

# Enabling Cape Verde to Perform Total Hip Replacement: Cost-Benefit Study

## Habilitar Cabo Verde a Realizar Artroplastia Total da Anca: Estudo Custo-Benefício



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### ABSTRACT

**Introduction:** Cape Verde is a middle-income country benefiting from a health agreement with Portugal. The purpose of this study is to conduct a cost-benefit analysis on the enablement of Cape Verde to perform total hip replacement.

**Material and Methods:** We assessed records from the Orthopaedic Department of Baptista de Sousa Hospital and the Portuguese Directorate-General of Health regarding hip fracture with indication for total hip replacement and hip arthritis cases evacuated to Portugal. We also analysed the direct costs of the treatment, and hypothesised the costs of performing total hip replacement in Cape Verde. We then conducted a cost-benefit analysis.

**Results:** From 2011 to 2016, 126 patients (135 hips) would have indication for total hip replacement if it was possible to do it in Cape Verde. The performance of the procedure in Cape Verde would have resulted in a global benefit of €80 644.08, and a benefit of €597.36/ per patient.

**Discussion:** Our analysis indicates that the enablement of Cape Verde to autonomously perform total hip replacement on patients with hip fracture and arthritis would have a positive financial return. Total costs were underestimated due to the impossibility to calculate indirect costs. Enabling Cape Verde to perform total hip replacement would provide the recommended treatment for patients and reduce the socio-psychological impact of evacuation.

**Conclusion:** Enabling Cape Verde to perform total hip replacement would represent an expense reduction, and an improvement of the country's quality of healthcare and autonomy.

**Keywords:** Arthroplasty, Replacement, Hip/economics; Cabo Verde; Cost-Benefit Analysis; Quality of Health Care

### RESUMO

**Introdução:** Cabo Verde é um país de médio-desenvolvimento, que ainda beneficia de um robusto acordo de Saúde com Portugal. No que diz respeito à artroplastia total da anca, a falta de implantes impossibilita a sua realização. O objectivo deste estudo é realizar uma análise custo-benefício da habilitação de Cabo Verde a realizar artroplastia total da anca.

**Material e Métodos:** Recolhemos dos registos do Serviço de Ortopedia do Hospital Dr Baptista de Sousa e Direção Geral de Saúde Portuguesa, casos de fratura proximal do fémur com indicação para artroplastia total da anca e casos de artrose da anca evacuados para Portugal. Calculámos os custos diretos do tratamento destes doentes e supusemos o custo de realizar artroplastia total da anca em Cabo Verde. Efetuámos uma análise custo-benefício.

**Resultados:** De 2011 a 2016, 126 doentes (135 ancas) teriam indicação para artroplastia total da anca. Comparando com a presente situação, habilitar Cabo Verde a realizar artroplastia total da anca resultaria num benefício global de €80 644,08, um benefício de €597,36/por doente.

**Discussão:** A nossa análise indica que habilitar Cabo Verde a realizar artroplastia total da anca autonomamente para doentes com fratura proximal do fémur e coxartrose teria um retorno financeiro positivo. Os custos encontram-se subestimados, pela impossibilidade de calcular custos indiretos. Esta mudança permitiria oferecer o tratamento recomendado para os casos de fratura e reduziria o impacto sócio-psicológico dos doentes evacuados.

**Conclusão:** Habilitar Cabo Verde a realizar artroplastia total da anca representaria uma redução de gastos e simultaneamente permitiria melhorar a qualidade dos cuidados de Saúde e autonomia do país.

**Palavras-chave:** Análise Custo-Benefício; Artroplastia Total da Anca/economia; Cabo Verde, Cuidados de Saúde

### INTRODUCTION

According to a report by the World Health Organization (WHO), Africa's population is ageing, with a substantial increase of the absolute number of older people (from 7.4 million in 2005, to 193 million by 2050). Life expectancy at age 60 is 15 years for men, and 17 years for women.<sup>1</sup> The number of hip arthritis and hip fractures will also increase, and the ability to appropriately treat these patients will become a matter of public health. Total hip replacement (THR) is the gold-standard treatment for both hip arthritis and displaced femoral neck fractures in active, elderly patients who

are community ambulators.<sup>2</sup>

Cape Verde is a West African country with a growing economy. It graduated from the group of least developed countries in 2008. However, it still benefits from a strong health cooperation agreement with Portugal.

