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ORIGINAL STUDY

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Financial implications of the renewed reimbursement system of total hip arthroplasty in Belgium

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In Belgium, from June 1st 2018 on, a renewed reimbursement for hip arthroplasty implants was launched and from January 1st 2019 on, a lump sum covering doctors' fees for "low variable patients", was introduced. We investigated the impact of both reimbursement systems on the funding of a University Hospital in Belgium. All patients from the UZ Brussel with a severity of illness score of one or two whom had an elective total hip replacement implanted between January 1st and May 31st 2018, were included retrospectively. We compared their invoicing data to those of patients operated in the same period but one year later. Moreover, we simulated the invoicing data of both groups as if they had been operated in the other period. Overall, we compared invoicing data of 41 patients before and 30 after the introduction of both renewed reimbursement systems. After the introduction of both new laws, we noted a loss of funding per patient and per intervention between 46.8€ and 753.5€ for a single room and, between 105.5€ and 1877.7€ for a double room. We noted the highest loss in the subcategory "physicians' fees". The renewed reimbursement system is not "budget neutral". In time, the new system can lead to an optimization of care, but it can also lead to a progressive decrease of funding if future fees and implant reimbursements would be aligned towards the national mean. Moreover, we fear the new financing system could affect the quality of care and/or result in the selection of profitable patients.

Keywords: Hip arthroplasty; health economics; global prospective amount; low variable care; healthcare funding.

INTRODUCTION

Belgium has a complex multimodal hospital financing system *(1-4)*. Most medical activities are funded by a pay-for-service system including physicians' fees and technical acts (40.7% of revenues). Part of the physicians' fees cover the costs not included in the hospital's budget (material and wage costs for nurses) *(1,4)*. Non-medical activities (Capital/Investments, Operational and Construction costs), are financed by the Budget of Financial Mean (BFM, 38.6% of revenues). Pharmaceutical specialties (including some medications, implants and invasive medical equipment) are financed

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through both, a product-by-product basis and a lump sum per admission (15.1% of revenues). Lump sums are also paid for conventions, day care and rehabilitation care (4.7% of revenues). If the patients opt for a single room, room supplements and extra physicians' fees for personalized care of physicians (0.6% of revenues), can be charged to the patient or his private insurance on top of the standard dues agreed with insurance companies *(4)*.

In Belgium, before June 1st 2018, the cost of orthopedic hip implants depended on implant type, bearing and fixation. Later, that reimbursement system was replaced by a flat rate depending on the intervention type (primary of revision), rather than on the material used *(5,6)*.

As the hospital budget structurally underfund Belgian hospitals, physicians' fees are used to compensate for the deficit *(1,4)*. In that pay-for-service financial model, doctors and hospitals are encouraged to carry out as many procedures and examinations as possible. In the worst case, this could induce over-consumption. As such, and according to the Federal Knowledge Center for Healthcare (KCE), reforming of the Belgian hospital financing system is needed. This includes, a lump sum for common surgical procedures and a reformation of the physicians' fee system for personalized care *(1,2,7)*.

As lawmakers assume that the cost of a particular intervention, in patients with a severity of illness (SOI) score of one or two, should be similar, a "low variable care" (LVC) system was introduced on January 1st, 2019 *(8)*. Considering the KCE's recommendations, lump sum funding was applied to 57 patient clusters, classified according to "All Patient Refined Diagnosis Related Groups" (APR-DRG) *(9)*. That system provides, for each of the 57 interventions, a fixed budget covering all physicians' fees for patients with a similar diagnosis (DRG) and benefit from low variable care (LVC). That budget depends on the SOI and not any more on the care administered. Hence, the financial risk is borne by the hospitals and/or the physicians instead of the insurance companies *(1,3,10)*. Moreover, in the period we investigated, the LVC system limits the "extra physicians' fees for personalized care" in a single room to 115%. In the original billing system, the regulator did not impose any restrictions on those extra fees.

