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Economic Evaluations Comparing a Trial of Labor with an Elective Repeat Cesarean Delivery: A Systematic Review

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ABSTRACT

Background: For women who have had a previous low transverse cesarean delivery, the decision to undergo a trial of labor after cesarean (TOLAC) or an elective repeat cesarean delivery (ERCD) has important clinical and economic ramifications. **Objectives:** To evaluate the cost-effectiveness of the alternative choices of a TOLAC and an ERCD for women with low-risk, singleton gestation pregnancies. **Methods:** We searched EMBASE, MEDLINE, CINAHL, Cochrane Library, EconLit, and the Cost-Effectiveness Analysis Registry with no language, publication, or date restrictions up until October 2015. Studies were included if they were primary research, compared a TOLAC with an ERCD, and provided information on the relative cost of the alternatives. Abstracts and partial economic evaluations were excluded. **Results:** Of 310 studies initially reviewed, 7 studies were included in the systematic review. In the base-case analyses, 4 studies concluded that TOLAC was dominant over ERCD, 1 study found ERCD to be dominant, and 2 studies found that although TOLAC was more costly, it offered more benefits and was thus cost-effective from a population perspective when considering societal willingness to pay for better outcomes. In sensitivity analyses, cost-effectiveness was found to be dependent on a high likelihood of TOLAC success, low risk of uterine rupture, and low relative cost of TOLAC compared with ERCD. **Conclusions:** For women who are likely to have a successful vaginal delivery, routine ERCD may result in excess morbidity and cost from a population perspective.

Keywords: cesarean delivery, cost, economics, effectiveness, elective surgical procedures, pregnancy complications, probability, quality-adjusted life-years, trial of labor, utility, vaginal birth after cesarean.

Introduction

As the most frequently performed surgical procedure in the United States [1], cesarean deliveries accounted for 32.2% of nearly 4 million births in 2014 [2]—a substantial increase from 20% in 1996 and 5% in 1970 [3]. Although the optimum mode of delivery after a previous cesarean delivery is dependent on various individual characteristics and the indications for the primary cesarean birth [4,5], clinical consensus is that a trial of labor after cesarean (TOLAC) is generally a safe alternative to an elective repeat cesarean delivery (ERCD) for most women [6]. Despite these guidelines, more than 90% of women who have had a previous cesarean delivery have a repeat cesarean in subsequent pregnancies [7]. Although these women may avoid uterine rupture, they are increasingly susceptible to greater maternal morbidity than their successful TOLAC counterparts, especially across multiple cesareans [8].

In addition to clinical consequences, the decision to undergo a TOLAC or an ERCD has important economic ramifications. The cost incurred by hospitals, and thus passed on to payers in the health system, is generally considered to be greater for an ERCD because of higher resource use and longer average hospital stays [9]. Nevertheless, because of the various types of costing methods, the estimated economic impact has varied by study. Although most studies have found cesarean births to be more costly than vaginal births when assessing payments made [10–12], a few studies have reported that vaginal deliveries offer only a modest reduction in cost [13,14]. Some, however, have found that cesarean deliveries may be equivalent to vaginal deliveries, or even cost saving, in terms of economic impact after accounting for variables such as oxytocin augmentation, epidural anesthesia, or failed trials of labor [15,16].

From a public health perspective, it is crucial to maximize health outcomes while stewarding constrained resources. Economic evaluations allow for the formal comparison of alternative interventions with simultaneous regard to their health effects, resource use, and costs [17]. The objective of this systematic review was to analyze the range and quality of studies that address the cost-effectiveness of the alternative choices of a

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TOLAC and an ERCD for women with a singleton gestation who have had a previous low transverse cesarean delivery.

Methods

Conduct of Systematic Review

We developed a systematic review protocol using the Preferred Reporting Items for Systematic review and Meta-Analysis for Protocols (PRISMA-P) [18,19] and registered it in the PROSPERO database (CRD42015029177) [20]. In consultation with a librarian, we searched the databases EMBASE, MEDLINE, CINAHL, Cochrane Library, EconLit, and the Cost-Effectiveness Analysis Registry without language, publication, or date restrictions up until October 2015. Details of the search strategy are available in Appendix A. The reference lists of included articles were assessed for additional relevant studies.