Regarding total hip replacement (THR), Cape Verde struggles with the absence of instruments and implants, although it has skilled personnel and suitable infrastructures. Thereby, all Cape Verdean patients with hip arthritis have to go through a slow and laborious evacuation process to

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Portugal. Patients with hip fractures, even those with a formal indication for THR, undergo the only treatments available in Cape Verde: hemiarthroplasty or internal fixation. The cost of the evacuation and treatment of these patients is partially supported by both countries. According to the existing law (decree-law no. 24/77, of 3<sup>rd</sup> of March, and decree-law no. 129/80, of 18<sup>th</sup> of November), Cape Verde is responsible for paying the patients' trips, accommodation and medication, while Portugal is in charge of the payment of all medical care expenses.

The purpose of this study was to conduct a cost-benefit analysis on the enablement of Cape Verde to autonomously perform THR, meaning providing one set of instrumental and the implants needed for the projected number of cases.

## MATERIAL AND METHODS

### Data collection

In order to define the study sample, we have retrospectively assessed:

- All cases of displaced hip fracture included in the medical records of the Orthopaedic Department of São Vicente – Cape Verde.
- All arthritis cases referred for evacuation from Cape Verde to Portugal due to THR included in the Portuguese Directorate-General of Health records.

We have studied the period from 2011 to 2016.

Patients with hip fracture without indication for THR (considering age and co-morbidities), and those with an evacua-

tion request denied were excluded. The patients who were evacuated with bilateral hip arthritis were included twice in the cost calculation. A total of 126 patients (135 hips) met these criteria, and formed the sample (hip fractures n = 43; hip arthritis n = 92).

Data on costs came from the financial departments of Dr Baptista de Sousa Hospital, the Portuguese Ministry of Health, the Portuguese Embassy in Cape Verde, and surgical implant suppliers.

We assessed all the direct costs associated with the treatment of hip fracture in Cape Verde, according to the Hospital's financial department. The costs included hospitalisation and surgery (Table 1). Although THR is not performed in Cape Verde, the financial department has a predictable cost for the procedure.

For those with hip arthritis (treated in Portugal under the evacuation protocol) the costs included: clinical appointments, hospitalisation, surgery, post-operative medication, and daily stipend (Table 2). These costs fluctuate according to the year and the hospital responsible for performing the surgery.

The enablement of Cape Verde to autonomously perform THR is associated with the direct cost of the necessary instruments and of the THR implants. Other hypothetical costs are also involved: appointments, hospitalisation, and surgery.

Indirect costs related with quality of life, absenteeism, and psychological issues as a result of undergoing surgery abroad were not included.

Database management ensured patient anonymity and confidentiality, and fully complied with Caldicott principles.

The data was anonymised and none of the authors had access to patient identification. The authors have followed the protocols of their work center on the publication of data.

### Study design and data analysis

We performed a cost-benefit analysis on the enablement of Cape Verde to autonomously perform THR in cases of hip fracture and arthritis. The reference for comparison was the present treatment situation, which included treating hip fractures in Cape Verde, and hip arthritis in Portugal.

Table 1 – Cost of treatment of hip fracture in Cape Verde per patient

	Euros €
<b>Clinical appointment</b>	
First appointment	13.63
Follow-up appointment	11.36
<b>Hospitalisation fee</b>	90.00
<b>Fee per day of hospitalisation</b>	24.75
<b>Global surgery cost</b>	
Hemiarthroplasty	506.25
Internal fixation	405.00
<b>Total hip replacement</b>	<b>596.25</b>

Table 2 – Cost of treatment of hip arthritis supported in Portugal per patient

	2011	2012	2013	2014	2015	2016
<b>Daily stipend (€12.47/day)</b>	748.20	748.20	748.20	748.20	748.20	748.20
<b>Postop medication</b>	117.61	117.61	117.61	117.61	117.61	117.61
<b>Clinical appointments</b>						
First appointment	116.69	83.79	73.04	70.12	70.12	68.02
Follow-up appointment	106.08	76.17	73.04	70.12	70.12	68.02
<b>Total hip replacement</b>						
CHLC <sup>1</sup>	4732.38	4704.90	4383.85	3210.95	2823.80	2823.80
CHUC <sup>2</sup>	*	*	3703.64	2793.26	2438.10	2438.10
CHLO <sup>3</sup>	*	4864.69	4413.40	3120.42	2559.42	2559.42

<sup>1</sup> Centro Hospitalar Lisboa Central; <sup>2</sup> Centro Hospitalar Universitário de Coimbra; <sup>3</sup> Centro Hospitalar Lisboa Ocidental

\* Missing data

For the hip fracture the costs included: initial hospitalisation fee, fee per day of hospitalisation, surgery, and two follow-up appointments.

