditure of the several techniques (regular x-ray, CT, echography and percutaneous interventional procedures)

Dependent variable	**Tot. medical imaging**		**X-ray**		**CT**		**Echography**		**Perc. Interv. Proced.**	
N	*189.773*		*173.454*		*45.275*		*82.869*		*3.063*	
R^2 (adjusted)	**57,30%**		**49,20%**		**23,20%**		**31,90%**		**30,40%**	
Independent variables	ß value	sig.	ß value	sig.	ß value	sig.	ß value	sig.	ß value	sig.
DRG x Severity of illness*	/	< 0,001	/	< 0,001	/	< 0,001	/	< 0,001	/	< 0,001
Risk of mortality	/	< 0,001	/	< 0,001	/	*0,055*	/	< 0,001	/	*0,272*
minor	-32,85	< 0,001	-70,09	< 0,005	-5,78	*0,151*	-9,38	< 0,001	111,93	*0,064*
moderate	-47,14	< 0,001	-78,61	< 0,001	-6,99	*0,068*	-9,53	< 0,001	104,78	*0,068*
major	-48,49	< 0,001	-108,13	< 0,001	-0,92	*0,799*	-10,03	< 0,001	57,85	*0,287*
extreme	0,00	Reference	0,00	Reference	0,00	Reference	0,00	Reference	0,00	Reference
Sex	/	< 0,001	/	*0,337*	/	< 0,001	/	*0,973*	/	*0,261*
man	9,77	< 0,001	5,84	*0,337*	7,72	< 0,001	0,01	*0,973*	18,12	*0,261*
woman	0,00	Reference	0,00	Reference	0,00	Reference	0,00	Reference	0,00	Reference
Intensive care unit	/	< 0,001	/	*0,759*	/	< 0,001	/	*0,703*	/	< 0,001
no	-31,00	< 0,001	-3,35	*0,759*	-6,10	< 0,001	-0,24	*0,703*	-84,71	< 0,001
yes	0,00	Reference	0,00	Reference	0,00	Reference	0,00	Reference	0,00	Reference
Type of admission	/	< 0,001	/	< 0,01	/	*0,088*	/	< 0,001	/	*0,117*
planned	-20,54	< 0,001	27,37	< 0,01	2,37	*0,088*	-3,12	< 0,001	29,45	*0,117*
urgency	0,00	Reference	0,00	Reference	0,00	Reference	0,00	Reference	0,00	Reference
Age	0,05	*0,064*	-0,09	*0,748*	-0,33	< 0,001	0,02	< 0,05	-1,45	< 0,05
Nr. of affected systems	3,58	< 0,001	3,91	*0,477*	1,31	*0,139*	1,52	< 0,001	2,75	*0,833*
Nr. of secondary diagnoses	10,56	< 0,001	3,94	< 0,05	3,13	< 0,001	1,58	< 0,001	12,00	< 0,005
Nr. of procedures	7,46	< 0,001	-1,70	*0,085*	1,49	< 0,001	0,82	< 0,001	-0,94	*0,427*
Length hospitalization	3,93	< 0,001	7,37	< 0,001	1,07	< 0,001	0,65	< 0,001	-1,77	< 0,005

* 1=minor, 2= moderate, 3=major, 4=extreme

Assumptions :

1) The data are not normally distributed, but the sample is large enough to compensate the deviations.

2) The assumption that the variances in each experimental condition are fairly similar, is violated (p<0,001).

3) The model hasn't the same amount of inpatient stays for each value of the different variables.

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