


The Impact of the Fascia Iliaca Block Beyond Perioperative Pain Control in Hip Fractures: A Retrospective Review

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Abstract

Background: Geriatric hip fractures are common injuries that are associated with high morbidity and mortality. Adequate pain control remains a challenge as the altered physiology in elderly patients makes use of traditional analgesics challenging. The use of regional anesthetics, specifically the fascia iliaca compartment block (FICB), in the perioperative period has been shown to decrease opioid use in this population. This study aimed to investigate the effect the FICB had on pain control, length of stay, readmissions, and complications in a 30-day postoperative period. **Methods:** This was a retrospective cohort study comparing patients who sustained hip fractures; one cohort (110 patients) received a preoperative fascia iliaca block with continuous infusion (FICB), whereas the other cohort (110 patients) did not receive a block (NO-FICB). Both cohorts were from level II trauma centers. Data were collected between 2016 and 2019. Descriptive statistics was performed to describe and summarize the data. Bivariate analysis was performed using chi-square test, with 2 tailed *P*-values $\leq .05$ were considered statistically significant. **Results:** The FICB group had a lower length of stay (3.9 days vs 4.8 days; $P < .001$), and lower pain scores on post-operative days 2 and 3 ($P = .019$). There was no difference in time from admission to surgery ($P = .112$) or narcotic use between cohorts ($P = .304$). However, the FICB group was more likely to discharge to a skilled nursing facility ($P = .002$), and more likely to be readmitted within 30 days ($P = .047$). There were no differences in medical complications or mortality between the 2 groups. **Conclusions:** The primary study endpoint, length of stay, was found to be significantly shorter in the patients who underwent the FICB vs the group who did not undergo the FICB. Pain scores on POD2 and POD3 were lower in patients who received a FICB. This study adds to the body of evidence that the FICB is an effective addition to a multimodal pain pathway. **Level of Evidence:** Level III Evidence – Retrospective Cohort Study

Keywords

anesthesia, delirium, fragility fractures, geriatric medicine, geriatric trauma, osteoporosis, physical therapy, trauma surgery

Introduction

Geriatric hip fractures are very common injuries associated with high morbidity and mortality.¹ Patients sustaining hip fractures are presented with a difficult recovery and 1-year mortality rate as high as 35%.¹ Much emphasis has been placed on perioperative optimization, expedited surgery and early mobilization, as these have been shown to improve outcomes, and even provide mortality benefit.² “Hip fracture pathways” have emerged as a recognition that earlier

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operative intervention confers a mortality benefit.² These pathways include rapid admission to the hospitalist team or trauma/critical care team with perioperative medical optimization, consultation with anesthesia to perform regional anesthesia, and consultation with the orthopedic surgery service for timely surgical intervention.³

Integrated hip fracture pathways have led to earlier surgery and early weightbearing, necessitating a well-orchestrated pain management strategy so that patients may appropriately engage in physical therapy and safely navigate the post-operative period.⁴ Pain control strategies remain challenging in the geriatric hip fracture population as pain during mobilization is often severe. Commonly used analgesics are often unsafe due to comorbidities, and delirium is a frequently encountered complication with rates reported up to 70%.⁵ Because of this challenge, pharmacological and non-pharmacological pain management remains a point of emphasis which may or may not include regional anesthetic use.³ Multimodal pain control has been shown to decrease opioid usage in the geriatric hip fracture patients.⁵ The use of regional anesthetics, specifically the fascia iliaca compartment block (FICB), in the perioperative period has also been shown to independently decrease opioid use in this cohort of patients.⁶

The purpose of this study was to investigate the effect of the FICB on multiple parameters. The primary endpoint of this study is the effect of the FICB on length of stay. Secondary endpoints include the effect of FICB on discharge disposition, readmissions, perioperative opioid use, and complications in a 30-day period following hip fracture surgery. It was hypothesized that the use of the FICB perioperatively would lead to a decreased length of stay, a decrease in the total opioid use during hospitalization, as well as a decrease in pain scores, decreased readmissions, and decreased unplanned complications.

Materials and Methods

Study Design

This study was designed as a retrospective cohort study comparing patients who sustained hip fractures; one cohort received a preoperative fascia iliaca block with continuous infusion (FICB), whereas the other cohort did not receive a fascia iliaca block (NO-FICB). Following Institutional Review Board approval, all data were extracted from the Trauma Registry (TraumaBase) at each respective hospital, as well as the electronic medical record (EPIC). Records were queried between January 1, 2016 and October 31, 2019 to search for eligible patients.