Total hip arthroplasty (THA) is one of the APR-DRGs subjected to both, the new LVC billing system and the new implant reimbursement system. Both reforms were presented as "budget neutral" *(3)*, but the lump sums provided, could be revised in the future. As such, we investigated the impact of the renewed Belgian hip arthroplasty reimbursement system on the financing of a University Hospital.

MATERIALS AND METHODS

All patients operated in the UZ Brussel and, registered with an APR-DRG code 301 (hip joint replacement) and a SOI score of one or two, were included retrospectively for two different periods. During the first period of five months (January 1st 2018 to May 31st 2018), implants were billed according to the original reimbursement scheme and physicians were paid according to the original pay-for-service system. During the second period of five months, exactly one year later, implants were billed according to the new reimbursement scheme and physicians were paid according to the new lump sum system. Patients with a SOI score above two, fracture treatment and revision surgery were excluded.

For both study periods, we analyzed the invoices of primary THA's according to six categories: fees, medication, supplements, materials, lab testing and others. "Fees" included all benefits and supplements for personalized care, received by any physician (surgeons, anesthesiologists, radiologists, geriatricians, etc...) during hospitalization. "Medication" consisted of a lump sum of 0.62€ per day, a variable medication allowance per admission and specific medication that was invoiced to patients and/or insurance companies *(11)*. "Supplements" comprised room supplements and everything that was charged as a supplement in the billing. The category "materials" covered implants, "lab" included costs related to blood and urine analysis while "others" grouped all other costs related to the hospitalization such as a fixed nursing fee *(11)*. We checked all invoices for inaccuracies/discrepancies

and corrected obvious billing errors manually, based on the medical records.

First, we compared billing data, demographics, diagnoses and comorbidities as well as admission, discharge data and the length of stay of patients from the first period to those of the second period. In a second stage, we compared the actual invoices of each patient to a financial simulation as if he/she had been operated on in the other period (crossover design). As such, all patients charged according to the original billing system were compared to themselves, but billed according to the new system and the new implant reimbursement rate, and vice versa. In the new billing system, a fixed global prospective amount (GPA) of 1626.0€ (for SOI one) and 1653.8€ (for SOI two) replaced all physicians' fees and the new implant reimbursement rate was used. Applying the old billing system, we allocated a fixed rate for each physician's fee and charged the old implant reimbursement rate.

Statistical analysis

Normality of ratio variables was assessed with a Shapiro-Wilk test. The data were reported as medians and interquartile ranges and analyzed with a non-parametric Mann-Whitney. We compared categorical variables with a Chi² test. P values <0.05 were considered statistically significant.

The statistical analysis was performed with the software 'R' (version 4.0.3, 2020, https://www.r-project.org/).

The Ethical Committee of the UZ Brussel approved this study (B.U.N. 143201941050 and B.U.N. 143201837555).

RESULTS

Based on the APR-DRG code 301, we included 56 consecutive patients for the first and 56 consecutive patients for the second period. After

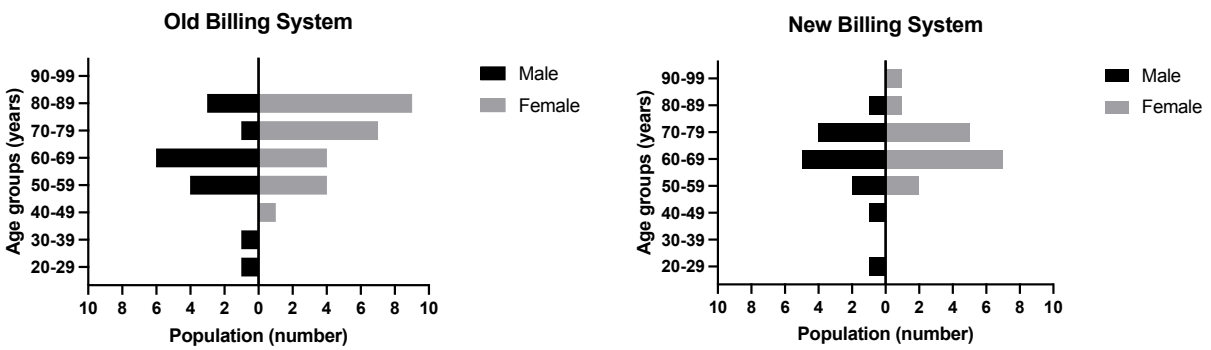

Figure 1. — Distribution age and sex for the population of the old and new billing system

