

OBSTETRICS

Medical cost savings associated with 17 alpha-hydroxyprogesterone caproate

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OBJECTIVE: This study was undertaken to assess the impact of 17 alpha hydroxyprogesterone caproate treatment on future medical costs for expectant mothers with a prior spontaneous preterm birth.

STUDY DESIGN: Data on the costs of preterm birth were combined with published data on the effectiveness of 17 alpha hydroxyprogesterone caproate to produce estimates of the effect of treatment on expected future direct medical costs. These estimates were compared with an estimate of the cost of a typical 17 alpha hydroxyprogesterone caproate treatment regimen to estimate the net savings per treated woman.

RESULTS: Treatment is estimated to reduce initial neonatal hospitalization costs by \$3800 per woman treated with 17 alpha hydroxypro-

gesterone caproate. Expected lifetime medical costs (discounted) of treated infants are estimated to decline \$15,900.

CONCLUSIONS: Treating expectant mothers with a prior spontaneous preterm birth with 17 alpha hydroxyprogesterone caproate generates future medical cost savings that substantially exceed the cost of treatment. If this population were universally treated with 17 alpha hydroxyprogesterone caproate, discounted lifetime medical costs of their offspring could be reduced by more than \$2.0 billion annually.

Key words: 17 alpha hydroxyprogesterone caproate, low birthweight, neonatal medical costs, preterm birth

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Reducing rates of preterm birth (PTB) could substantially reduce medical expenditures in the United States. In 2003, PTB occurred in approx-

★ EDITORS' CHOICE ★

imately 12.3% of births nationwide, affecting nearly half a million infants.¹ Although mortality rates of preterm infants have declined over time, morbidity of surviving infants has increased because of survival of more seriously ill infants,² increasing the mean neonatal costs for surviving preterm infants.³⁻⁵ Mean neonatal costs were estimated to be \$17,300 greater (in 2004 dollars) for preterm infants relative to term infants, suggesting additional neonatal costs of preterm infants account for more than \$8.6 billion of annual medical spending in the United States.⁶

Recently published evidence that is based on randomized control trials indicates that 17 alpha hydroxyprogesterone caproate (17P) is effective in the prevention of recurrent spontaneous PTB.⁷⁻⁹ Prior spontaneous preterm birth (PSPTB) is one of the strongest risk factor for preterm birth,¹⁰ and the largest randomized trial of 17P tested was specifically on this population.⁷ On the basis of these findings, the American College of Obstetricians and Gynecologists has stated that a history

of PSPTB is an appropriate indication for using 17P to prevent PTB.¹¹ Petrini et al¹² estimate that approximately 133,000 expectant mothers have a history of PSPTB and are eligible for 17P each year, and treatment of this population could prevent 10,000 PTBs annually.

The purpose of our article is to assess the economic impact of 17P treatment for expectant mothers with PSPTB in terms of subsequent medical costs.

METHODS

Data sources

Medical costs associated with PTB. We identified 6 studies estimating the medical costs associated with PTB. These were identified via a MEDLINE search using the search terms "health care costs" and "prematurity," with additional studies identified from references. Studies consisting of non-US data were excluded. Also excluded were studies that did not provide or allow for computation of the incremental medical costs associated with preterm vs normal term deliveries. Six studies meeting our criteria were identified and are described briefly in Table 1.^{2-4,13}

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For Editors' Commentary,
see Table of Contents



See related editorial, page 194

TABLE 1

Studies estimating medical costs associated with gestational age and/or birthweight outcomes

