Cost Savings From Avoidance of Early Elective Deliveries

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ABSTRACT

OBJECTIVES: The purpose of this study is to determine the annual potential cost savings to a health insurance company and its members by avoiding early elective deliveries (EEDs) performed between 37 and approximately 39 weeks of gestational age. Postterm deliveries are not included in the scope of the review.

STUDY DESIGN: A large national healthcare insurance company was audited with respect to the ratio of those currently pregnant to the total number of insured lives.

METHODS: This data was refined by estimating the number of singleton pregnancies that underwent an EED—defined in this analysis as an induced vaginal delivery or performance of an elective abdominal delivery, with or without failure of previous induction, between 37 and 38.6 weeks of gestation when there is no indication for performing said delivery. The data were analyzed to determine cost savings related to avoidance of EEDs over a 1-year period.

RESULTS: This analysis showed that elimination of this practice resulted in significant neonatal intensive care unit (NICU) savings by reducing the incidence of admission to the NICU; and for those admitted to the NICU, it reduced length of stay secondary to reduction in severity of disease.

CONCLUSIONS: The cost analysis demonstrates the savings rendered from avoidance of EEDs, as defined above. These savings, in turn, provide decreased premiums for healthcare consumers not only due to short-term savings, but also due to cost savings associated with the long-term healthcare sequalae experienced by those children born electively and unnecessarily due to issues associated with birth between 37 and 38.6 weeks of gestational age.

For the purpose of this discussion, the preterm delivery range is early-term delivery as defined by the American Congress of Obstetricians and Gynecologists (ACOG).[1] Preterm birth (PTB), or delivery before 37 weeks gestation and after 19 weeks and 6 days, is the primary cause of neonatal mortality and morbidity in the United States and elsewhere. In the developed world, PTB constitutes 12.7% of all births,[2] and this percentage has risen from 9% over the past 2 decades, with one-third of these deliveries occurring before 32 weeks of gestation. This incidence is higher in African American and Hispanic populations.

With respect to inductions of labor (IOL), the ACOG stated over 3 decades ago that caution against inductions before 39 weeks, in the absence of a medical indication, should be exercised. The ACOG has also noted that "a mature fetal lung maturity test result before 39 weeks gestation, in the absence of appropriate clinical circumstances, is not an indication for delivery."[3,4] Notwithstanding this warning, a changing distribution of births to a lower gestational age over a 16-year period (1990 to 2006) had occurred, and there was a sharp decline in deliveries occurring after 39 weeks with a concomitant sharp increase in births occurring before 39 weeks, particularly between 36 and 38 weeks gestation.[5]

A significant increase in both IOL and cesarean deliveries occurred between 1992 and 2002. The largest increase in IOL occurred in the early-term and full-term periods, and although the cesarean section rate increase is fairly constant and begins to narrow at around 34 to 35 weeks, a significant difference only disappeared after 39 weeks.[5] These increased rates of induction have been similar across all racial

groups, with the highest increase in non-Hispanic whites.[6]

Early elective delivery (EED), which occurs from 37 through 38.6 weeks, may be driven by choices made by the provider or the desire of the patient to end the pregnancy and, thus, undergo a delivery in the early-term period. A survey published in *Obstetrics and Gynecology* was conducted in 2009 by interviewing 650 insured women. This study elucidated the belief that 50% of women thought that reaching 37 to 38 weeks gestation was a full-term gestational age for a singleton pregnancy. Additionally, over 50% of these women also thought that it was safe to deliver between 34 and 36 weeks gestation.[7]

Providers may also have their own agenda for choosing an EED that includes physician convenience, guaranteed attendance at birth, the avoidance of scheduling conflicts and reduction in the frequency of being awakened at night, particularly if they have to address a surgical schedule the next morning. Also, after a delivery is performed, bad outcomes may be unrecognized by the obstetrician as the newborn is now under pediatric care. If bad outcomes were recognized, however, there may then be a belief that the neonatal intensive care unit (NICU) and neonatology handles these seemingly unavoidable issues appropriately, thus rendering them benign. Finally, all practitioners of obstetrics want to limit the risk of a bad pregnancy outcome and possible medical malpractice causes of action.

Neonatal complications that arise from EEDs include intraventricular hemorrhage, necrotizing enterocolitis, anemia, jaundice, respiratory distress syndrome, and bronchopulmonary dysplasia, in addition to other afflictions that persist throughout life, such as cognitive disorders and audiovisual deficiencies. These early deliveries are also associated with an increase in NICU admissions, transient tachypnea of the newborn, and increased ventilator support.[8] These problems can even affect newborns delivered between 38 weeks and 4 days through 38 weeks and 6 days.[9] Thus, there is a difference in newborn outcomes in deliveries during the 38th week as opposed to deliveries during week 39, and every attempt should be made to reach a gestational age of 39 weeks, given that no medical or obstetrical disease processes supersede this goal.