Table I. — Comparison of patients billed according to the original and the new billing system

	Old billing system	New billing system	Statistics	p-value
Number of patients	41	30		
Sex: M/F	16/25	14/16	Chi²	0.689
Age: median (interquartile range) in years	67.0 (59.0-80.0)	66.0 (60.3-72.8)	Mann-Whitney*	0.564
Destination : % discharge back home	85.4	90.0	Chi²	0.654
Diagnosis: % primary coxarthrosis	87.8	86.7	Chi²	0.321
Comorbidities: median (interquartile range)	8.0 (4.8-11.0)	10.0 (6.5-13.0)	Chi²	0.055
Length of stay: median (interquartile range)	6.0 (5.0-7.3)	5.0 (4.0-6.0)	Mann-Whitney**	0.027

* Not normally distributed (Shapiro-Wilk test p = 0.008). ** Not normally distributed (Shapiro-Wilk test p < 0.001).

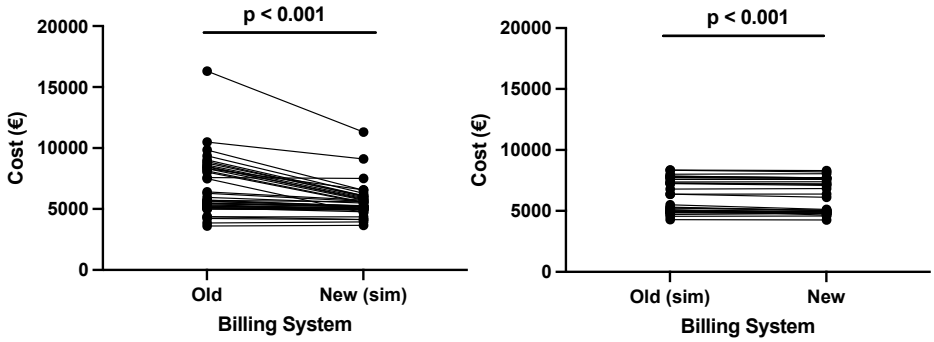

Figure 2. — Overview of the evolution of the total cost per patient (crossover design). Data were not normally distributed (Shapiro-Wilk test $p < 0.001$). P-values of Mann-Whitney.

Table II. — Comparison of the median overall total cost per patient of the first period for a single room and that cost per patient broken down in subcategories

N = 15 patients	Old billing (original)	New billing (sim)	Difference (old-new)	p-value*
Total cost (€)	8501.2 (8075.8-8961.0)	7747.7 (7507.8-8012.1)	753.5	0.055
Fees (€)	3828.9 (3796.6-3905.8)	371.3 (340.1-415.3)	3457.6	< 0.001
Medication (€)	205.4 (193.3-303.8)	205.4 (193.3-303.8)	0.0	1
Supplements (€)	1464.8 (1152.2-1792.5)	792.0 (660.0-990.0)	672.8	0.001
Materials (€)	2700.7 (2103.7-2774.3)	2471.7 (1987.6-2525.8)	229.0	0.001
Lab testing (€)	0.0 (0.0-10.0)	0.0 (0.0-0.0)	0.0	0.181
Other (€)	435.1 (378.4-500.3)	435.1 (378.4-500.3)	0.0	1
GPA (€)	/	1653.0		

* Not normally distributed (Shapiro-Wilk test, $p < 0.001$).

