

# Utilization and Outcomes of Inpatient Urological Care at Safety Net Hospitals

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## Abbreviations and Acronyms

ACA = Patient Protection and Affordable Care Act

AHA = American Hospital Association

LOS = length of stay

NIS = Nationwide Inpatient Sample

SNH = safety net hospital

TURBT = transurethral resection of bladder tumor

TURP = transurethral resection of prostate

**Purpose:** Because proposed funding cuts in the Patient Protection and Affordable Care Act may impact care for urological patients at safety net hospitals, we examined the use, outcomes and costs of inpatient urological surgery at safety net vs nonsafety net facilities prior to health care reform.

**Materials and Methods:** Using the Nationwide Inpatient Sample we performed a retrospective cohort study of patients who underwent inpatient urological surgeries from 2007 through 2011. We defined the safety net burden of each hospital based on the proportion of Medicaid and self-pay discharges. We examined the distribution of urological procedures performed and compared in-hospital mortality, prolonged length of stay and costs in the highest quartile of burden (safety net) vs the lowest quartile (nonsafety net).

**Results:** The distribution of urological procedures differed by safety net status with less benign prostate surgery (9.1% safety net vs 11.4% nonsafety net) and major cancer surgery (26.9% vs 34.3%), and more reconstructive surgery (8.1% vs 5.5%) at safety net facilities ( $p < 0.001$ ). Higher mortality at safety net hospitals was seen for nephrectomy (OR 1.68, 95% CI 1.15–2.45) and transurethral resection of the prostate (OR 2.17, 95% CI 1.22–3.87). Patients in safety net hospitals demonstrated greater prolonged length of stay after endoscopic stone surgery (OR 1.20, 95% CI 1.01–1.41). Costs were similar across procedures except for radical prostatectomy and cystectomy. For these procedures the average admission was more expensive at nonsafety net facilities (prostatectomy \$11,457 vs \$9,610 and cystectomy \$27,875 vs \$24,048, each  $p < 0.02$ ).

**Conclusions:** Reductions in funding to safety net hospitals with health care reform could adversely impact access to care for patients with a broad range of urological conditions, potentially exacerbating existing disparities for vulnerable populations served by these facilities.

**Key Words:** urologic surgical procedures, hospitals, healthcare disparities, outcome assessment (health care), Patient Protection and Affordable Care Act

As SNHs provide care for vulnerable populations regardless of the ability to pay, these hospitals represent an important source of urological care for many patients. Despite its emphasis on expanding coverage several provisions in the ACA<sup>1</sup> coupled with subsequent legislative rulings may paradoxically threaten current levels of funding for

safety net facilities. Included among the potential funding cuts are reductions in disproportionate share payments<sup>2</sup> and changes in reimbursement as a consequence of Medicaid expansion. The growing focus on value and quality based payment incentives will likely further threaten the funding of safety net hospitals since these

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facilities are more likely to receive penalties related to meaningful use requirements and have excess readmissions.<sup>3,4</sup>

Many worry that such funding cuts will compromise care and outcomes for vulnerable patients treated in SNHs, including those with a wide range of urological conditions. However, while certain aspects of specialty care in safety net facilities have been studied, little is known about the use and outcomes of urological care in SNHs and how it compares to that provided in nonsafety net facilities.<sup>5,6</sup> An awareness of such differences is important to anticipating and perhaps even mitigating the impact of ACA directed funding changes for these already resource-poor facilities.

In this context we compared the use, outcomes and costs of common inpatient urological procedures for patients treated at safety net vs nonsafety net facilities prior to implementation of the ACA.

## MATERIALS AND METHODS

### Data Sources

We used data from the NIS for 2007 through 2011 to perform this analysis. The NIS provides data from a 20% sample of inpatient discharges from hospitals in 46 states.<sup>7</sup> This data set includes patient demographic information, primary payer, LOS, admission type, hospital charges and diagnosis and procedure codes (which also allow identification of comorbidities) defined by the ICD-9 and CCS (Clinical Classification Software).<sup>8</sup> When possible, we linked the NIS data with the AHA Annual Survey<sup>9</sup> from 2011 to obtain additional information on hospital characteristics. Hospital information is obtained nationally through this survey. However, privacy laws prevent linkage between the NIS and the AHA in 18 states.

