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Costs of surviving meningococcal disease in Spain: Evaluation for two cases of severe meningitis and septicaemia

Josep Darbà [a,*], Lisette Kaskens [b], Mareile Hark [c], Claire Wright [d]

[a] University of Barcelona, Barcelona, Spain
[b] BCN Health Economics & Outcomes Research SL, Barcelona, Spain
[c] Novartis, Basel, Switzerland
[d] Meningitis Research Foundation, Bristol, UK

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ABSTRACT

Objectives: The aim of this study was to count the lifelong rehabilitation costs associated with surviving meningococcal disease with major sequelae from the perspective of the Spanish National Healthcare System (NHS) and the national government.
Methods: Two severe scenarios describing meningococcal disease were developed, one case that represented meningococcal septicaemia and another case for meningococcal meningitis. The scenarios were developed based on a literature review on severe sequelae of meningococcal disease, and discussions with paediatricians who have been responsible for the treatment of children with this disease in Spain. Second, a detailed list of all health, educational and social care resources used by survivors during their acute illness and during the rest of their lives and by family members was obtained by interviewing survivors and their families. Professionals in health and social care were also interviewed to complete the list of resources and ensure the scenario's were accurate. The costs attributed to these resources were obtained from tariff lists, catalogues and published information by the national authorities. All costs were based on a life expectancy of a survivor of 70 years and expressed in EUR 2012.
Results: In this study it was estimated that the lifelong discounted rehabilitation costs associated with the treatment of long-term sequelae due to meningococcal disease are approximately €1180,000–€1400,000. Medical care and social care were the main cost drivers for both septicaemia and meningitis. Annual costs showed to be the largest in the first year after diagnosis of the disease for both cases, due to high hospital admission and medical care costs during this period and decreased significantly over the years.
Conclusion: This study shows that the lifelong rehabilitation costs associated with the survival of meningococcal disease with severe sequelae place an important burden on the NHS budget and governmental resources in Spain.

1. Introduction

Meningococcal disease is caused by the microorganism *Neisseria meningitidis*, a bacterium that usually colonises the nasopharynx asymptomatically but occasionally can invade the host causing meningococcal septicaemia or meningitis [1]. The incidence of meningococcal disease in Spain was estimated at approximately 0.96 per 100,000 inhabitants in the period 2009–2010 and 70% of the cases were caused by an infection of the bacterium with serogroup B [2]. Most of the patients with meningococcal disease survive relatively unscathed, but some patients are left with severe long-term sequelae and disability [3].

Sequelae associated with surviving meningococcal disease depend on the type of infection that occurred and can include limb loss (3% of patients), growth plate damage, renal failure, skin necrosis/scarring and pain (21–28% of patients) for septicaemia [3–6]. Sequelae associated with meningitis include mental disability, neurological sequelae (7% of patients) such as seizures, motor impairment, hydrocephalus, loss of vision and hearing loss (4% of patients) [3,7].

Several studies have been identified [3,8,9], two in Spain and one in the United Kingdom, that evaluated the costs associated

Abbreviations: (NHS), Spanish National Healthcare System; (INE), Spanish National Statistics Institute; (PICU), Paediatric Intensive Care Unit.

* Corresponding author. Tel.: +34 934021937; fax: +34 934039082.
E-mail address: darba@ub.edu (J. Darbà).

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with meningococcal disease or with one of the manifestations of meningococcal disease. The study by Iñigo et al. [8] evaluated the associated hospitalisation costs of severe sepsis in the region of Madrid in Spain for the year 2001. They showed that hospitalisation costs summed up to approximately €10.000 per case of severe sepsis. In another study performed by Gil Prieto et al. [9] it was observed that the overall hospitalisation costs per patient with meningococcal disease came to €4918 and the average annual hospitalisation costs summed up to €592,980 in the region of Madrid over the period 1997–2005. To date only one study has been identified that counted the lifelong rehabilitation costs of surviving meningococcal disease [3]. This study was performed in the UK and showed that surviving meningococcal disease with major sequelae is associated with an important burden for the NHS and government. Accurate data on the costs-of-illness of meningococcal disease is fundamental for health economic evaluations as cost-effectiveness analyses and immunisation programmes. On its turn an increase in analyses on immunisation programmes has been observed in Spain [10,11]. Although there has been an improvement in the methodological quality of studies it is clear that the existence of a huge gap in this kind of work compared to other countries [10,11].