Table III. — Comparison of the median overall total cost per patient of the first period for a double room and that cost per patient broken down in subcategories

N = 26 patients	Old billing	New billing (sim)	Difference (old-new)	p-value*
Total cost (€)	5298.5 (5026.2-5642.6)	3420.8 (3254.3-3592.3)	1877.7	< 0.001
Fees (€)	1814.5 (1779.2-1945.6)	371.3 (366.7-440.6)	1443.2	< 0.001
Medication (€)	226.1 (188.8-258.6)	226.1 (188.8-258.6)	0.0	1
Supplements (€)	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.0	1
Materials (€)	2585.9 (1533.3-2735.5)	2426.9 (1500.1-2504.1)	159.0	< 0.001
Lab testing (€)	33.3 (19.4-67.1)	0.0 (0.0-0.0)	33.3	< 0.001
Other (€)	440.6 (398.6-523.8)	440.6 (398.6-523.8)	0.0	1
GPA (€)	/	1661.0		

* Not normally distributed (Shapiro-Wilk test $p = <0.001$).

applying the exclusion criteria, we retained 41 and 30 patients in the original and the new billing system respectively. In both periods, all patients came from home, all surgeries were unilateral and were planned outside an emergency setting. The most common comorbidities were difficult gait and essential hypertension. Both populations were comparable (Table I). Patients billed according to the new system had a significant shorter length of stay (median 5.0 vs. 6.0 days) despite the fact that they had a tendency to have more comorbidities.

Table IV. — Comparison of the median overall total cost per patient of the second period for a single room and that cost per patient broken down in subcategories

N = 12 patients	Old billing (sim)	New billing	Difference (old-new)	p-value*
Total cost (€)	7673.3 (7286.9-7894.1)	7626.5 (7211.7-7800.7)	46.8	0.027**
Fees (€)	3822.6 (3784.6-3840.6)	2231.8 (2193.8-2250.9)	1590.8	0.002
Medication (€)	129.5 (127.5-138.0)	129.5 (127.5-138.0)	0.0	0.586
Supplements (€)	930.9 (676.4-1062.2)	1059.2 (824.4-1155.4)	-128.3	<0.001***
Materials (€)	2314.6 (2270.9-2336.9)	2232.8 (2211.0-2254.6)	81.8	0.064
Lab testing (€)	1.1 (0.0-2.9)	0.0 (0.0 - 0.0)	1.1	0.035
Other (€)	348.5 (306.5-385.6)	348.5 (306.5-385.6)	0.0	1
GPA (€)	/	1638.2		

* Not normally distributed (Shapiro-Wilk test $p < 0.001$). ** Normally distributed (Shapiro-Wilk test $p = 0.555$). *** Normally distributed (Shapiro-Wilk test $p < 0.359$)

Table V. — Comparison of the median overall total cost per patient of the second period for a double room and that cost per patient broken down in subcategories

N = 18 patients	Old billing (sim)	New billing	Difference (old-new)	p-value*
Total cost (€)	5046.8 (4868.2-5292.2)	4941.3 (4794.2-5055.0)	105.5	0.003
Fees (€)	1905.1 (1777.2-1976.9)	391.9 (337.8-484.0)	1513.2	< 0.001
Medication (€)	140.7 (131.0-169.1)	140.7 (131.0-169.1)	0.0	1
Supplements (€)	80.7 (61.6-99.7)	80.7 (61.6-99.7)	0.0	0.471
Materials (€)	2314.6 (2270.9-2314.6)	2254.6 (2211.0-2254.6)	60.0	0.080
Lab testing (€)	28.8 (13.4-43.2)	0.0 (0.0-0.0)	28.8	< 0.001
Other (€)	384.3 (329.9-466.7)	384.3 (329.9-466.7)	0.0	1
GPA (€)	/	1647.9		

* Not normally distributed (Shapiro-Wilk test, $p < 0.001$).

We corrected the obvious inaccuracies, discrepancies and billing errors manually. With these corrections there was an average difference of 185.5€ per patient in the first period in favor of the hospital and 20.7€ per patient in the second period in favor of the patient.

In a second stage, we simulated the cost of each patient as if he/she had been operated in the other period and billed accordingly (Fig. 2 and Table II, III, IV, V). The overall cost of a total hip arthroplasty (cross over design) was not normally distributed (Shapiro-Wilk test, $p < 0.001$) and was significantly higher (Mann-Whitney, $p < 0.001$) for patients operated and charged according to the old billing method and according to the 'old' hip implant reimbursement system for both periods.

