Hospitalizations for Pelvic Inflammatory Disease in Texas

A Population-Based Analysis

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OBJECTIVE: To calculate pelvic inflammatory disease (PID) hospitalization rates for Texas and identify risk factors for prolonged length of stay (PLOS) among women hospitalized for PID throughout Texas and discharged during a 2-year period.

STUDY DESIGN: A cross-sectional study of 6,421 women discharged from Texas hospitals in 2004 and 2005 with a diagnosis of PID was conducted. Data for 2004 and 2005 were obtained from the Texas Department of State Health Services. Diagnoses had been coded using the ICD-9-CM. Odds ratios for PLOS adjusted for age, insurance status, race, diabetes, hypertension, and receipt of oophorectomy during hospitalization were calculated.

RESULTS: Blacks experienced the highest unadjusted hospitalization and were more likely than whites to have PLOS. Presence of diabetes was the strongest risk factor for PLOS. Undergoing an oophorectomy during the hospital stay was not significantly correlated with PLOS.

CONCLUSION: This unique statewide study found that among a large group of women hospitalized for PID, blacks were significantly more likely than whites to have PLOS. The presence of diabetes was the strongest factor associated with a PLOS. (J Reprod Med 2010;55:367–372)

Keywords: diabetes, pelvic inflammatory disease, race.

Pelvic inflammatory disease (PID) is a spectrum of infections of the female upper genital tract not associated with pregnancy or intraperitoneal operations. Sequelae that can result from this condition include infertility, ectopic pregnancy, chronic pelvic pain, and recurrent PID. PID is the most common gynecologic reason for emergency department visits and hospitalization in the United States. Between 1975 and 1981, PID represented 350,000 hospital admissions and 150,000 surgical procedures per year in the United States.

Hospitalizations for PID and its consequences represent a substantial economic burden. In 1990, PID and its sequelae cost an estimated 4.2 billion dollars.

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dollars, with ~2.7 billion dollars for direct expendi-
tures for medical services, and 1.5 billion dollars for
indirect costs such as lost wages and impact on
household management. In 1998, direct medical
expenditures for PID and its sequelae were estimat-
ed at 1.88 billion dollars.

A prolonged length of stay (PLOS) in the hospital
is associated with increased use of health care re-
sources and higher costs. The objectives of this
population-based, cross-sectional study were to cal-
culate PID hospitalization rates for Texas and iden-
tify risk factors for PLOS among women hospital-
ized for PID throughout Texas and discharged in
2004 or 2005. Determining which factors are associ-
ated with a prolonged hospital stay may provide
important information on improving delivery of
health care and reducing costs, as well as an im-
proved understanding of the continuing evolution
of the epidemiology of this disease.

**Materials and Methods**

**Source Population and Inclusion Criteria**

Retrospective analyses were performed using hos-
pital inpatient discharge data that were obtained
from the Texas Department of State Health Services
(Austin, Texas). Both public use and research data
were used in this study. These data were purchased
by the Department of Obstetrics and Gynecology at
the Paul L. Foster School of Medicine. The dataset
contains clinical and demographic information for
millions of patients who were discharged in calen-
dar years 2004 and 2005. A unique patient identifi-
er was available that allowed the identification of
patients who had repeated admissions.

The principal diagnosis and up to 24 secondary
diagnoses were evaluated in our study. These vari-
ables were coded using the *International Classifica-
tion of Diseases, Ninth Revision, Clinical Modification*
(ICD-9-CM). During the study period the majority
of the reporting hospitals could record only seven
or fewer procedures (a principal procedure field
plus six secondary procedures) that the patient un-
derwent during that hospital stay. However, we
searched the principal procedure field and all of the
24 secondary procedure fields. Procedures were
coded using ICD-9-CM.

Records were included if any of the following
ICD-9-CM codes for PID were found in the princi-
pal discharge diagnosis field: 614.0, 614.1, 614.2,
614.3, 614.4, 614.5, 614.6, 614.7, 614.8, 614.9, 615.0,
615.1, or 615.9. The records of women who were
hospitalized once during the study period (2004–
2005) for PID were included. If a woman was dis-
charged twice during the study period with a prin-
cipal discharge diagnosis of PID, only the first
record was retained. The records of patients who
were not residents of Texas at the time of discharge
were excluded.

**Statistical Analysis**

The following age categories, in years, were creat-
ed: 10–19, 20–29, 30–39, 40–49, and ≥ 50. Age-group
specific hospital discharge rates for Texas residents
were calculated by dividing the appropriate num-
ber of cases that were discharged in 2004 and 2005
by the stratum-specific female Texas population es-
timates for the years 2004 and 2005 combined.

