

OBSTETRICS

Patterns of obstetric infection rates in a large sample of US hospitals

Sarah L. Goff, MD; Penelope S. Pekow, PhD; Jill Avrunin, MS; Tara Lagu, MD, MPH; Glenn Markenson, MD; Peter K. Lindenauer, MD, MSc

OBJECTIVE: Maternal infection is a common complication of childbirth, yet little is known about the extent to which infection rates vary among hospitals. We estimated hospital-level risk-adjusted maternal infection rates (RAIR) in a large sample of US hospitals and explored associations between RAIR and select hospital features.

STUDY DESIGN: This retrospective cohort study included hospitals in the Perspective database with >100 deliveries over 2 years. Using a composite measure of infection, we estimated and compared RAIR across hospitals using hierarchical generalized linear models. We then estimated the amount of variation in RAIR attributable to hospital features.

RESULTS: Of the 1,001,189 deliveries at 355 hospitals, 4.1% were complicated by infection. Patients aged 15–19 years were 50% more likely to experience infection than those aged 25–29 years. Rupture of membranes

>24 hours (odds ratio [OR], 3.0; 95% confidence interval [CI], 3.24–3.5), unengaged fetal head (OR, 3.11; 95% CI, 2.97–3.27), and blood loss anemia (OR, 2.42; 95% CI, 2.34–2.49) had the highest OR among comorbidities commonly found in patients with infection. RAIR ranged from 1.0–14.4% (median, 4.0%; interquartile range, 2.8–5.7%). Hospital features such as geographic region, teaching status, urban setting, and higher number of obstetric beds were associated with higher infection rates, accounting for 14.8% of the variation observed.

CONCLUSION: Obstetric RAIR vary among hospitals, suggesting an opportunity to improve obstetric quality of care. Hospital features such as region, number of obstetric beds, and teaching status account for only a small portion of the observed variation in infection rates.

Key words: hospital characteristics, maternal infection rates, variation

Cite this article as: Goff SL, Pekow PS, Avrunin J, et al. Patterns of obstetric infection rates in a large sample of US hospitals. *Am J Obstet Gynecol* 2013;208:456.e1-13.

Childbirth is the most common reason for hospital admission in the United States, with >4,000,000 admissions for labor and delivery occurring annually.¹ Although most births are

★ EDITORS' CHOICE ★

uncomplicated, a small but significant number of women experience complications such as infection, trauma, and

hemorrhage during childbirth.^{2–4} Reducing obstetric complications has emerged as a national priority in the US, as reflected in goals established by Healthy People 2020⁴ and the Centers for Medicare and Medicaid Services' Partnership for Patients.⁵

Maternal infection is one of the most common perinatal complications, affecting nearly 6% of deliveries,² and many of these infections may be preventable. Several small studies and reviews have described clinical practices that can increase the risk of infection, primarily related to cesarean deliveries.^{6–10} Some larger epidemiologic studies have estimated overall regional and national obstetric infection rates^{2,3,11} and still others have explored the associations between complications and factors such as an obstetrician's residency training site.¹² However, little is known about the extent to which obstetric infection rates vary across hospitals or what impact structural and organizational features of a hospital may have on these rates.

To support the national goal of improving maternal outcomes following childbirth, we used hierarchical generalized linear model-

From the Department of Medicine (Drs Goff, Lagu, and Lindenauer), the Center for Quality of Care Research (Drs Goff, Pekow, Lagu, and Lindenauer and Ms Avrunin), and the Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology (Dr Markenson), Baystate Medical Center, Springfield, and Tufts University School of Medicine, Boston, and the Clinical and Translational Science Institute at Tufts University School of Medicine (Drs Goff and Lindenauer), Boston, MA.

Received Sep. 18, 2012; revised Jan. 27, 2013; accepted Feb. 3, 2013.

The project described was supported by grant number KL2 RR025751 from the National Center for Research Resources and grant number KL2 TR000074 from the National Center for Advancing Translational Sciences, National Institutes of Health (S.L.G.).

The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

The authors report no conflict of interest.

Presented in poster format at the annual meeting of the Tufts Clinical and Translational Science Institute, Washington, DC, April 18–20, 2012.

Reprints: Sarah L. Goff, MD, Baystate Medical Center, Pediatrics, 3300 Main St., Suite 1D, Springfield, MA 01199. Sarah.Goffmd@baystatehealth.org.

0002-9378/free • © 2013 Mosby, Inc. All rights reserved. • <http://dx.doi.org/10.1016/j.ajog.2013.02.001>



For Editors' Commentary, see Contents



See related editorial, page 427

TABLE 1

Frequency of maternal infections by category of infection

Infection	n (%)
Any infection below	40,605 (4.1)
Puerperal infection	20,519 (2.1)
Maternal pyrexia	16,067 (1.6)
Surgical site infection	3523 (0.4)
Infection of genitourinary tract	1964 (0.2)
Sepsis	1319 (0.1)
Other maternal infection	1456 (0.2)

Goff. Patterns of obstetric infection rates. *Am J Obstet Gynecol* 2013.

ing to estimate risk-adjusted maternal infection rates (RAIR) in a large sample of US hospitals. We then examined whether hospital features, such as the number of hospital beds, teaching status, geographic region, volume of deliveries, and level of implementation of electronic health records (EHR), were associated with higher rates of infection.