Out of 41 patients that were included in the first period, only two would have cost more if they had been billed according to the new hip implant reimbursement system and the renewed reimbursement system. Patients in a single room yielded a median of 753.5€ more when billed according to the old billing and reimbursement system (Table II). For a double room, the median difference was 1877.7€ in favor of the old billing and reimbursement system (Table III).

Patients operated in the second period and simulated in the old billing system, had a higher overall cost compared to their real invoice (Table IV and V). From the 30 patients of the second period, 22 would have yielded more if they had been billed according to the 'old' hip implant reimbursement system and the pay-for-service system for physicians' fees. For those patients admitted in a single room, the median difference would have been 46.8€ (Table IV). In a double room the median difference would have been 105.5€ (Table V).

To clarify the origin of differences between both billing systems, we compared the costs of the six subcategories (fees, medication, supplements, material, lab testing and other) of both populations with their simulations.

In both populations and for both hospitalization in a single or double room, the median cost of the subcategories 'medication' and 'others' were the same as these subcategories were not impacted by the new laws (Table II, III, IV, V). In addition, supplements in double room remained the same in the first period (median 0.0€) and the second period (median 80.7€) when simulated in the alternative scenario. The supplements of the second period are the medications who were invoiced as supplements for the patients in our data.

Single- and double room patients invoiced (Table II and III) or simulated (Table IV and V) yielded more fees according to the old billing system (even taking the fixed global prospective amount (GPA) into account). Similarly, but to a lesser extent, the old billing system generated more income for implants than the new system.

The main cost drivers were the subcategories 'fees' and 'materials'. Materials accounted for the largest percentage of the total cost in both populations and in both types of room. Overall, the percentage was higher in a double room (first period single room (old-new) 31.7-31.9%, first period double room (old-new) 48.8-70.9%, second period single room (old-new) 30.2-29.3%, second period double room (old-new) 45.8-45.6%).

The median patients' costs according to the old billing system was 3825.3€ and 844.0€ in a single room and a double room respectively. The median patients' costs according to the new billing system was 0.0€ and 429.1€ in a single room and a double room respectively. As such, the new billing system was cheaper from the patient's point of view (Mann-Whitney, $p < 0.01$ for a single and a double room). Due to complexity the simulation of the patients cost was not possible.

DISCUSSION

Our study investigated the impact of the introduction of the low variable care system and a new reimbursement system for hip implants on the funding of a Belgian University Hospital. Due to large variations in the cost of hip arthroplasties, we could not show a significant effect of these measures when comparing two populations operated one year apart. However, when comparing data from individual patients in a crossover design, it was clear that both measures were not "budget neutral" as announced by policy makers *(3)*. Both measures reduced the hospital income per operation between 46.8€ and 753.5€ when patients stayed in a single room and between 105.5€ and 1877.7€ in a double room. Overall, the effect of the LVC billing system was much larger than that of the new implant reimbursement system.

Compared to data from the same hospital but 17 years ago *(12)*, the average cost of a total hip arthroplasty decreased from 9500€ to 6127€ with the new billing system. This is a large difference as it does not take into account inflation (consumer price index 31.3% between 2002 and 2019 *(13)*). However, both, the average hospital stay and the hospital financing system, have also evolved. In 2001-2002 the average length of stay was 14.4 days *(12)*, as in our study it was 7.2 days in the first population and 5.5 days in the second population. For comparison, according to the website of AZ Delta *(14)*, a Non-University Hospital, patients stay on average 4 days after a total hip arthroplasty. In that hospital, the patient's cost varies between 480€ and 555€ in a double room and between 2150€ and 2250€ in a single room. Similarly and according to the website of another Non-University Hospital (OLV Aalst), the average stay is 5 days and the estimated cost for a total hip arthroplasty is 542.4€ in a double room and 2527.4€ in a single room *(15)*.

Overall, we found that implants represent about 30% of the cost of a total hip arthroplasty. This is in line with an average of 34% reported in a study from 2008 (16), comparing the cost of a primary hip replacement in nine countries.