Setting

The cohorts came from 2 different hospitals. Both hospitals are Level II Trauma Centers as verified by the American College of Surgeons Committee on Trauma. The FICB group was treated at one hospital: a 435-bed hospital located in a suburban area with a population of 140,000. The NO-FICB group was treated at a different hospital: a 712-bed hospital also located in a suburban area with a population of 265,000. The hospitals are both not-for-profits, have similar overall patient experience ratings (4/5 stars; per American Hospital Directory), and similar Total Performance Scores (FICB Hospital 31.0/NO-FICB Hospital 26.75, per Medicare data).

Participants

Cases were manually reviewed for inclusion and exclusion criteria, starting on the last date of the query and consecutively enrolled patients until this was complete. Inclusion criteria included any patient over the age of 65 years old who underwent surgical management of an isolated femoral neck or peritrochanteric femur fracture. Exclusion criteria included any periprosthetic or peri-implant femur fractures, patients admitted with more than one fracture, non-operative management of hip fracture, or incomplete data collection. The sample size was determined using GPOWER. A priori analysis indicated that 200 participants were needed to have 80% power for detecting an effect size of .40 at a 95% confidence interval. Additionally, we accounted for attrition of 10% (10 per group) for a total sample size of 220 (110 per group).

Hip Fracture Pain Protocols

At both hospitals, a similar opioid-sparing multimodal pain protocol is used on all patients admitted for hip fractures. The protocols include the same medications, including scheduled oral or intravenous Acetaminophen, scheduled oral or intravenous NSAID (Ketorolac, Ibuprofen, Celecoxib), and as-needed oral or intravenous narcotics (Oxycodone, Hydrocodone, Morphine). At the NO-FICB Hospital, the fascia iliaca block is not utilized as part of the hip fracture pathway and patients are treated with an opioid-sparing multimodal pain regimen alone. At the FICB Hospital, patients are treated with an opioid-sparing multimodal pain regimen in addition to a fascia iliaca block. The FICB is offered to all patients admitted for hip fracture so long as there are no strict contraindications, and procedure consent obtained.

FICB Protocol

A fascia iliaca compartment block is a large volume anesthetic delivery method which infiltrates local anesthetic into the fascia iliaca compartment.⁷ This compartment is described as a potential space between the fascia iliaca anteriorly, and the iliacus and psoas muscles posteriorly.⁷ The fascia iliaca itself attaches to the iliac crest laterally and becomes investing fascia of the psoas muscle medially.⁷ This space comprises branches of the femoral and obturator nerves, as well as the lateral femoral cutaneous nerve, all of which contribute to provide sensation to the hip.⁷ The block is performed using ultrasound guidance. A FICB can be administered in a single shot or continuously through a placed catheter.⁸ Stephan et al. found in his 2020 prospective observational cohort study that there was no significant difference in patient's pain control or opioid use between either method when administered preoperatively for elderly hip fracture patients.⁸ At our institution, the FICB is performed using ultrasound guidance in the emergency department by a member of the anesthesia team (MD, DO, or CRNA). Any trainee is directly supervised by the attending anesthesiologist. FICB catheter is attached to an elastomeric pump system, which is used to deliver local anesthetic to the site at a constant rate for 72 hours. Short-acting (Xylocaine) and long-acting (Bupivacaine) anesthetics are used in combination in a 1:1 fashion.

Outcomes Measured

Length of stay (LOS) was measured as a continuous variable. Pain score data was extracted from EPIC using the Numerical Rating Scale from 0 – 10. Pain scores were obtained by asking patients their pain level on a 1 to 10 scale. Patients who were unable to answer based on Numerical Rating Scale, such as in the setting of cognitive impairment, used the Wong Baker FACES Pain Scale, or the PAINAD Score, as per hospital protocol, and these numbers were converted and utilized instead. Mean opioid consumption was calculated using the Morphine Equivalent Dose (MED) calculator and this was performed by a pharmacist at each respective site. The time from admission to surgery were evaluated. The 30-day mortality and 30-day readmission rates were extracted from EPIC and the TraumaBase registry, as well as outpatient records. The Charlson Comorbidity Index (CCI) was measured to observe for differences in the baseline populations.

