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Care-as-usual provided to formerly preeclamptic women in the Netherlands in the next pregnancy: health care consumption, costs and maternal and child outcome

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ABSTRACT

Objective: To explore hospital costs by pregnant women with a history of early-onset preeclampsia or HELLP syndrome, managed according to customary, but non-standardized prenatal care, by relating maternal and child outcome to maternal health care expenditure.
Study design: This was a cohort study, in women of 18 years or older who suffered from early-onset preeclampsia or HELLP syndrome in their previous pregnancy ($n = 104$). We retrieved data retrospectively from hospital information systems and medical records of patients who had received customary, non-standardized prenatal care between 1996 and 2012. Our analyses focused on the costs generated between the first antenatal visit at the outpatient clinic and postpartum hospital discharge. Outcome measures were hospital resource use, costs, maternal and child outcome (recurrence of preeclampsia or HELLP syndrome, incidence of eclampsia, gestational age at delivery, intrauterine fetal demise, small-for-gestational-age birth and low 5 min Apgar score). We used linear regression analyses to evaluate whether maternal and child outcome and baseline characteristics correlated with hospital costs.
Results: Maternal hospital costs per patient averaged € 8047. The main cost drivers were maternal admissions and outpatient visits, together accounting for 80% of total costs. Primary cost drivers were preterm birth and recurrent preeclampsia or HELLP syndrome.
Conclusion: Hospital costs in the next pregnancy of formerly preeclamptic women varied widely with over 70% being medically unexplainable. The results of this study support the view that care standardization in these women can be expected to improve costs and efficacy of care without compromising outcome.

Introduction

Preeclampsia (PE) affects about 2–5% and the syndrome of hemolysis, elevated liver enzymes and low platelets (HELLP) 0.5% of all pregnancies [1,2]. Women with a history of PE or HELLP are at increased risk of recurrence in their next pregnancy [1,2]. Women who experienced early-onset PE in the first pregnancy have a 6.6-fold higher risk of recurrence in their next pregnancy than women who completed a normotensive first pregnancy [3]. Therefore, gynecologists often provide extensive follow-up and counseling to these women, both postpartum and during their next pregnancy. However, only 7% of these former patients will actually develop a recurrent early-onset PE in their next pregnancy [2]. Therefore, current clinical management may be excessive in most former patients [4–6]. Nowadays, the challenge of rapidly rising health care costs asks for close scrutiny on costs and benefits of all

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medical treatments. At this moment, there are no evidence-based and standardized clinical practice guidelines for the management of pregnant women with a history of early-onset PE or HELLP. As a consequence, the intensity of follow-up can be expected to vary per center, gynecologist and patient, influenced by subjective factors, such as the perceived recurrence risk in the next pregnancy and the patient's neuroticism, anxiousness and associated demand for care [7,8]. This practice variation is referred to as care-as-usual (CAU): "the full spectrum of patient care practices in which clinicians have the opportunity to individualize care [9]". Describing CAU is an essential first step in understanding and identifying potential options to ameliorate the costs and efficiency of care.

This study aims to describe the hospital costs of CAU in a cohort of pregnant women with a previous pregnancy complicated by early-onset PE/HELLP in the Netherlands, and whether these costs relate to pregnancy outcome.

Material and methods

Study design

This study is part of a multicenter "before–after" study (the PreCare study) designed to compare effects and costs of recurrence risk-guided care (RGC) with those of CAU [10]. In RGC (the 'after' part of the study), pregnant women were assigned to either medium or high care, depending on their anticipated risk to develop recurrent PE/HELLP, estimated at booking using a prediction model [11]. In CAU (the 'before' part of the study) gynecologists were asked to treat their patients as they deemed appropriate. All women in our study received low-dose aspirin from 12 to 37 weeks pregnancy, a practice which became universally accepted in the Netherlands shortly after the CLASP study (1994). The CLASP study provided evidence for a low-dose aspirin – taken from early pregnancy onwards – to lower the risk of developing PE in women at increased risk of developing PE [12]. This practice has not changed since. For this study we used data retrieved from hospital information systems and medical records of patients who had received CAU between 1996 and 2012 in six university and three non-university hospitals in the Netherlands: Maastricht University Medical Center, Erasmus Medical Center Rotterdam, Academic Medical Center Amsterdam, Radboud University Medical Center Nijmegen, University Medical Center Groningen, University Medical Center Utrecht, Atrium Hospital Heerlen, Onze Lieve Vrouwe Hospital Amsterdam, Amphia Hospital Breda.