Study Selection

Studies were included if they met the following criteria: 1) had to be primary research; 2) compared TOLAC versus ERCD; and 3) provided information on the relative cost of each course of action. One investigator screened all the abstracts of retrieved articles according to the inclusion criteria, erring toward inclusion in the case of uncertainty. Two investigators then assessed full-text articles that passed the initial screen, with disagreements on which articles to include resolved by discussion. Conference abstracts for which full-text articles were unavailable and partial economic evaluations, which comprise "cost analyses, cost-description studies and cost-outcome descriptions," were excluded [21].

Data Extraction and Quality Assessment

Two investigators independently abstracted data from each article using the Guide to Community Preventive Services Economic Evaluation Abstraction Form [22,23] and the recommendations of the Panel on Cost-Effectiveness in Health and Medicine [24]. The principal summary measures of interest were incremental cost-utility ratios (i.e., the additional cost per utility—a measure of both length of life and subjective level of well-being), cost-effectiveness ratios (i.e., the additional cost per unit of effect—identical units of an outcome or event such as death), or cost-benefit ratios (i.e., the additional cost per benefit—in which effects of alternative interventions are expressed in monetary units) [21]. A validated quality assessment tool was considered [25], but not used because there is a lack of consensus in the literature as to the ideal instrument for economic evaluations [26,27]. We used the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist because it offers more precise guidance as to which components are essential. We scored studies on whether they completely satisfy (1), partially satisfy (0.5), or do not satisfy (0) each component, with a maximum score of 24 (Appendix B) [28]. The level of agreement was assessed with kappa statistics, and differences in CHEERS scores were resolved by discussion.

Costs

To make the studies comparable, all costs were adjusted to 2016 US dollars using purchasing power parities for the year of the data [29] and then adjusted for inflation using the medical care component of the Consumer Price Index [30].

Results

Search Results and Quality Assessment

Database searches yielded 310 records, 224 of which were unique citations (Fig. 1). Seven studies [31–37] met the inclusion and exclusion rubric for this systematic review (Table 1). Six studies presented a cost-utility analysis [31–36], and one study presented a cost-effectiveness analysis [37]. Six of the studies [31,32,34–37] were conducted in North America and one [33] in Europe. CHEERS scores ranged from 11 to 23, with most of the studies providing comprehensive information about their methods and results. The study by Chuang et al. [31] was an outlier in terms of its CHEERS score because of incomplete reporting on items such as study perspective, preference-based outcomes, and model assumptions; the other studies had scores ranging from 21 to 23. The inter-rater reliability for the raters was found to be $\kappa = 0.773$ (95% confidence interval 0.649–0.897).

Study Characteristics

Decision modeling and analytic horizon

The included studies primarily defined their populations as being women who had one previous low transverse cesarean delivery and no contraindications to labor. All studies presented a decision tree comprising the decision node of a TOLAC versus an ERCD, with the TOLAC branch allowing for either a successful or failed trial of labor, and uterine rupture as a potential severe adverse event of TOLAC. Two studies [31,33] used a short-term analytic horizon, whereby costs and consequences accrued in the immediate time period surrounding the index pregnancy. The remaining studies used long-term analytic horizons and reported discount rates for both costs and utilities, thus evaluating future costs and consequences in terms of their present value. Two studies [34,37] allowed for the decision made in the index pregnancy to impact the outcomes and costs of future pregnancies by using a Markov model.

Study perspective

The study perspective, the viewpoint from which the costs are calculated (hospital, payer, or society), varied among the studies. Three studies [33,36,37] reported the payer's perspective—the insurance company or the government (in the case of Ireland)—as the entity responsible for paying for the costs. In these studies, cost components generally included short-term hospitalization costs (direct and indirect), professional fees, and long-term costs. Among the three studies [32,34,35] with a societal perspective—which considers the costs borne by the patient and is thus recommended by the Panel on Cost-Effectiveness in Health and Medicine—patient out-of-pocket costs and loss of employment productivity were added into calculations [24]. Chuang et al. [31] did not report the perspective taken, but it appears to be that of the hospital.

Utility inputs

The summary measures that were reported differed among the studies. The study by Grobman et al. [37] calculated the incremental cost of an ERCD over a TOLAC for one major neonatal adverse outcome (death or cerebral palsy). The other six studies assigned a utility value to the various delivery outcomes and complications. Chung et al. [32] used the Quality of Well-Being classification system [38] to derive utilities and were subsequently quoted in articles by Fawsitt et al. [33] and Gilbert et al. [34,35]. Chuang et al. [31] used several studies that measured patient preference values with regard to labor and postpartum