For hip arthritis, the design of the study established: 60 days of stay in Portugal, one first Orthopedic surgery and an Anaesthesia appointment, two follow-up Orthopedic Surgery appointments, and 30 days of post-operative analgesic medication (40 pills of paracetamol 1000 mg, and 40 pills of dipirone 575 mg), as well as anti-thrombotic medication (low molecular weight heparin 40 mg).

We have calculated the direct cost of the treatment of our sample and hypothesised the cost of the enablement of Cape Verde to autonomously perform THR on the same number of patients. For this calculation, we considered: one first Orthopedic surgery and Anaesthesia appointment, two follow-up Orthopedic surgery appointments, the average duration of hospitalisation at the São Vicente Orthopaedic department, the purchase cost of the instruments (€80 000), and implants per patient (€1300). The cost of the instruments and implants are an informal estimation provided by a major medical company. The cost of medication was not taken into consideration because without the evacuation protocol, the patients would bear it.

The primary outcome measure was the cost or benefit per patient over a 6-year period. All costs and benefits were converted to Euros.

#### Data collection limitations

The present study presents some limitations regarding the data collection. It was not possible to include the cost of evacuation. It was not possible to ascertain the cost of performing THR in 2011 and 2012 at Centro Hospitalar Universitário de Coimbra, and in 2011 at Centro Hospitalar Lisboa Ocidental. For the THR performed at these Centres,

**Table 3** – Global cost for treating hip fracture treated in São Vicente Cape Verde, from 2011 to 2016

	n	Total cost (euros)
Hospitalisation fee	43	3870.00
Hospitalisation per day	841	20 517.75
Appointments	43	976.96
Hemiarthroplasty	28	14 175.00
Internal fixation	10	4050.00
Conservatively	5	0.00
<b>Total cost of treatment (euros)</b>		<b>43 589.71</b>

**Table 4** – Patients with hip arthritis referred to evacuation to Portugal, from 2011 to 2016

	2011	2012	2013	2014	2015	2016
<b>n</b>	13	24	7	13	15	20
<b>Daily stipend</b>	9726.60	17 956.80	5237.40	9726.60	11 223.00	14 964.00
<b>Appointments</b>	5792.02	7678.08	2045.12	3646.24	4207.20	5441.60
<b>Surgery</b>	58 903.58	108 239.43	29 741.53	40 617.14	41 067.73	54 756.98
<b>Medication</b>	1528.93	2822.64	823.27	1 528.93	1764.15	2352.2
<b>Total cost</b>	<b>75 951.13</b>	<b>136 696.95</b>	<b>37 847.32</b>	<b>55 518.90</b>	<b>58 262.08</b>	<b>77 514.78</b>
<b>Total cost of treatment (euros)</b>				<b>441 791.17</b>		

we have replaced the missing values with the cost of performing THR during the following year (Table 2).

#### RESULTS

Between 2011 and 2016, the Orthopaedic Department of São Vicente - Cape Verde treated 43 patients with hip fracture and a formal indication for THR (Table 3). The average age of the patients was 63.1 years (min. 36; max. 75, median 66); 18 patients were females, and 25 were males. In 28 of the cases, the treatment option was hemiarthroplasty; in 10 cases, internal fixation was performed; and 5 cases were treated conservatively. There were 841 days of hospitalisation in total. The average of the hospitalisation duration was 19.3 days (min. 5, max. 74, median 16). The total cost of treatment was €43 589.71.

During the same period of time, 83 patients were evacuated to Portugal in order to undergo THR, 9 of them bilateral (n = 92 hips) (Table 4). The average age of the patients at the time of the referral was 50.5 (min. 17; max. 86, median 53), and 31 patients were female, while 52 were male. A total of €441 791.17 was spent in the treatment of these patients. The global cost of treatment of both hip arthritis and fractures is €485 380.88.