Population estimates were obtained from the
Texas Department of State Health Service’s website
(http://soupfin.tdh.state.tx.us/) for the following
race and ethnic groups: white, black, Hispanic, and
other. Hospitalization rates by these race-ethnic
groups were calculated. A more detailed classifica-
tion of race and ethnicity was possible during our
regression analyses as described later. To clarify,
the health department’s classification treats race
e.g., white) and Hispanic ethnicity as mutually ex-
clusive, whereas the hospital discharge data allow
the researcher to identify subgroups within the His-
panic ethnicity (e.g., white Hispanics, black His-
panics, Asian Hispanics, etc.).

PLOS was defined as a length of stay (recorded in
days) > 75th percentile in our sample. The 75th per-
centile was 4 days, and therefore PLOS was a stay of
≥ 5 days. Dichotomizing length of stay (LOS) using
the 75th percentile has been used in previous clin-
eal epidemiology analyses.

Data were primarily analyzed using The SAS
System for Windows 9.1.3 (The SAS Institute, Inc.,

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Given the profound economic
and societal burden that PID
presents, reduction of LOS after
hospital admission could result in
a substantial improvement in
resource consumption, as well as
reduce the cost of health care
delivery.
Cary, North Carolina). Logistic regression was performed to determine if there was a relationship between the following exposures and the outcome of PLOS: maternal age (for every 5-year increase), race-ethnicity (white non-Hispanic, white Hispanic, black non-Hispanic, Asian, and other), insurance payer status, receipt of oophorectomy during the hospitalization, diabetes, and hypertensive disease. The insurance variable was a 23-level variable that was converted to a 3-level variable: Uninsured, Medicaid, or Other (which included Medicare and Blue Cross/Blue Shield). The Uninsured category was created by combining the response “self-pay” with the response “charity, indigent or unknown.” Oophorectomy was defined as ICD-9-CM procedure codes 65.3, 65.31, 65.39, 65.5, 65.51, 65.52, 65.53, 65.54, 65.4, 65.41, 65.49, 65.6, 65.61, 65.62, 65.63, and 65.64. Diabetes was defined as an ICD-9-CM code of 250 in any of the secondary diagnosis fields. Hypertensive disease was defined as codes 401.0 through 405.99.

Unadjusted and adjusted prevalence odds ratios (ORs) for the outcome are reported along with the 95% CI. An OR was considered to be statistically significant if the 95% CI for the population OR excluded the null value of 1.

Finally, the overall median total charges were calculated and the strength of the linear relationship between LOS and total charges in dollars was assessed by calculating a Pearson correlation coefficient. The null hypothesis was that the population correlation coefficient was 0.

A total of 6,421 records were available for analysis. The appropriate institutional review boards of the Texas Tech University Health Sciences Center, El Paso, Texas, and the Texas Department of State Health Services approved this protocol.

Results

The PID hospitalization rates per 10,000 female

### Table I Hospitalization Rates for Pelvic Inflammatory Disease by Age Group, Texas, 2004–2005

<table>
<thead>
<tr>
<th>Age group (yr)</th>
<th>No. of cases</th>
<th>Hospitalization rate per 10,000 female population</th>
</tr>
</thead>
<tbody>
<tr>
<td>10–19</td>
<td>831</td>
<td>2.5</td>
</tr>
<tr>
<td>20–29</td>
<td>1,752</td>
<td>5.3</td>
</tr>
<tr>
<td>30–39</td>
<td>1,748</td>
<td>5.3</td>
</tr>
<tr>
<td>40–49</td>
<td>1,469</td>
<td>4.4</td>
</tr>
<tr>
<td>≥50</td>
<td>621</td>
<td>1.0</td>
</tr>
</tbody>
</table>

### Table II Hospitalization Rates for Pelvic Inflammatory Disease by Race/Ethnicity, Texas, 2004–2005

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>No. of cases</th>
<th>Hospitalization rate per 10,000 female population</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>3,402</td>
<td>3.4</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1,095</td>
<td>1.8</td>
</tr>
<tr>
<td>Black</td>
<td>1,528</td>
<td>6.8</td>
</tr>
<tr>
<td>Other</td>
<td>396</td>
<td>5.2</td>
</tr>
</tbody>
</table>

### Table III Demographic and Clinical Characteristics of 6,421 Women Hospitalized in Texas for Pelvic Inflammatory Disease and Discharged in 2004 or 2005