Statistical Analysis

The study included several variables: gender (male, female), race (white, black, other), ethnicity (non-Hispanic or Latino, Hispanic or Latino), 30-day mortality, 30-day readmission, discharge disposition to higher level of care,

comorbidities, unplanned ICU admission, unplanned intubation, post-op pneumonia, and rate of DVT/PE. Descriptive statistics were performed to describe and summarize the data. The corresponding mean, standard deviation, frequency, and percent distribution were reported. Difference in study variables by FICB were assessed using Independent Sample t-test, Fishers Exact Test and Chi-Square Test. Significance was evaluated at $\alpha < .05$. Analyses were conducted using SAS[®] v9.4.

Source of Funding

There was no source of funding for this investigation, and it did not play a role in the investigation.

Results

The cohorts consisted of 110 patients in the FICB group, and 110 patients in the NO-FICB group. The mean age was 81.9 years old; 153 patients (69.6%) were female, and 67 (30.4%) were male. All demographic data from each cohort are described in [Figure 1](#).

When assessing our primary endpoint, length of stay, the mean length of stay was 4.4 days (SD 1.8). Overall, the FICB group had a shorter length of stay. In the FICB group, the mean length of stay was 3.9 days (SD 1.4), and in the NO-FICB group the mean length of stay was 4.8 days (SD 2.1; $P < .001$), as seen in [Figure 2](#). There were 173 patients (79.7%) discharged to a higher level of care compared to their pre-morbid living status. A greater proportion of patients in the FICB group discharged to a higher level of care compared to the NO-FICB group (88.2% vs 71.0%, $P = .002$). Moreover, a greater proportion of participants who underwent FICB had readmission within 30 days compared to those who did not (21.8% vs 11.8%, $P = .047$). There were no FICB-related readmissions. However, in the FICB group the readmissions fell largely into 4 main categories: anemia/GI Bleed,⁴ DVT,⁴ respiratory distress/cardiac issues,⁷ and other wound issues not involving the hip.³ The other readmission criteria were extremely varied from constipation to narcotic overdose. There was no difference in the time from admission to surgery between the 2 cohorts (21.3 hours FICB, 23.7 hours NO-FICB; $P = .122$).

When assessing pain control and narcotic use, the morphine milligram equivalent dose per day (MME/day) averaged 25.1 for the FICB group, and 28.9 for the NO-FICB group ($P = .304$). The data on all opioid use and pain scores can be seen in [Figures 3-5](#). Pain scores on post-operative day 2 (POD2) and POD3 were significantly lower in the FICB group (POD2 2.2 vs 3.2, $P = .0189$; POD3 1.7 vs 2.7, $P = .0193$).

There were no statistically significant differences between the FICB group vs the NO-FICB group in the rate of

		Total (N=220)	FICB (N=110)	no-FICB (N=110)	p value
Age	Mean (SD)	81.9(8.2)	82.3(8.1)	81.5(8.2)	0.479
Gender					0.057
	Female	153(69.6%)	83(54.2%)	70(45.8%)	
	Male	67(30.5%)	27(40.3%)	40(59.7%)	
Race					0.513 †
	White	216(98.2%)	108(50.0%)	108(50.0%)	
	Black	1(0.5%)	0	1(100.0%)	
	Other	3(1.4%)	2(66.7%)	1(33.3%)	
Ethnicity					0.999 †
	Non-Hispanic or Latino	218(99.1%)	109(50.0%)	109(50.0%)	
	Hispanic or Latino	2(0.9%)	1(50.0)	1(50.0%)	

Footnote: † Fishers exact test

Figure 1. Background characteristics of patients.