MATERIALS AND METHODS

Study sample and data source

We conducted a cross-sectional study using Perspective, a voluntary, fee-supported database developed by Premier Inc (Charlotte, NC) that enables participating hospitals to analyze care quality and costs at their institution and to compare their performance to other institutions within the database. The database is comprised of a structurally and geographically diverse set of approximately 450 US hospitals that together account for approximately 20% of all annual hospital admissions in the United States. In addition to information derived from standard hospital discharge files (ie, Uniform Billing form-04) Perspective contains a date-stamped log of all items (eg, medications, laboratory, diagnostic tests) and therapeutic services billed to the patient or their insurer.

Women were included in the study if they were discharged from Jan. 1, 2008, through Dec. 31, 2009, and had an *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) principal or secondary diagnosis or procedure code for a vaginal delivery

(650, 640.0x-676.9x [$x = 1$ or 2], or 73.59) or cesarean delivery (763.4, 669.71, 74.x [$x = 0-2, 4$], or 74.99). We excluded discharges for ectopic and molar pregnancies and for pregnancies ending in spontaneous or elective abortion because we were interested in exploring intrapartum/peripartum infections. We also excluded patients who were transferred from or to another institution, because we did not have information about the clinical course or treatments prior to admission or subsequent outcomes, and women age <15 or >44 years because 15-44 years is a common age range for childbearing. In addition we excluded hospitals that recorded <100 deliveries over the 2-year study period to provide stable estimates of infection rates, and because these institutions do not routinely provide obstetric care. Permission to conduct the study was obtained from the institutional review board at Baystate Medical Center in Springfield, MA.

Obstetric infection

A delivery was considered complicated by infection if the patient received ≥ 1 diagnoses consistent with infection using a broad set of ICD-9-CM codes that have been used in earlier studies of infections associated with childbirth^{2,12} (Appendix; Supplementary Table 1). We excluded ICD-9-CM infection codes with a fifth digit of 3, which indicates an antepartum condition, because we were most interested in risk-adjusted infection rates occurring in the intrapartum/peripartum period as well as the association between these risk-adjusted infection rates and hospital features. We organized infection codes into groups of related diagnoses for descriptive purposes (Table 1). Each infection code was counted toward the overall frequency of each type of infection. When calculating hospital-level infection rates, a patient was considered to either have experienced or not experienced an infectious complication regardless of the number of infection codes associated with a single delivery.

Patient characteristics

We recorded patient demographics (age, gender, race/ethnicity, marital status, and insurance status) and conditions that might confer elevated risk for obstetric infection. We used 2 complementary meth-

ods to identify maternal comorbidities and pregnancy-specific conditions that could influence a patient's risk of infection. The presence of any of 29 comorbidities was computed using Elixhauser Comorbidity Software, version 3.1, developed by the Agency for Healthcare Research and Quality.¹³ In addition, we identified the presence of a set of pregnancy-specific conditions that may confer higher risk for infection.¹⁴ These conditions were originally developed to predict risk for cesarean delivery, but have also been used for risk adjustment for infection rates in obstetric patients.¹² For conditions that appeared in both sets, such as hypertension and substance abuse, we created combined indicators for patients identified by either method. Gestational diabetes and diabetes existing prior to pregnancy were assessed separately because they confer different risk for infection.¹⁵ A total of 41 maternal comorbidities and pregnancy-specific conditions were evaluated for inclusion in risk-adjustment modeling (Table 2).

Structural and organizational hospital features

Using data from the American Hospital Association (AHA) annual survey and Premier Inc, we noted each hospital's geographic location, number of hospital beds, number of obstetric beds, number of deliveries in the 2-year period, whether the hospital was located in an urban or rural setting, teaching status, and whether a hospital reported full implementation of EHR. Four questions on the AHA Annual Survey (2008)¹⁶ were used to define a hospital's level of implementation. The questions encompassed EHR use related to patient-level health information, results management, order entry management, and decision support. A hospital was categorized as having a fully implemented EHR if all 4 domains were reported as "fully implemented."

Statistical analysis

We evaluated the association of patient demographics, maternal comorbidities, pregnancy-related conditions, and structural and organizational hospital features with the presence of "any infection" using χ^2 statistics. We used this

Download English Version:

<https://daneshyari.com/en/article/6146193>

Download Persian Version:

<https://daneshyari.com/article/6146193>

[Daneshyari.com](https://daneshyari.com)