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic</td>
<td></td>
</tr>
<tr>
<td>Age group (yr)</td>
<td></td>
</tr>
<tr>
<td>10–19</td>
<td>831 (12.9)</td>
</tr>
<tr>
<td>20–29</td>
<td>1,752 (27.3)</td>
</tr>
<tr>
<td>30–39</td>
<td>1,748 (27.2)</td>
</tr>
<tr>
<td>40–49</td>
<td>1,469 (22.9)</td>
</tr>
<tr>
<td>≥50</td>
<td>621 (9.7)</td>
</tr>
<tr>
<td>Race-ethnicity</td>
<td></td>
</tr>
<tr>
<td>Black non-Hispanic</td>
<td>1,525 (23.8)</td>
</tr>
<tr>
<td>Other</td>
<td>1,494 (23.3)</td>
</tr>
<tr>
<td>White Hispanic</td>
<td>554 (8.6)</td>
</tr>
<tr>
<td>White non-Hispanic</td>
<td>2,848 (44.4)</td>
</tr>
<tr>
<td>Health insurance</td>
<td></td>
</tr>
<tr>
<td>Self-pay, charity, indigent, or unknown</td>
<td>1,507 (23.5)</td>
</tr>
<tr>
<td>Medicaid</td>
<td>1,022 (15.9)</td>
</tr>
<tr>
<td>Other (includes Medicare and commercial)</td>
<td>3,892 (60.6)</td>
</tr>
<tr>
<td>Clinical</td>
<td></td>
</tr>
<tr>
<td>Diabetic</td>
<td>339 (5.3)</td>
</tr>
<tr>
<td>Hypertensive disease</td>
<td>653 (10.2)</td>
</tr>
<tr>
<td>Oophorectomy performed during hospital stay</td>
<td>1,777 (27.7)</td>
</tr>
<tr>
<td>Outcome</td>
<td></td>
</tr>
<tr>
<td>Prolonged length of stay (stay ≥ 5 d)</td>
<td>1,275 (19.9)</td>
</tr>
</tbody>
</table>

*Median age (minimum, maximum): 33 years (10 years, 95 years).
not have health insurance. Approximately 28% of the overall sample underwent a unilateral or bilateral oophorectomy during their hospital stay (Table III).

Adjusted ORs for the outcome of PLOS in 6,421 women who were hospitalized for PID are found in Table IV. Each of the ORs in Table IV is adjusted for the remaining variables found in the table. Black non-Hispanics were 63% more likely than white non-Hispanics to have a PLOS (adjusted OR = 1.63, 95% CI 1.38–1.91, p < 0.0001). Similarly, uninsured (adjusted OR 1.78, 95% CI 1.52–2.08, p < 0.0001) and Medicaid (adjusted OR 1.53, 95% CI 1.27–1.86, p < 0.0001) status was a significant risk factor for the outcome. Diabetic women had twice the odds of having PLOS compared to nondiabetics (adjusted OR = 2.13, 95% CI 1.67–2.73, p < 0.0001). Women who underwent an oophorectomy during their hospitalization appeared to have reduced odds for having PLOS (adjusted OR = 0.90, 95% CI 0.77–1.04); however, the result was not statistically significant (p = 0.14).

The financial burden of PID in this cohort of women was examined using the variable total charges in dollars. Total charges ranged from $0 to $1,003,372.99, with a median of $13,221. A strong linear association was detected between LOS and total charges in dollars: r = 0.79 (p < 0.0001).

**Discussion**

PID and its sequelae are conditions of clinical and economic significance. 3-7 The elucidation of the clinical epidemiology of PID may reveal opportunities to reduce morbidity and its associated financial costs in these women. One of the objectives of this population-based, cross-sectional study was the identification of risk factors for PLOS among women hospitalized for PID in Texas. LOS is a recognized measure of disease severity when evaluating pregnancy-related morbidity, and it may be argued that the same is true for gynecologic patients.15

The demographic characteristics in this study are similar to those published by Paik et al.16 They described the demographic characteristics of patients admitted to hospitals in California for PID or tuboovarian abscess between 1991 and 2001. They also found that the highest hospitalization rates were in the 20–39-year age category and in blacks.16

Diabetes was the strongest correlate of PLOS in our investigation. This finding is not surprising given the morbidity associated with diabetes. We previously reported that diabetics had an increased risk of PLOS among women hospitalized for preeclampsia.12 Medicaid beneficiaries and the uninsured in the current study also had higher odds of having PLOS. The increased LOS associated with Medicaid and uninsured patients has been reported previously.17,18 In our investigation of hospitalizations for nontraumatic disorders of the eye and ocular adnexa we found an adjusted OR for the outcome of PLOS of 1.93 for Medicaid enrollees (95% CI 0.95–3.95).19

We examined the effect of surgical management (oophorectomy) on PLOS and found a nonsignificant adjusted OR of 0.90 (95% CI, 0.77–1.04, p = 0.14). In our study a statistically significant OR that was <1 indicated a protective factor, that is, a characteristic that was associated with a reduction in the odds of having PLOS. This indication of a possible 10% reduction in the odds of PLOS associated with the receipt of oophorectomy (after controlling for selected comorbidities and other factors) is clinically plausible: removing the source of inflammation/infection would lead to reduced morbidity and hence a shorter LOS.