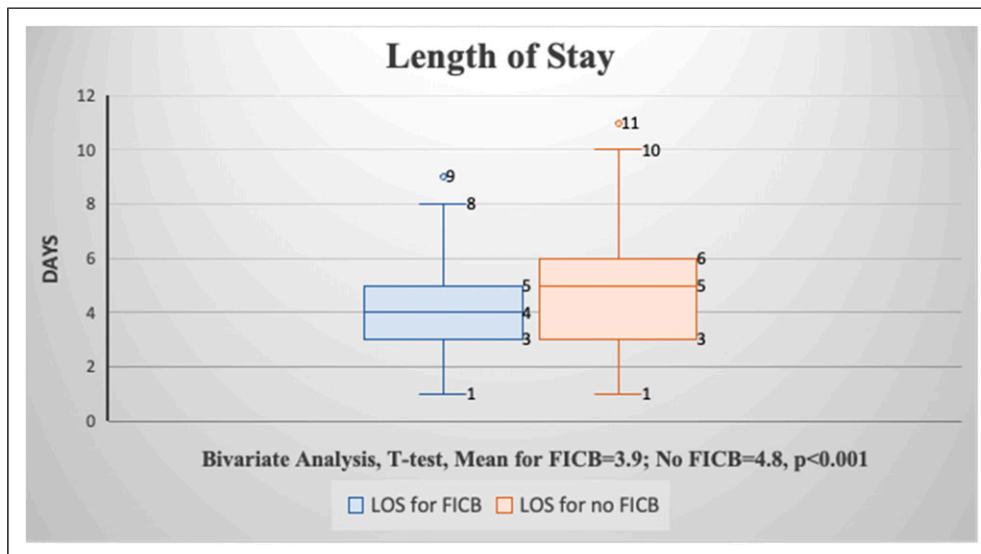


Figure 2. Length of Stay.

	Total Mean(SD)	FICB Mean(SD)	no-FICB Mean(SD)	p value
Time from admission to surgery		21.3 (7.7)	23.7 (13.8)	0.112
Pain Score on admission	5.9 (3.4)	6.3 (3.5)	5.5 (3.4)	0.108
Pain Score Post Op Day 1	2.5 (3.2)	2.2 (3.3)	2.9 (3.1)	0.107
Pain Score Post Op Day 2	2.7 (3.0)	2.2 (3.0)	3.2 (2.9)	0.019*
Pain Score Post Op Day 3	2.2 (2.6)	1.7 (2.5)	2.7 (2.6)	0.019*
Opioid use during hospitalization (MME/Day)	27.0 (27.9)	25.1 (25.6)	28.9 (30.1)	0.304

Footnote: † Fishers exact test; *p<0.05, (SD) Standard deviation

Figure 3. Pain scores and opioid use.

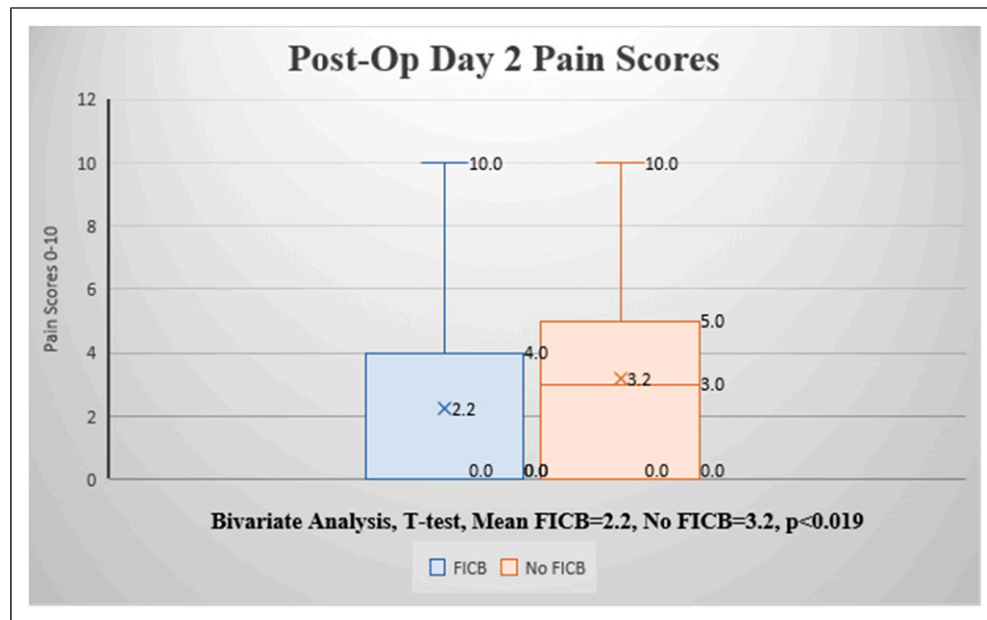


Figure 4. Post-operative day 2 pain scores.