Lifelong rehabilitation costs in the UK were shown to vary between approximately £1360,000 and £1720,000 for a survivor with severe sequelae due to sepsis and meningitis [3]. The major sequelae associated with surviving meningococcal disease are also associated with an important loss of quality of life [5,6]. Up to date no studies on the lifetime rehabilitation costs associated with surviving meningococcal disease with major sequelae in Spain have been identified. The objective of this study is to count the lifelong rehabilitation costs associated with surviving meningococcal disease with major sequelae in the Spanish setting. The results are presented in a format suitable for input into further health economic evaluations including cost-effectiveness analysis. As cost-effectiveness studies play a crucial role in determining whether immunisation programmes will be implemented, it is important to identify these costs.

2. Methods

2.1. Scenarios and resources

The approach used to estimate the lifelong rehabilitation costs associated with the survival of meningococcal disease consisted of three consecutive steps. First, two scenarios describing severe cases of meningococcal disease with major sequelae were developed. One described a case of acute meningococcal septicaemia (patient A) and the other described a case of meningococcal meningitis (patient B). Second, a list of health, educational, social care and other resources used by survivors during the treatment of their acute illness and for the rest of their life was compiled. In the last step, costs attributed to the different resources and lifelong rehabilitation costs associated with the survival of both cases of meningococcal disease were calculated.

The development of the scenarios was based on a cost study on surviving meningococcal disease published recently and conducted in the UK [3]. Scenarios from this study were adapted to the Spanish setting by conducting a literature review and interviewing three paediatricians from different Spanish hospitals to ensure that the scenarios were representative of severe cases of meningococcal disease in Spain. These paediatricians were also responsible for ensuring that the two scenarios accurately described the course of rehabilitation after survival meningococcal disease.

Once the scenarios were outlined and validated by the paediatricians, long-term health, educational, social care and other resources were collected for each scenario. For this purpose telephone interviews with six survivors or parents of survivors with sequelae similar to those of patient A and three interviews with survivors or parents of survivors with sequelae similar of those of patient B were performed. Patients were recruited by the Sant Joan de Déu hospital in Barcelona, the Clinical University Hospital in Santiago de Compostela and the Spanish association for amputations (ANDADE). Each survivor or their families were sent an informed consent for their participation in the study. Patients were interviewed from different regions in Spain including Catalonia, Galicia, Madrid and Andalusia, and it was observed that differences in benefits and reimbursement in these regions affect the overall lifelong rehabilitation costs for the treatment of severe sequelae. Other health and social care professionals including paediatricians, a paediatric surgeon, a plastic surgeon, a traumatologist, an otorhinologist, a rehabilitation specialist, social workers, a psychologist and a language and speech therapist were interviewed to obtain information regarding the support that each scenario would need for the rest of their lives and to refine resource utilisation.

Resource use was categorised into three groups: medical care, educational support and social care. As medical care is funded by the Spanish NHS and educational and social care by the government, the perspectives of this study were of the Spanish NHS and the national government. Tables 1 and 2 summarise the resources used by patient A and B, respectively.

Table 1
Patient A's resource use.

Acute care
Emergency department visit, diagnostic procedures, hospital admission during 121 days, treatment of complications such amputation surgery, renal failure, pulmonary oedema
Outpatient appointments
Regular follow-up appointments with paediatrician and traumatologist
Appointments with rehabilitation specialist and physiotherapist
Appointments with the occupational therapist to learn how to deal with the prosthetics
Five appointments with plastic surgeon to deal with the breakdown of skin graft
Specialised equipment
Children and adult wheelchair and crutches
Prosthetic provision
Non articulating low limb prosthesis, the knee is changed every three years, all other components are changed annually until the age of 16 and thereafter every two years
Upper limb cosmetic below elbow prosthesis, changed annually until the age of 16 and thereafter every two years
A micro limb prosthesis is placed only once and used until the age of four
Micro electric upper limb prosthesis with flexion and pronosupination, replacing the first micro limb prosthesis at the age of four, all parts are changed annually until the age of 16 and thereafter every two years
Cosmetic glove, changed annually
Sockets for both upper and lower limb prosthetics are changed annually
Revisions of stumps and skin graft surgery
Five surgical procedures regarding corrections of bony overgrowth and skin replacement surgery between ages of 4 and 14
Psychological therapy
Child receives weekly therapy during 20 years, parents receive three sessions a year until the child is 21
Public health care
Chemoprophylaxis for the family
Blood sample processing to analyse the bacterium
Education
Special assistance at nursery and primary school, age 3–11
Refund of University fees, age 18–21
Transport from and to school during primary and secondary school, age 5–18
Personal social services
Disabled facility grant (home care costs)
Carer allowance for parent that gave up working
Other governmental costs
Direct costs: pensioner credit due to temporal incapacity to work during study period, 18–21 years
Indirect costs: loss of tax revenues of the survivor