Research shows that the best newborn outcomes, with respect to the afflictions cited above, occur between 39 and 40.6 weeks.[8] This is related to the timing of fetal brain development, as cortex volume increases by 50% between 34 and 40 weeks gestation. Also, there is a 5-fold increase in myelinated white matter during this time period. In all, given that the cortex is the part of the fetal brain that matures last, the activities that the cortex controls are the last to achieve functionality.[10] A report out of Norway states that even the incidence of cerebral palsy is increased with an EED, as opposed to deliveries that occur in the interval designated as full-term deliveries.[11]

Finally, regarding the incidence of stillbirths in normal healthy pregnancies, statistical analysis favors continuing the pregnancy until at least 39 weeks. Three studies, totaling nearly 1.2 million mothers, saw no difference in the stillbirth rate after decreasing the rates of EEDs.[12] Additionally, a large population-based study has consistently shown that the risk of infant mortality is 90% higher when delivered at 37 weeks and 40% higher when delivered at 38 weeks compared with newborns delivered at full term. The increased neonatal death rate averaged 1.6 per 1000 when delivered electively during the 37th week and 0.5 per 1000 when electively delivered during the 38th week of gestation.[10]

Hence, any methodology that can be employed to decrease the incidence of an EED should be effectuated. The ACOG and March of Dimes whole-heartedly support efforts to decrease the incidence of EEDs and their associated short- and long-term sequalae. It should be noted that the avoidance of EEDs is confined to a population of low-risk, uncomplicated pregnant patients without medical or obstetrical issues that would require early delivery and they are not, by definition, an elective delivery. Substantial reduction of EEDs has nationwide support, including the ACOG, CMS, HHS, The Joint Commission, Leapfrog Group, National Quality Forum, and March of Dimes.[10]

It should also be noted that state Medicaid programs are exploring the option of not covering an EED if subsequent NICU admission occurs, and some have already incorporated this methodology.

METHODS

Researchers selected a large US health insurance provider and divided the company into its different lines of businesses in order to ascertain the number of lives totally insured and determine the number of members in this group that were pregnant with a single fetus. Next, the pregnant patients chosen for an EED were placed into a subset. The following original mathematical derivation illustrates the cost savings associated with avoidance of EEDs within this subset. The below methodology can be employed by anyone to calculate the potential cost savings if an EED is avoided for a given population.

RESULTS

Calculations resulted in a yearly savings of at least 0.2 cents (if n = 2) per member, per month, per hospital stay, which increases by the same amount daily in a linear fashion. On average, for all deliveries, the national NICU LOS is 12.69 days,[5] which would equate to a total yearly savings of $5,417,474 for the sample population. See the **eAppendix** (available at **www.ajmc.com**) for detailed calculations.

DISCUSSION

Researchers calculated the amount of savings available to healthcare insurers if providers of obstetrical services avoided performing EEDs. The calculations illustrate a considerable savings, which is rarely seen in the adoption of alternative methodologies in medicine. Avoidance of elective preterm deliveries results in significant financial savings that can benefit consumers by making healthcare more affordable. These savings can then be applied to future premiums, thus decreasing the cost to the consumer of healthcare insurance policies.

CONCLUSIONS

Disease management programs provide key education for pregnant women regarding the benefits of term delivery versus early elective induction. The partial impact of such programs on the practice of early EEDs has the potential to increase the utilization of best practices and eliminate adverse outcomes while making healthcare more affordable, thus benefitting all patients under the care of the US obstetrical community.

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eAppendix. Derivation of the Formula to Determine Cost Savings Associated With the Avoidance of Early Elective Deliveries

IF D is the total number of annual deliveries for a health plan with benefit coverage for all needs associated with pregnancy, labor, delivery and postpartum care including charges associated with admission to, and stays in, the NICU or a newborn nursery (NBN).

Next, define the following quantities:

p = 0.046 (March of Dimes, 2010)

m = 0.023 (Franzoi, Salvadori, Golds, & Zanardo, 2004)

D = 200,000 deliveries (Optum, 2014)

E = $ 3,500 (Optum, 2014)

E' = $ 1,127 (Optum, 2014)

F = $ 440 (Optum, 2014)

F' = $ 269 (Optum, 2014)

TI = total number of insured members in the health plan.

TYS = the total savings from the avoidance of an EED as defined above.

Therefore, the number of singleton pregnancies that are included in the categories defined above is D * (1 – m) and this number of pregnancies includes a population that contains a subset of EEDs according to the probability p above implying that the number of pregnancies in this given population that have a history of an EED is p * D * (1 – m). The cost per day saved by preventing these EEDs with subsequent admission and treatment in the NICU is, defining E and F as above, (E + F) * p * D * (1 – m).

As newborns not needing the NICU incur expenses associated with a stay in a NBN, total cost is found by multiplying the number of newborns delivered as term infants and subtracting this from the expense associated with EED deliveries. The typical LOS for these term newborns is 2 days after vaginal delivery without complications and 4 days if an abdominal delivery is performed without complications. (LOS is mandated by federal guidelines.) The estimate of the ratio of vaginal deliveries to C-section deliveries is 2/1 so that expenses associated with this subpopulation, with E' and F' as previously defined, is given by,

$$[0.33 * 4 + 0.67 * 2] * (E' + F') * p * D * (1 – m)$$

Given N as above, cost savings over one year is the difference between the cost of EEDs requiring NICU admission and the costs for those pregnancies not electively delivered, or

$$N * (E + F) - 2.66 * (E' + F')$$

And for the number of deliveries that occurred in one year, given that 0.13% of EEDs are admitted to the NICU,

$$TYS = p * D * (1 - m) * [N * (E + F) - 2.66 * (E'+F')] * (.013)$$

For PMPM (per member per month) savings, TYS is divided (12 * TI) yielding,

$$PMPM = p * D * (1- m) * [1/(12 * TI)] * [N * (E + F) - 2.66 * (E'+F')] * (0.013)$$

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