The first weakness of our study is its retrospective and observational character. As lawmakers introduced both reforms within one year, it was not possible to perform a randomized study. As such, we choose to compare real data from patients operated one year apart, assuming that both populations would

not be different and elective total hip arthroplasty practice within the department would not evolve. To correct for this possible bias and to take into account the large variation in cost of total hip arthroplasty, we also performed a crossover comparison using each patient as its own control. Second, we noted errors in both, the ARP-DRG registration and billing data. We corrected these errors based on the medical records, but less obvious errors could have been missed. Billing inaccuracies were reported to the Medical Registration Department and the Billing Department. Third, our study was limited to one University Hospital (single center design). Unlike most Non-University Centers, clinical practice follows department guidelines and most doctors have a fixed income. As such, physicians have no personal financial incentive to over-consume medical care. On the other hand, as teaching hospitals, University Hospital might be less efficient compared to private practices and they might treat other types of patients. Therefore, our findings cannot be extrapolated to other hospitals, especially Non-University Hospitals. Fourth, the observation period was limited 10 months and included less than 50 patients per group. We choose five months periods, striving to compare the same period with maximum one-year interval. With the introduction of the new reimbursement of implants in June 2018 and the low-variance care scheme in January 2019, only two five-month periods could be compared. The small number of patients was compensated for by using each patient as his own control in a crossover study design. Moreover, both populations had comparable demographics and no treatment of hospitalization strategies were modified.

This study demonstrated that the introduction of two new reimbursement modalities for hip replacement surgery generated a significant loss for the UZ Brussel. Because the evolution of the GPA will be based on the actual care delivered, we expect a continuous downward pressure on that GPA. However, a drop in the future GPA would cause even more losses. As such, a financing system based on a lump sum for LVC could incite hospitals towards spending less on extra examinations or physicians' advices. This could result in suboptimal care. Moreover, we believe flat rate financing system for LVC could lead to patient selection, avoiding those SOI one and two patients that are expected to exceed the GPA. In addition, hospitals will have to invest more in medical registration so that patients who exceeded the fixed budget do not end up unjustly in the LVC. The extra burden of a high-performing hospital registration system is not covered by the LVC system and the money needed will be difficult to find in a healthcare system that is chronically underfinanced.

Linking implants reimbursement to the type of intervention instead of the type of implant used seems sensible. It puts the financial responsibility in the hands of care providers and stimulates them to make judicious choices. However, some primary cases need revision implants and these would only be reimbursed as primary implants in the new financing system. Moreover, policy makers do not allow claiming the extra cost from the patient and/or his insurance. This could have unwanted side effects such as: avoiding or referring cases that would need underfinanced implants, using unappropriated primary implants in complex cases needing revision implants and/or putting financial strains on those departments that collect a large proportion of complex cases. As such, for complex primary hip arthroplasties, it should be possible to request an increased reimbursement for both, revision implants and surgical fees.

CONCLUSIONS

This study shows that the introduction of both, the renewed reimbursement of hip implants and the global prospective amount for low variable care, are not budget neutral for a Belgian University Hospital. The net loss per hip replacement varies between 46.8€ and 753.5€ in a single room and between 105.5€ and 1877.7€ in a double room. The decrease in income is mainly attributable to a decrease in physicians' fees.

The effects of a reducing the reimbursement of hip arthroplasty surgery must be monitored closely. If this only leads to further optimization of the hospital stay, the introduction of well-functioning care programs and the making of sensible implant choices, we can only applaud this. However, there

is a real danger that this could also influence our quality of care and that it could lead to consciously choosing "profitable" patients. This could render it more difficult for certain patients to access the care they deserve and lead to a deterioration of our healthcare.

