

Level II trauma centers have highest charges for hip fractures

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Objectives: To evaluate the charges for pertrochanteric hip fracture care in Texas.

Design: Database review.

Setting: Texas Hospital Inpatient Public Use Data File (PUDF)

Intervention: Charges reported by hospitals to the Texas Department of State Health Services for pertrochanteric hip fractures.

Main outcome measurement: Charges associated with pertrochanteric hip fracture stratified by implant type and according to facility trauma level designation, urban versus rural, teaching versus non-teaching, and border versus inland status.

Results and conclusions: There were a total of 44,853 pertrochanteric hip fracture surgeries performed over the three-year period in the state of Texas. The vast majority were treated at urban (93.4%), inland (non-border) (92.3%), non-teaching (74.2%) facilities with intramedullary fixation (56.9%). A significant increase in charges was associated with treatment at an urban (\$32,412), border (\$44,919), or teaching (\$10,501) facility. Mean inpatient charges at Level II facilities was \$113,700. Further study is warranted to determine what drives the differences in charges associated with hip fracture treatment.

Level of Evidence: IV; Economic Database Analysis

Keywords: hip fracture, access to care, charge analysis, value-based care, Texas.

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INTRODUCTION

Hip fractures are devastating injuries that disrupt both the social functioning and financial well-being of patients.^{1,2} Hip fractures also represent an enormous societal cost.^{1,3} The relationship of charges, collections, cost, location, and type of treating facility is not well known. The state of Texas is diverse in terms of its demographics including race, urban/rural hospital setting, academic/private hospital mix, and citizenship status. This diversity provides an opportunity to evaluate economic relationships in pertrochanteric femur fracture management that may represent the broader trends in the United States population.

The expected increasing burden of hip fractures will pressure payors and treatment facilities to find a balance

between charges and collections for their services rendered.^{2,4-7} This tension between the cost and reimbursement should inform public policy. There are large price discrepancies between what private health plans pay and the amount that Medicare pays, often three times or more.⁸ Orthopedic training hospitals are often associated with higher costs, although with hip fracture care, this is not always the case.⁹⁻¹¹

The authors hypothesize that higher charges will be associated with teaching hospitals and Level I trauma designated centers.

METHODS

Institutional Review Board (IRB) exemption was obtained for a retrospective review of the Texas Department of State Health Services Texas Inpatient Public Use Data File (PUDF) for the years 2016-2018. This represents hospital discharge data from all state licensed hospitals in Texas, except those that are in a county of less than 35,000 or have fewer than 100 licensed beds.

Patients age ≥ 18 years old with an isolated pertrochanteric femur fracture (AO/OTA 31A, ICD 10 S72.1) stratified by procedure code for intramedullary vs internal fixation were included. Patients under the age of 18, with concomitant femoral head fractures, or with multiple fractures of the lower extremity were excluded. Variables of interest included facility type, primary diagnosis, procedural code, source of payment, patient demographics, transfer status, and length of stay, state trauma designation level, rural and urban status, and border county status.

RESULTS

There were 44,853 surgeries performed for pertrochanteric hip fractures over the three-year period in the state of Texas. The vast majority were treated in counties that are urban (93.4%) and inland (non-border) (92.3%). Furthermore, most patients were treated in non-teaching (74.2%) facilities with IM fixation (56.9%). Significantly increased charges were associated with treatment at an urban (\$98,232) compared to rural (\$65,720) (difference between means of \$32,512 [95% CI: \$28,979 - \$36,045], $p < 0.01$), border county (\$137,584) compared to inland (\$92,666) (difference between means of \$44,919 [95% CI: \$41,660 - \$48,177], $p < 0.01$), teaching (\$103,910) versus non-teaching (\$93,409) facility (difference between means of \$10,500 [95% CI: \$8503 - \$12,498], $p < 0.01$) and those treated with an IMN (\$99,323) compared to ORIF (\$91,878) (difference between means of \$7,446 [95% CI: \$5680 - \$9211], $p < 0.01$). (Table 1).

Level II trauma designated hospitals had the highest charges associated with treatment (mean charge of \$113,700 |

difference between means for Level II versus Level I of \$8230 [95% CI: \$3992 – \$12,469]). The Level II versus Level IV difference between means was \$28,845 [95% CI: \$25,101 – \$32,590]. Level I facilities were more expensive than Level III, IV, or undesignated facilities. (Table 2).

Table 1: Fracture Fixation Cost Analysis

	n	Mean Charges (SD)	p
Fixation type			
ORIF	19,323	\$91,878 (88,302)	P<0.01
Intramedullary	25,530	\$99,323 (98840)	
Urbanization			
Rural	2,920	\$65,720 (44794)	P<0.01
Urban	41,933	\$98,232 (96679)	
County type			
Inland	41,408	\$92,666 (93213)	P<0.01
Border	3,445	\$137,584 (100,057)	
Teaching facility			
Non-teaching	33,293	\$93,410 (75,153)	P<0.01
Teaching	11,560	\$103,910 (135,329)	
Trauma designation			
Undesignated (“0”)	8,657	\$88,768 (82,765)	P<0.01
1	6,720	\$105,470 (128,419)	
2	8,011	\$113,700 (98,167)	
3	10,194	\$94,821 (102,640)	
4	11,271	\$84,855 (60,328)	

DISCUSSION

We analyzed charges associated with pertrochanteric hip fractures in the state of Texas. Based on previous literature and conditions on the southern Texas border, we hypothesized that higher charges would be associated with teaching hospitals and border counties. However, the present analysis determined that Level II facilities, urban location, and teaching status incurred the highest charges.