Participants

Pregnant women of over 18 years of age, with their previous pregnancy being complicated by PE and/or the HELLP syndrome, requiring pregnancy termination before 37 weeks, were eligible for enrolment. We excluded women with severe co-morbidity (diabetes mellitus, systemic lupus erythematosus, renal disease and cardiac disease or the anti-phospholipid syndrome).

Estimation of hospital resource use

Hospital resource use was assessed by retrieving data from hospital information systems and medical records. All cost-generating activities in the hospital (maternal admissions, outpatient visits, maternal lab tests, mode of delivery, etc.) were registered at the patient level and recorded online in case report forms (CRFs). We classified intensive care and obstetrical ward admissions separately and categorized childbirth depending on whether or not the delivery was induced and whether or not delivery required termination by forceps/vacuum extraction or cesarean section. Variation in resource use was then determined and evaluated in relation to baseline characteristics and maternal and child outcome.

Estimation of unit costs

We performed the cost calculations using the Dutch manual for cost research in health care, a methodological reference for costing studies in the Netherlands [13]. The cost analysis was performed from the hospital perspective and covered the interval from conception until maternal postpartum discharge from hospital. The Unit prices are presented in 2011 Euros. If necessary, costs were adjusted to the 2011 price level using the consumer price index [14]. In order to assess whether a time effect was present in the data, we tested the calendar year from which the data were retrieved (1996–2012) for its association with maternal hospital costs. For each individual patient, we calculated a 'time trend variable' by subtracting year of delivery from 1996.

Pregnancy outcome

Baseline characteristics of participants, such as obstetric and medical histories, and maternal and child outcome were recorded in CRFs. We considered the following types of adverse maternal outcome to be relevant for analysis: recurrent PE/HELLP, requiring pregnancy termination before the 34th week, preterm birth (delivery <37 weeks) and recurrence of PE/HELLP/eclampsia, irrespective of gestational age. Meanwhile, intrauterine fetal demise (IUFD), low birth weight (birth weight centile <10%) and 5 min. Apgar score (below 7) were considered adverse child outcome.

Details of ethical approval

This study was approved by the medical-ethical committee of the University Hospital Maastricht (Ref. no. MEC 07-2-078). All hospitals successfully completed their obligatory feasibility assessment procedure.

Statistical analysis

Prior to analysis, we checked completeness and validity of our dataset. Two of the authors (DD and SvK) contacted the research nurses in the participating hospitals to maximize the effort to retrieve missing data or to correct identified inconsistencies in the data. If missing values could not be retrieved, we performed regression imputation (except for baseline characteristics, Table 1). If the total number of CRF-registered outpatient visits was unrealistically low (below 5), the number was considered missing, and also imputed by single imputation [15].

Table 1
Characteristics of the study population.

Maternal characteristics at conception of the target pregnancy	
Maternal age at conception, years (SD)	30.7 (5.0)
Body mass index, kg/m^2 (SD)	27.3 (6.1)
Primiparous, *n* (%)	93 (89.4)
Multiparous, *n* (%)	11 (10.6)
Characteristics of previous pregnancy	
Gestational age at delivery (weeks)	31.1 (3.8)
<34 weeks, *n* (%)	78 (75)
34–36+6 weeks, *n* (%)	26 (25)
PE, *n* (%)	95 (91.3)
HELLP syndrome, *n* (%)	59 (56.7)
Eclampsia, *n* (%)	5 (4.8)
IUFD, *n* (%)	14 (13.5)
Birth weight, g (SD)	1408 (765)

Data are given as mean ± SD or as percentages.

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