Surgeon Volume is Associated with Postoperative Complications after Lumbar Fusion
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INTRODUCTION:
Over the past two decades, spinal fusion surgeries have increased in both frequency and cost. In addition to the increased number of spinal fusion surgeries, a larger proportion of these surgeries are being performed in higher volume centers. Previous research has demonstrated that postoperative complications for lumbar fusion may be a function of surgeon volume. The purpose of this study is to characterize the volume-dependence of both facilities and surgeons on morbidity and mortality after lumbar fusion as well as characterize the role of socioeconomic status on postoperative complications.

METHODS:
Adults (≥40) who underwent lumbar fusion from 2011-2015 were identified using International Classification of Disease (ICD)-9 Clinical Modification (CM) diagnostic codes for lumbar disc degeneration and ICD-9 CM procedure codes for lumbar fusion in the New York Statewide Planning and Research Cooperative System (SPARCS) database. SPARCS is an all-payer database collecting all inpatient and outpatient (emergency department, ambulatory surgery, and hospital based clinic visits) claims in New York. Readmission, reoperation, in-hospital mortality, and other adverse events were compared across surgeon and facility volumes using multivariable Cox proportional hazards regression, controlling for patient demographic and clinical factors. Surgeon and facility volumes were compared between the lowest and highest 20% to represent low-volume and high-volume surgeons/facilities. Patient complication rates were mapped by ZIP code.

RESULTS:
Of the 12,355 patients identified with a lumbar fusion, 7,486 patients were treated at a high or low volume facility or by a high or low volume surgeon. Compared to high volume facilities, low volume facilities had lower 1, 3, and 12-month rates of deep vein thrombosis (1 mo. HR=0.261, p<.0001; 3 mo. HR=0.285, p<.0001; 12 mo. HR=0.367, p<.0001) and a lower 12-month rate of revision (12 mo. HR=0.653, p=0.0139). Compared to high volume surgeons, low volume surgeons had higher 1, 3, and 12-month rates of readmission (1 mo. HR=1.287, p=0.02; 3 mo. HR=1.322, p=0.0029; 12 mo. HR=1.238, p=0.001), urinary tract infection (1 mo. HR=1.547, p=0.008; 3 mo. HR=1.453, p=0.0148; 12 mo. HR=1.337, p=0.026), and pulmonary embolism (1 mo. HR=2.479, p=0.0125; 3 mo. HR=2.08, p=0.023; 12 mo. HR=2.171, p=0.0079); higher 1 and 3-month rates of cardiorespiratory arrest (1 mo. HR=5.264, p=0.0347; 3 mo. HR=5.445, p=0.028), pneumonia (1 mo. HR=1.85, p=0.0311; 3 mo. HR=1.719, p=0.0309), and acute respiratory failure (1 mo. HR=2.611, p=0.02; 3 mo. HR=2.133, p=0.05); and a higher 3-month rate of acute renal failure (3 mo. HR=1.556, p=0.0388). Patients that were treated at low volume facilities and went on to have complications were more concentrated to areas with higher social deprivation scores.

DISCUSSION AND CONCLUSION:
High volume surgeons have a lower rate of complications and postoperative readmission compared to low volume surgeons for patients undergoing lumbar spinal fusion surgery. Future research should focus on pinpointing differences in clinical care pathways between high and low volume surgeons. Additionally, there are significant socioeconomic disparities in which patients can access high volume surgeons. Identification and awareness of these demographic disparities is crucial to optimize patient care and to elucidate mechanisms for these disparities to be remedied.