Considering the hypothesis of performing 135 THRs in Cape Verde, which would mean 126 patients would be treated avoiding evacuation, a total sum of €404 736.80 would be spent (Table 5). Compared with the present situation, enabling Cape Verde to perform THR would result in a global benefit of €80 644.08, and a benefit of €597.36/per patient over a 6-year period.

#### DISCUSSION

The global burden of musculoskeletal disease in low and middle-income countries is large, growing, and neglected.<sup>3</sup> Half of the world's population lacks access to adequate primary healthcare, and two thirds lack access to orthopaedic care.<sup>4</sup>

To the best of our knowledge, there are no published papers regarding the cost-effectiveness of performing THR in middle-income countries. Cape Verde differs from the rest of the Portuguese-speaking African countries that benefit from the health agreement with Portugal, as it is a middle-income country, and thus it has reasonable infrastructures and trained surgeons capable of offering good healthcare services to its population.

**Table 5** – Hypothetic cost of performing THR in Cape Verde for a 5-year period

n = 135	Total cost (euros)
Purchase of Instruments	80 000.00
Appointments	6747.30
Hospitalisation fee	62 268.75
Surgery	80 493.75
Implants	175 500.00
<b>Total cost of treatment (euros)</b>	<b>404 736.80</b>

Our analysis indicates that enabling Cape Verde to autonomously perform THR on patients with hip fracture and arthritis would have a positive financial return, since it would represent savings of €597.36/per patient over a 6-year period. This analysis included one of the two Orthopaedic departments in the country. São Vicente Orthopaedic Department serves 167 658 of the 491 575 inhabitants, meaning that these results would be even more expressive if we considered the whole population of the country.<sup>5</sup> It should be taken into account that this is also an important focus for investment since we now witness a growing life expectancy, hence, an increase of the problem. The cost of evacuation is an important financial burden that was not possible to include in the current study. This limitation underestimates the benefit of the enablement of Cape Verde to perform THR. Indirect costs like the psychological burden and the quality of life of those who have to undergo an unsatisfactory treatment, or those who have to be evacuated and undergo surgery in a foreign country, were not taken into account. There are some other important aspects resulting from the enablement of Cape Verde to perform THR: we believe that an increase in patients' satisfaction and quality of life is expectable, as well as a decrease in absenteeism in the workplace. All these situations contribute to value the benefit of this adjustment.

The current situation is, of course, the result of a long-term and well established but outdated agreement between

Portugal and Cape Verde. Any changes to that agreement have to be carried out with sensitivity and responsibility from both political sides, and before definitely changing the current situation, it would be important to establish a trial phase.

## CONCLUSION

Compared with the present situation, enabling Cape Verde to perform THR would result in a global benefit per patient over a 6-year period, while improving the quality of healthcare and autonomy in the country. Nevertheless, the changes to the outdated political agreement with Portugal have to be made cautiously, in order to promote higher quality and fairer healthcare.

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## PROTECTION OF HUMAN AND ANIMAL SUBJECTS

The authors declare that the research procedures were performed according to the regulations of the institution's ethics committee and the Code of Ethics of the World Medical Association (Declaration of Helsinki).

## CONFIDENTIALITY OF DATA

The authors declare that they have followed the protocols of their work centre regarding the publication of data from patients.

## CONFLICT OF INTEREST

No conflict of interest has been declared by any author.

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## REFERENCES

1. Organização Mundial de Saúde. A WHO global report on falls among older persons prevention of falls in older persons: Africa case study. Geneva: WHO; 2005. p. 1–31.
2. Cannada L. Orthopaedic knowledge update: 11. Rosemont: American Academy of Orthopaedic Surgeons; 2014.
3. Beveridge M, Howard A. The burden of orthopaedic disease in developing countries. *J Bone Joint Surg Am.* 2004;86:1819–22.
4. Dormans JP, Fisher RC, Pill SG. Orthopaedics in the developing world: present and future concerns. *J Am Acad Orthop Surg.* 2001;9:289–96.
5. Instituto Nacional de Estatísticas de Cabo Verde. Apresentação de dados preliminares do IVo RGPH 2010: Gabinete do Censo 2010. Praia Santiago: INECV; 2011.