Study	Sample	Birth categories	Costs considered	Covariate adjustment	Nonsurvivors
Phibbs and Schmitt ⁶	California hospital births, 1998-2000, gestational age 24-37 wks	Gestational age (14 categories)	Neonatal hospital costs through discharge	None	Included
Gilbert et al ³	California hospital births, 1996, gestational age 25-38 wks	Gestational age (14 categories) Birthweight (11 categories)	Maternal and neonatal hospital costs through discharge	None	Omitted
St. John et al ⁴	Infants born at single Alabama hospital, 1989-1992, excluding transfers	Gestational age (19 categories)	Neonatal hospital costs and physician fees through discharge	Infant race and sex; length of stay	Included*
Schmitt et al ⁵	California hospital births, 2000	Birthweight (9 categories)	Prenatal, neonatal and maternal hospital costs through discharge	None	Included
Lewit et al ¹³	Data drawn from numerous sources (see study for details), with authors calculations intended to be representative of all US births in 1988	Birthweight (2 categories)	All infant medical costs through age 1 y	Infant race/ethnicity and sex; family income; mother's age and education; region and urban/rural indicators	Omitted
EPA-COI ^{2†}	Cost estimates derived from results in Lewit et al ¹³ (see study for details), and are therefore representative of US population in 1988	Birthweight (2 categories)	All infant medical costs through age 15 All infant medical costs through age 75	Infant race/ethnicity and sex; family income; mother's age and education; region and urban/rural indicators	Omitted

* To account for differences in how the St. John et al study treated nonsurviving infants, we combined the survivor/nonsurvivor cost estimates by taking the weighted mean across the 2 groups, with weights determined by their estimate of the proportion of survivors in each gestational age category (reported in their Table 2).

† The EPA Cost of Illness Handbook² imputes long-term incremental medical costs associated with low birthweight (LBW) (birthweight <2500 g) from estimates reported in Lewit et al¹³ and therefore does not represent an independent study in itself. Two particular imputations deserve mention. First, Lewit et al¹³ estimate incremental hospitalization costs (including medical fees associated with hospitalization) for LBW children through age 10 y. The EPA generated comparable estimates over years 11-75 of life assuming the incremental hospitalization costs associated with the age 6-10 y cohort reflect the incremental hospitalization costs of LBW in succeeding years. Second, incremental hospitalization-related costs systematically understate the total incremental medical costs of LBW by ignoring nonhospital medical care (eg, outpatient visits, pharmaceutical use, therapeutic services). The EPA addresses this bias using the inpatient/outpatient cost ratio for asthmatic children as an estimate for the inpatient/outpatient cost ratio of LBW children. Although these imputations are reasonable, they present additional uncertainty in the EPA-COI² estimates.

The 6 studies identified vary in a number of important respects. First, the studies vary in their categorization of outcomes (birthweight vs gestational age, number of categories). Second, the studies vary in the medical costs considered and their treatment of nonsurvivors. Third, the studies vary in the extent that cost estimates are adjusted for covariates. Fourth, the studies vary in terms of the time spans over which preterm costs were estimated. All cost estimates were converted to 2004 dollars by using the Consumer Price Index for medical care services.¹⁴ The Environmental Protection Agency's Cost of Illness Handbook (EPA-COI)² provides the only com-

prehensive estimate of long-term medical costs, with the remaining studies primarily focuses on hospital costs through discharge. For long-term costs estimated in the EPA-COI Handbook,² we use the results discounting future costs at a 3% annual rate.

Effectiveness of 17P for preventing preterm delivery

Drawing on 2 recently published meta-analyses,^{8,9} we identified 7 randomized control trials (RCTs) examining the effect of 17P on women at risk for preterm

delivery.^{7,15-20} A MEDLINE search using the terms "hydroxyprogesterone" and "preterm birth" failed to find any additional RTCs examining the effect of 17P treatment published since 1990.

Of the identified studies, we use the results of Meis et al⁷ to provide our estimate of treatment effectiveness. This decision reflects a number of considerations. First, the study by Meis et al⁷ was conducted recently, whereas the others were conducted before 1985. Second, the study by Meis et al⁷ used a sample 3 to 15 times larger than the others. Most importantly, the selection criteria used across the studies varied, with only Meis

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