### Identification

**Safety Net Hospitals.** Consistent with previously described methods<sup>10,11</sup> we used data from the NIS to determine the "safety net burden" (ie the proportion of discharges with a payer status of Medicaid or self-pay) for each hospital. Self-pay claims represent approximately 5% of all discharges. Consistent with the published literature, we include these cases in the calculation of safety net burden because self-pay patients are frequently uninsured and from lower income households. Next we divided hospitals into quartiles based on this proportion. For analytical purposes hospitals in the highest quartiles (those with the largest proportion of Medicaid and self-pay discharges) were termed SNHs and those in the lowest quartile were termed nonSNHs.

To validate our definition of safety net hospitals we compared our classification of hospitals into SNHs vs nonSNHs with America's Essential Hospitals,<sup>12</sup> a group of public and nonprofit hospitals that report a primary goal of serving vulnerable populations. Of those hospital systems that allowed linkage to the AHA survey 80% of facilities included in America's Essential Hospitals were in the highest quartile of safety net burden. No hospital systems from this list were in the lowest quartile of safety net burden.

**Urological Procedures.** After excluding admissions for patients younger than 18 years we used CCS and ICD-9 procedure codes to identify admissions with major urological procedures performed in an operating room.<sup>13</sup> We categorized similar procedures into 7 mutually exclusive but clinically relevant groups, including endoscopy, urinary incontinence, major oncologic, benign prostatectomy (including TURP and simple open prostatectomies when occurring without a prostate cancer diagnosis), reconstructive, kidney transplantation and other.

### Outcome Measures

Using ICD-9 procedure codes we then identified admissions where patients underwent 1 of 7 specific urological procedures, including TURP, urinary incontinence surgery, TURBT, endoscopic upper tract stone removal, nephrectomy, radical prostatectomy and cystectomy. For patients undergoing these procedures we measured 3 primary outcomes, including 1) in-hospital mortality, 2) prolonged LOS and 3) hospital costs associated with the surgical admission. LOS was defined as prolonged if it exceeded the 90th percentile for that procedure. Hospital costs were calculated from surgical admission charges in the NIS. Consistent with established methods to obtain more accurate measures of episode cost we adjusted charges according to hospital specific cost-to-charge ratios and the primary admitting diagnosis.<sup>14,15</sup>

### Statistical Analysis

For all analyses we compared hospitals in the highest vs the lowest quartiles of safety net burden. In our first step we used the chi-square test and t-test to compare hospital and patient characteristics for safety net and nonsafety net facilities. Next we compared the overall distribution of urological procedures performed at SNHs vs nonSNHs. Finally we fit multivariable regression models (applying sampling weights that accounted for the complex survey design of the NIS) to compare each of the outcome measures for patients who underwent the 7 common urological procedures performed at SNHs vs nonSNHs. In-hospital mortality and prolonged LOS were classified as dichotomous variables and total hospital admission costs were log transformed prior to analysis. We adjusted our models for patient and hospital characteristics that could impact outcomes, including age, race, number of comorbidities, median household income, primary payer and admission type (emergent/trauma, urgent and elective). Comorbidities were identified using ICD-9 diagnosis codes. As a sensitivity analysis we compared mortality and prolonged LOS after specifying SNHs based on deciles or quintiles (rather than quartiles) of safety net burden.

All statistical analyses were performed with SAS®, version 9.4 software using a 5% significance level. This study was deemed exempt from review by the University of Michigan institutional review board.

## RESULTS

We identified more than 260,000 inpatient urological procedures performed at a total of 746 SNHs and 528 nonSNHs from 2007 through 2011. Despite an equal number of hospitals in each quartile of safety

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