REFERENCES

1. **Callens S, Peers J.** Organisatie van de gezondheidszorg. In: derde edit. Intersentia; 2015. p. 755.
2. **Crommelynck A, Degraeve K, Lefèbvre D.** De organisatie en financiering van de ziekenhuizen [Internet]. 2013 [cited 2019 Jun 11]. Available from: https://www.cm.be/media/CM-253-NL-Infofiche_tcm47-17926.pdf
3. **Volksvertegenwoordigers BK van.** Wetsontwerp betreffende de gebundelde financiering van de laag variabele ziekenhuiszorg. België; 2018 p. 44.
4. **Van de Voorde C, Van den Heede K, Obyn C, Quentin W, Geissler A, Wittenbecher F, *et al.*** Conceptual framework for the reform of the Belgian hospital payment system [Internet]. 2014. Available from: https://kce.fgov.be/sites/default/files/atoms/files/KCE_229_Hospital Financing_Report.pdf
5. **RIZIV.** Terugbetaling implantaten en invasieve medische hulpmiddelen [Internet]. Available from: https://www.riziv.fgov.be/nl/professionals/individuelezorgverleners/verstrekkers-van-implantaten/Paginas/terugbetaling-implantaten.aspx
6. **Noblesse V.** Implants tableau correspondance implantaten concordantietabel [Internet]. 2017 [cited 2018 Jul 11]. Available from: https://webcache.googleusercontent.com/search?q=cache:6Yfn6CvcEuAJ:https://www.inami.fgov.be/SiteCollectionDocuments/implants_tableau_correspondance_implantaten_concordantietabel.xlsx+&cd=1&hl=fr&ct=clnk&gl=be&client=safari
7. **Pommee U.** Financiële situatie van de algemene ziekenhuizen in België [Internet]. Brussel; 2018. Available from: https://www.belfius.be/about-us/dam/corporate/press-room/press-articles/downloads/nl/2018/Persbericht_Belfius_MAHA_10_10_2018.pdf
8. **Horn SD, Horn RA, Sharkey PD.** The Severity of Illness Index as a severity adjustment to diagnosis-related groups. Health Care Financ Rev [Internet]. 1984;Suppl:33–45. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4195109&tool=pmcentrez&rendertype=abstract
9. **RIZIV.** Lijst patienten laagvariabele zorg [Internet]. RIZIV; 2019. Available from: https://www.riziv.fgov.be/nl/professionals/verzorgingsinstellingen/ziekenhuizen/financiering/Paginas/welke-verstrekkingen.aspx
10. **ruzb - chab.** Hervorming ziekenhuisfinanciering [Internet]. 15/09/2014. 2014 [cited 2018 Oct 10]. p. 1-8. Available from: https://www.univ-hospitals.be/hervorming-ziekenhuisfinanciering/
11. **RIZIV.** De kostprijs van een ziekenhuisopname [Internet]. 19/02/2018. 2018 [cited 2018 Oct 25]. Available from: https://www.riziv.fgov.be/nl/themas/kost-terugbetaling/door-ziekenfonds/verzorging-ziekenhuizen/Paginas/default.aspx
12. **Scheerlinck T, Duquet WD, Casteleyn PC.** Socioeconomic aspects of total hip arthroplasty. A one-year survey in a Belgian university hospital. Acta Orthop Belg. 2004;70:525-33.
13. **Triami Media BV.** Historische inflatie België-historische CPI inflatie België [Internet]. [cited 2021 Nov 14]. Available from: https://www.inflation.eu/nl/inflatiecijfers/belgie/historische-inflatie/cpi-inflatie-belgie.aspx
14. **AZ Delta.** Totale heupprothese [Internet]. 28 juni. 2021. Available from: https://www.azdelta.be/nl/patient/wat-het-u-zal-kosten/prijsramingen/totale-heupprothese
15. **OLV.** Prijsraming - Klassieke hospitalisatie - Totale heupprothese [Internet]. [cited 2021 Nov 14]. Available from: https://www.olvz.be/sites/default/files/2020-09/prijsraming_h_heupprothese.pdf
16. **Stargardt T.** Health service costs in Europe: cost and reimbursement of primary hip replacement in nine countries. Health Econ [Internet]. 2008 Jan [cited 2021 Dec 6];17(1 Suppl). Available from: https://pubmed.ncbi.nlm.nih.gov/18186038/