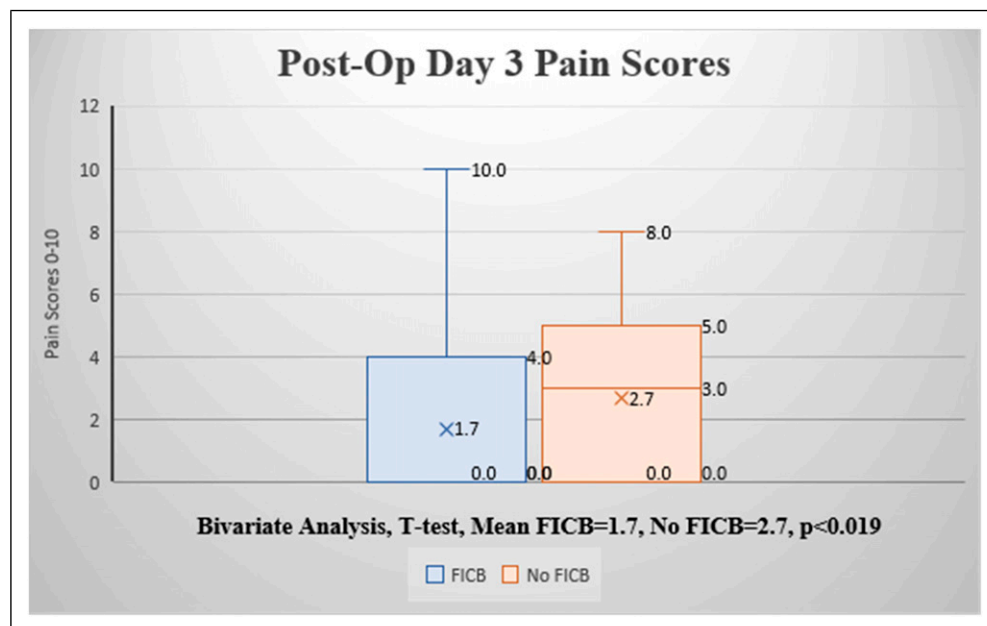


Figure 5. Post-operative day 3 pain scores.

acute postoperative complications, including unanticipated ICU admission (.9% vs 1.8%), unplanned intubation (0% vs 1.8%), pneumonia (0% vs 0%), DVT (0% vs .9%), or 30-day mortality (.9% vs 4.6%), respectively, as shown in [Figure 6](#). There were no FICB-related complications in the FICB cohort. The CCI was calculated and was found to be statistically different (FICB CCI mean 4.2 with an

estimated 10-year survival of 45.3%; NO-FICB CCI mean 4.6 with an estimated 10-year survival of 39.4%; $P = .046$).

Discussion

Length of stay and complications following hip fractures are important considerations for hospitals, as the economic burden

	Total N(%)	FICB N(%)	no-FICB N(%)	p value
Discharge Disposition to Higher Level of Care	173 (79.7)	97 (88.2)	76 (71.0)	0.002**
30-day Mortality	6 (2.7)	1 (0.9)	5 (4.6)	0.098 †
30-day Readmission	37 (16.8)	24 (21.8)	13 (11.8)	0.047*
Comorbidities	203(92.3)	100 (90.9)	103 (93.6)	0.449
Unplanned ICU	3 (1.4)	1 (0.9)	2 (1.8)	0.561 †
Pneumonia	0	0	0	1
Rate of DVT/PE	1 (0.4)	1 (0.9)	0	0.316 †
Unplanned Intubation	2 (0.9)	0	2 (1.8)	0.498†
Length of stay				<0.001***
Less than equal to 4 days	133 (60.5)	82 (74.6)	51 (46.4)	
Greater than 4 days	87 (39.5)	28 (25.5)	59 (53.6)	

Footnote: † Fishers exact test *p<0.05; **p<0.01;***p<0.001

Figure 6. Post-operative outcomes.

of hip fractures exceeds 12 billion dollars annually in the United States.⁷ Length of stay is also of importance to patients. In their prospective study, Magaziner et. al demonstrated that a prolonged hospital stay had a significantly negative impact on hip fracture patients' recovery of physical and instrumental activities of daily living at one year post surgery, putting further emphasis on rapid discharge from the hospital.⁹

Proper post-operative pain control is an important modifiable risk factor in minimizing complications. Poor pain control delays post-operative time to ambulation, which causes long-term functional impairment and leads to increased opioid use.¹⁰ Morrison et. al demonstrated this in their study of hip fracture patients, finding that those with poorly controlled pain were less likely to ambulate by post-operative day 3 (POD3), and more likely to miss physical therapy sessions.⁸ Additionally, the authors hypothesize that pain decreased mobility such that patients were reluctant to move from their bed, increasing other known complications from prolonged immobilization. These patients also had poorer functional recovery at 6 months post-operatively, with decreased mobility scores and more difficulty with activities of daily living. Furthermore, Kamel et. al found that time to ambulation following hip

fracture surgery is significantly related to the development of new-onset delirium among other postoperative complications, thus prolonging length of stay.¹¹ Patients who ambulated on POD4 had double the length of stay compared to patients who ambulated on POD1. Our study found that those who received a FICB had improved pain scores on POD2 and POD3, possibly explaining why this cohort had a shorter length of stay. Current literature demonstrates the use of the FICB in geriatric hip fracture patients produces more mobile patients, ambulating as early as POD1, which plays a role in decreasing length of stay.¹⁰⁻¹³