Our multivariate analysis revealed that blacks

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**Table IV** Adjusted ORs for a Prolonged Length of Stay* in 6,421 Women Hospitalized for Pelvic Inflammatory Disease in Texas and Discharged in 2004 or 2005

<table>
<thead>
<tr>
<th>Potential risk factor</th>
<th>Adjustedb OR</th>
<th>95% CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (for each 5-yr increase)</td>
<td>1.22</td>
<td>1.19–1.25</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Race-ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black non-Hispanic</td>
<td>1.63</td>
<td>1.38–1.91</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Other</td>
<td>1.06</td>
<td>0.90–1.26</td>
<td>0.50</td>
</tr>
<tr>
<td>White Hispanic</td>
<td>0.98</td>
<td>0.77–1.25</td>
<td>0.89</td>
</tr>
<tr>
<td>White non-Hispanic</td>
<td>1 (Referent)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Health insurance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uninsured (self-pay, charity, indigent, or unknown)</td>
<td>1.78</td>
<td>1.52–2.08</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Medicaid</td>
<td>1.53</td>
<td>1.27–1.86</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Other (includes Medicare and commercial)</td>
<td>1 (Referent)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Diabetes (present vs. absent)</td>
<td>2.13</td>
<td>1.67–2.73</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Hypertensive disease (present vs. absent)</td>
<td>1.14</td>
<td>0.92–1.39</td>
<td>0.23</td>
</tr>
<tr>
<td>Oophorectomy during stay? (Yes vs. No)</td>
<td>0.90</td>
<td>0.77–1.04</td>
<td>0.14</td>
</tr>
</tbody>
</table>

*Defined as a length of stay of 5 or more days.

bEach OR is adjusted for each of the remaining variables in the table.
were 63% more likely than whites to have had a PLOS even after controlling for health insurance status, surgical management (receipt of oophorectomy), age, diabetes, and hypertension (adjusted OR = 1.63, 95% CI 1.38–1.91, p < 0.0001). Post-hoc calculations indicated that oophorectomy was an effect modifier of the association between race and the outcome PLOS. In other words, we detected an interaction between race and oophorectomy. Among the women who did not undergo an oophorectomy (n = 4,644), blacks experienced a small increase in the odds of PLOS compared to whites (adjusted OR = 3.19, 95% CI 2.35–4.32, p < 0.0001). A potential clinical explanation for this finding is the possibility that blacks are less likely to consent to this procedure because of differing cultural attitudes toward oophorectomy.16,20 Thus they consent to the procedure later, and at a more advanced stage of disease, than whites. Another possibility is that these patients are offered the surgical intervention at a later stage of disease. Evidence in the cardiac literature indicates that blacks tend to be offered operative interventions at a lower rate compared to whites.21–24

The potential explanations for the PLOS in blacks and uninsured patients are most likely multiple and complex. These populations are known to have decreased access to health care.25–28 Whereas patients with good primary care would present to their physician and be treated early, these populations are more likely to delay care and present at a more severe stage of diseases.29–31 The literature also reveals a large disparity in health care quality and delivery in these groups compared to insured individuals and whites.32–34 This raises the possibility that the PLOS encountered in the uninsured and in blacks is the product of a different standard of care or efficiency of health care delivery.

Strengths of our statewide epidemiologic study include its large sample size and novel source of patient records. A PubMed search did not reveal any similar studies of PID conducted using Texas hospital data. A limitation of our analysis is the unknown sensitivity and specificity of the ICD-9-CM coding of PID in this Texas inpatient dataset.

Given the profound economic and societal burden that PID presents, reduction of LOS after hospital admission could result in a substantial improvement in resource consumption, as well as reduce the cost of health care delivery. In our study the combined LOS for the 6,421 patients was 22,896 days, with the total charges for our patients being $112,109,971. This represents a daily cost of $4,896.49. A prospective study design is required to delve further into why black PID patients and the uninsured are at higher odds for having a PLOS after accounting for multiple clinical and demographic variables. Further investigations into the possible protective effect of operative intervention (i.e., oophorectomy) are warranted because this may be a possible way to reduce hospital stay.

References

13. BuSaba NY, Schaumberg DA: Predictors of prolonged length
of stay after major elective head and neck surgery. Laryngoscope 2007;117:1756–1763