The highest hospital charges in this study were associated with Level II trauma facilities. Patient transfers from lower-level facilities, case complexity, patient comorbidities, and lack of resources at the treating hospital may influence this finding.^{13, 14} Clancy and colleagues described similar hospital charges between Level I and II facilities.¹⁵ However when controlling for transfers, the cost associated became significantly higher for patients transferred to Level I facilities.¹⁵ Interestingly, three quarters of transfers were treated at Level I facilities.¹⁵ Although our study population was different in the severity and type of injury sustained, we would expect that the charges at the Level I facility should be higher than the Level II facilities if the increased charges were related to the complexity of care for transferred patients.

The proliferation of Level II trauma centers has impacted established trauma ecosystems by siphoning volume from Level I facilities.^{16, 17} The addition of Level II facilities to the Florida trauma system increased access by 25% while simultaneously increasing personnel expense by 217%.¹⁷ In

the statewide trauma system in Arkansas, a small number of patients with high charges and payments positively influenced the total net margin for Level II hospitals.¹⁸ This has the potential for a net detrimental effect if hospitals were to refer their sickest patients for transfer, as increased injury severity score and length of stay is associated with increased cost, and with less reimbursement.^{18, 19}

Availability of orthopaedic trauma coverage can be a barrier for care. Crichlow and colleagues described factors leading to transfers to a Level I facility for orthopaedic trauma. Lack of orthopaedic surgeon coverage accounted for 27% of transfers.¹³ In this study, the 29 Level I-II facilities (10%) performed 33% of procedures, while the 262 Level III-IV facilities (90%) performed 67% of procedures. From this we interpret that Level III-IV facilities are treating hip fractures while incurring lower inpatient charges. This may be attributed to the robust number of Level III and Level IV facilities throughout Texas. Galanis and colleagues described the development of rural Level III facilities within an existing regional trauma system and found that the Level III facilities were able to provide care with no significant difference in mortality while decreasing the transfers to higher level care by 32%.²⁰

In this study, we found that the charges were higher for teaching facilities compared with non-teaching facilities in contrast to previous literature.¹¹ However, there is literature to support that patient comorbidities and treatment determines the cost for hip fracture patients, rather than social care factors.²¹ Additionally, in our study the mean charge for intramedullary fixation was \$99,323, and for internal fixation was \$91,878. These charges are significantly higher than a recent Medicare cost analysis study, where the estimated inpatient and skilled nursing facility services for intertrochanteric hip fracture was \$44,135.¹

Table 2: Comparison of Average Charges by Facility Trauma Level Designation; all significant at 0.05

Trauma Level Designation	Difference	95% CI	
Level 1 vs. Level 2	-\$8,230	-\$12,469	-\$3,992
Level 1 vs. Level 3	\$10,650	\$6,623	\$14,676
Level 1 vs. Level 4	\$20,615	\$16,666	\$24,564
Level 1 vs. undesignated	\$16,702	\$12,536	\$20,868
Level 2 vs. Level 3	\$18,880	\$15,054	\$22,705
Level 2 vs. Level 4	\$28,845	\$25,101	\$32,590
Level 2 vs. undesignated	\$24,932	\$20,960	\$28,905
Level 3 vs. Level 4	\$9,965	\$6,463	\$13,468
Level 3 vs. Level 0	\$6,053	\$2,308	\$9,798
Level 4 vs. undesignated	-\$3,913	-\$7,575	-\$251

While the charges from the Texas inpatient database are not the same as what the facility collects or is paid, there is an approximate \$60,000 discrepancy between Texas hospitals' charges and Medicare payments.

Kelly and colleagues recently published their hospital's cost of care and payment from Medicare based on the Medical-Severity Diagnosis-Related Grouping (MS-DRG) for isolated intertrochanteric fractures.²² The average payment was just over \$19,000, and there was a net deficit of \$773 per patient between the cost of care and the payment received from Medicare. Patients with more comorbidities provided a net profit of \$1616. Surprisingly, healthier patients had a net deficit of \$1566. The inpatient charges that are reported to the state of Texas are significantly higher than what is paid by Medicare in this study.

This study has limitations related to the nature of the dataset. The lack of outcome data limits our ability to draw conclusions about the value of the care patients are receiving at any of the facilities. Additionally, the study does not address the cost of care, these are the administrative charges and may not represent the actual cost that is remunerated. Finally, it is difficult to ascertain if more medically complicated patients are treated at the higher trauma designated facilities, leading to increased associated costs for their hospitalization.

CONCLUSION

Over a recent three-year period, Texas hospitals treated close to 45,000 pertrochanteric fractures. Two thirds of these were treated at level III and IV trauma centers. Factors that seemed to increase hospital charges incurred include teaching facility status, border county location, Level II trauma designation, and intramedullary fixation. Mean inpatient charges at Level II facilities was \$113,700, almost \$70,000 more than the estimated mean initial 90-day post-fracture cost calculated in a recent Medicare database study.¹ Further study is warranted to determine how possible initiatives may reduce charges associated with hip fracture treatment in the state of Texas.

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