Multiple studies have demonstrated the preoperative FICB significantly decreases opioid use in patients undergoing hip surgery.^{6,8,12-14} This is especially relevant as geriatric patients are at an increased risk of developing complications secondary to opioid use, such as postoperative nausea, urinary retention, ileus, respiratory depression, and delirium.¹⁵⁻¹⁸ These complications lead to poorer outcomes and increased length of stay. To illustrate, one report found that hospitalized hip fracture patients that developed urinary retention had a longer time to ambulation as a result, leading to increased length of stay.¹¹

Thompson et. al in their 2020 prospective randomized controlled trial demonstrated a 98% reduction in morphine use for severe pain in those who received a preoperative FICB.⁶ In a study summarized by Schulte et. al, there was a statistically significant reduction in morphine milligram equivalents (MME) consumed in hip fracture patients who received a preoperative FICB compared to those who did not.¹¹ Though there was no statistically significant difference in opioid consumption between the cohorts in our study, the trend of lower opioid use in patients who received the FICB is clinically relevant.

Delirium is an important complication to consider, as it is the greatest risk factor for increasing length of stay.¹⁹ Though it is unclear if limiting opioids or improving pain control is more important, any intervention which leads to lower opioid usage and improved pain control must be viewed as protective of developing delirium.^{20,21} Our study was able to demonstrate improved pain control in those who underwent a preoperative FICB, through opioid consumption was similar between the 2 groups. Nie et. al demonstrated in their randomized controlled trial that patients who received a preoperative fascia iliaca block had a significant reduction in postoperative nausea and delirium.²² Moreover, Hao et. al performed a randomized controlled trial in 2019 including 85 patients, 44 received a fascia iliaca block whereas 46 patients did not. Receiving a fascia iliaca block resulted in a significant decrease in fentanyl use, and led to a decreased incidence of delirium (13.9% vs 35.7%, $P = .018$).²³ Current literature proves the benefits of the FICB over a traditional pain protocol supported by improvement in measured opioid consumption, complications, and hospital length of stay.²²⁻²⁴

The main limitations in this study were that it was retrospective in nature, and that each cohort came from a different institution. As described previously, the baseline characteristics between the 2 hospitals are similar; they are both Level 2 Trauma Centers, and they have similar patient experience scores. Both hospitals have similar hip fracture protocols emphasizing rapid resuscitation, early surgery, and post-operative weight bearing as tolerated. It should be noted that the time from admission to surgery did not differ between the 2 cohorts (21.3 hours FICB, 23.7 hours NO-FICB; $P = .122$). The percent of the population on Medicaid-type insurance plans in the FICB hospital's county was 12% as opposed to the 7% in the NO-FICB hospital's county (US Census Data 2011-2015). The CCI's varied between the 2 institutions, implying that the FICB cohort were sicker patients to begin with, which could help to explain the results that differed from our hypothesis, such as increased rehospitalizations and discharge to a higher level of care in the FICB cohort. There could also exist other institutional-level differences between the hospitals that our study was not designed to assess, such as the availability of physical therapy or social work services

on POD0 or POD1, for example. Perhaps a patient's financial resources and social network are more influential in deciding their discharge disposition and readmission rather than FICB usage.⁹ Our study was not conducted to evaluate these differences, and we did not collect insurance status as part of our protocol. Delirium as a complication was not measured as part of this study, which is an area of future study. Additionally, data related to time to ambulation post-operatively was not collected in our study, but we see what an influential factor ambulation makes on length of stay. Further investigation can certainly be done to elaborate on these factors. A prospective study performed at a single institution would be beneficial to standardize study variables such as block performers, operative protocols, and postoperative care.

This study can be generalized to hip fracture patients in the geriatric population, as we kept our exclusion criteria to a minimum. The administration of fascia iliaca compartment block is not standardized across hospitals, an area that calls for an improvement in patient care. The information found in the study can add to the current literature for this topic to bring about recommendations in the perioperative management of geriatric hip fracture patients.

Declaration of Conflicting Interests

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