Contribution of Cost of Preterm Infants to the Total Cost of Infant Health Care in the United States

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Despite large expenditures on health care informatics across the United States, our ability to answer seemingly simple questions remains problematic. Administrative health databases contain limited clinical detail, databases remain poorly integrated, and barriers to access pose considerable challenges. The article by Grosse et al[1] in this issue of *Pediatrics* is a case in point. Their seemingly simple question was: "What does it cost employers or employer-sponsored health plans to provide health care for preterm infants born with or without major birth defects during the first year of life?" The complex set of assumptions the authors deemed necessary to support their methods reveals why this question poses so many challenges.

One challenge the authors faced was that of accurately identifying which live births were delivered preterm and which infants were diagnosed with major birth defects. Diagnoses, procedures, therapies, and duration of clinician interaction are typically revealed by health care claims records by using coding rubrics, including *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) (although billing claims in the United States now use the *International Classification of Diseases, 10th Revision, Clinical Modification* rubric, its precursor was in use at the time of their study), *Current Procedural Terminology* codes, and specialized rubrics for prescriptions and laboratory services. The ICD-9-CM has no specific code for identifying preterm delivery, therefore the authors created a strategy by using codes for short gestation and low birth weight, noting that their approach likely has strong positive predictive value but lesser sensitivity. It is impossible to know for certain what proportion of infants born preterm in their study sample were not so identified, limiting the generalizability of their results. Although the authors report the prevalence of preterm birth as 7.7% by using ICD-9-CM codes only, and 9.8% with an additional diagnosis-related group (DRG) code, this almost surely underestimates the true prevalence in the study sample. As the authors note, it is likely that most preterm infants not so identified probably were late preterm (35–36 weeks' gestation). Although this is a concern, given the size of the sample and the meticulous care the authors took in analyzing their data under several scenarios, the health plan expenditure estimates do provide useful information.

One solution to this problem would be linkage of the Truven MarketScan database with birth certificates. Birth certificates contain information on the clinical estimate of gestational age as well as the maternal date of last menses and the date of birth. In recent years, researchers and vital statisticians have shifted to using the clinical estimate, which has been demonstrated to be a more accurate and reliable measure for gestational age assessment.[2] The prevalence of preterm birth in which a clinical estimate of gestational age is used is typically lower than that based on date of last menses, but somewhat higher than the rates identified in Grosse et al.[1]

Additionally, identifying infants with major birth defects solely from health care claims records probably misses

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some cases. Active ascertainment through direct review of clinical records is the gold standard for case finding in birth defects registries; methods based solely on administrative health records typically miss some cases and lack detailed information necessary for classification by subtypes.[3] But how important is that for the plan expenditure estimates provided in this study? In their approach, Grosse et al[1] likely miss few preterm infants who underwent surgical procedures related to major birth defects. Those missed are much more likely to have been diagnosed in outpatient settings or to have had an ICD-9-CM code in the 740.00 to 759.99 rubric only once rather than twice as required by the study methodology. Based on the data provided in Table 3,[1] the prevalence of major birth defects among preterm infants was 5.9%, compared with 2.0% in term infants, for an overall prevalence of 2.3%. The increased prevalence of major birth defects in preterm infants is well documented.[4] However, the total prevalence of major birth defects among live-born infants in human populations is thought to be in the range of 3% to 5%.

A strength of the study methodology lies in its use of claims records, which document the actual charges and payments made for each health service provided. Researchers for similar studies relying on hospital discharge data must make adjustments to hospital charges and provider fees to estimate actual costs.[5,6] This is counterbalanced by the weakness that the characteristics of the study population are not well documented and may not be truly representative of all live births occurring in the United States during 2013 and 2014. The health plans included likely underrepresent infants for whom antepartum and intrapartum paid by Medicaid or other government-sponsored health plans and may not include detailed information for patients whose care was billed globally rather than by health care encounter. However, this is not strictly speaking a weakness, given that the authors' goal in this study was to estimate costs of care in premature infants from the perspective of employers or employer-sponsored health plans. Although these limitations should be considered, the authors have carefully weighted their implications in extrapolating to national estimates by using their results. Additional studies are necessary, in which researchers should examine costs among Medicaid recipients, other government-sponsored health plans, and for self-pay patients.

This study has several implications. First, it reminds us that prematurity results in dramatically increased health expenditures, and prevention strategies can lead to significant cost savings. But it also reveals that infants born with birth defects generate considerably greater health plan expenditures, especially those born preterm. Prematurity prevention strategies must include a focus on primary prevention of birth defects where interventions are available.

Second, current administrative health informatics are inadequate for addressing many important clinical and policy questions in perinatal care. Where possible, consortiums of states should work to create all-payer claims databases, enhancing the data elements to include specific fields for clinical entities that are not adequately captured by using *International Classification of Diseases, 10th Revision, Clinical Modification*, *Current Procedural Terminology*, or other coding rubrics. These data should be linked, at least across state residents in each state, to administrative public health databases including hospital discharge, outpatient surgery, and emergency departments as well as vital records, and made accessible within privacy and confidentiality guidelines to qualified researchers and public health staff to support studies that are aimed at improving population health. This would support population-based estimates of the costs of preterm birth, the consequences of antepartum and intrapartum clinical management decisions on overall costs of care, and the contribution of costs of care for infants with birth defects on overall expenses for the health care of infants born preterm.

ABBREVIATION

ICD-9-CM: International Classification of Diseases, Ninth Revision, Clinical Modification

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