Surgical Endoscopy (2022) 36:9416–9423
https://doi.org/10.1007/s00464-022-09287-7

2021 SAGES ORAL

Impact of insurance type in postoperative emergency department utilization and clinical outcomes following ventral hernia repair (VHR)

Savannah Renshaw[1] · Dahlia Kenawy[1] · Rosevine Azap[2] · Anand Gupta[1] · Benjamin Poulose[1] · Courtney Collins[1]

Received: 13 September 2021 / Accepted: 18 April 2022 / Published online: 18 May 2022

Abstract

Background Access to care and barriers to achieving health equity remain persistent and prevailing issues in the USA, particularly for low socioeconomic (L-SES) populations. Previous studies have shown that public insurance (a surrogate marker for L-SES) is an independent predictor of emergent hernia repair. However, the impact of insurance type on postoperative healthcare utilization, including emergency department (ED) care, following ventral hernia repair (VHR) remains unknown.

Methods The 2013–2020 Abdominal Core Health Quality Collaborative (ACHQC) database was used to identify patients aged 18–64 undergoing ventral hernia repair (VHR) who had private or Medicaid insurance. Patients with no health insurance were also included. Using insurance type, the cohort was divided into three groups: private, public (Medicaid), and uninsured (self-pay). Multivariate logistic regression analyses were used to assess the impact of insurance type on emergency department (ED) utilization, postoperative complications, and readmission.

Results A total of 17,036 patients undergoing VHR were included in the study, out of which 13,980 (85.8%) had private insurance, 2,451 (8.4%) had public, and 605 (5.8%) were uninsured. Following adjustment for demographics (age, gender, race), comorbidities (hypertension, diabetes, smoking), and clinical characteristics (emergent procedure, ASA class, surgical approach), public insurance was associated with 1.7 times greater odds of returning to the emergency department (ED) within 30 days of surgery compared to private insurance (95% CI 1.4, 2.0; $p = 0.01$). Public insurance or being uninsured was also associated with increased odds of experiencing any postoperative complications compared to those who were privately insured (public: OR 1.3, $p < 0.01$; self-pay: OR 1.67, $p < 0.01$).

Conclusion Our study demonstrates that public and self-pay insurance are associated with increased emergency department (ED) utilization and worse postoperative outcomes compared to those with private insurance. In an effort to promote health equity, healthcare providers need to assess how parameters beyond physical presentation may impact a patient's health.

Keywords Hernia · Insurance · Medicaid · Emergency · Socioeconomic status

Insurance status is an important indicator of a patient's access to routine healthcare and health surveillance. Patients with publicly funded insurance, such as Medicaid, have been shown to have significant barriers to care, including transportation issues [1] and work or caregiving conflicts, which have been further associated with less access to high-volume hospitals with specialty surgical care [2] and presenting with more advanced disease progression [3]. In addition, publicly insured patients have been found to participate in fewer scheduled office visits compared to privately insured patients [4] and subsequently requiring increased emergency care [4].

Lack of access and engagement in the healthcare system can be especially critical in certain disease processes, where mismanagement or failure to seek care at an optimal time can significantly impact operative conditions and postoperative outcomes. Ventral hernias, for example, may become

Meeting Presentation: This work was presented at the 2021 Society of American Gastrointestinal and Endoscopic Surgeons Annual Meeting (Las Vegas, NV; September 2021).

✉ Courtney Collins
courtney.collins@osumc.edu

[1] Center for Abdominal Core Health, Department of Surgery, Ohio State University Wexner Medical Center, 181 Taylor Avenue, 11th Floor, Suite 1102A, Columbus, OH 43203, USA

[2] College of Medicine, Ohio State University Wexner Medical Center, 181 Taylor Avenue, 11th Floor, Suite 1102A, Columbus, OH 43203, USA

incarcerated or strangulated resulting in the need for emergent laparotomies with and without bowel resections. Previous studies have found insurance status to be an independent predictor of emergency repair [5]. Publicly insured patients undergoing emergent repair have also been found to have delayed time to care from admission to surgery, indicating that disparities may exist even when these patients finally present for care [6]. Studies have also found public insurance to be associated with increased odds of non-elective admission, as well as worse postoperative outcomes following VHR [7].

However, these associations have been limited to administrative data sources [5–8] and have not been explored in a hernia-specific dataset that provides access to more granular details of hernia morphology and operative characteristics. Previous studies have also not been able to specifically elucidate the relationship between public insurance and emergency department (ED) utilization in the immediate postoperative period for patients undergoing VHR. In this study, we seek to investigate the role of insurance payer type on unplanned ED visits within 30 days of VHR, as well as important postoperative outcomes including postoperative complications and readmission among patients undergoing ventral hernia repair in a hernia-specific national dataset.

Methods

Design overview

For this study, a retrospective review was performed on data collected prospectively through the Abdominal Core Health Quality Collaborative (ACHQC). Patients who underwent ventral hernia repair (VHR) were separated into three distinct study groups based on their insurance type: private, Medicaid, and self-pay. Clinical characteristics and postoperative outcomes were assessed for each group, and multivariate regression was employed to identify factors associated with each outcome of interest. Institutional Review Board (IRB) approval was obtained prior to the start of the study and a data use agreement was executed with the ACHQC before accessing data.

Study population and data source

The Abdominal Core Health Quality Collaborative (ACHQC) is a national registry of hernia patients including more than 400 surgical providers across the USA and representing academic medical centers, community health centers, and private practice. Standard definitions are used throughout the registry to ensure data integrity, which have been previously reported. To perform this study, the ACHQC database was queried for all patients aged 18–65 undergoing ventral hernia repair (VHR) between 2013 and 2020. All hernia types and surgical approaches were included. Patients were excluded if they did not have insurance payer-type data available.

Comparison groups

Using insurance payer type, the sample was then divided into three distinct comparison groups. These included private insurance (commercially insured), public insurance (Medicaid insurance), and uninsured (self-pay). All other insurance payer types, including Medicare, Tricare, VA, and workers compensation, were excluded for the purpose of this study.

Outcome measures

The primary outcome of interest in this study was unplanned ED visit within 30 days of surgery. Secondary outcomes of interest included any postoperative complication and readmission. Postoperative complications included surgical site infection (SSI), surgical site occurrence (SSO), as well as urinary tract infections (UTI), deep vein thrombosis (DVT), pulmonary embolism (PE), dehiscence, progressive renal insufficiency, bleeding requiring transfusion, pneumonia, unplanned reintubation, postoperative ventilator use, renal failure, stroke, cardiac arrest, myocardial infarction (MI), and sepsis/septic shock.

Data analysis

Demographic and clinical characteristics were compared by insurance type using Chi-Square and Kruskal–Wallis tests. Unadjusted univariate results were reported for each outcome of interest by insurance type. Multivariate logistic regression was then used to test the association of insurance type with experiencing any postoperative outcome within 30 days of surgery. Regression models were also used to determine the association of insurance type with unplanned emergency department (ED) visit and readmission within 30 days of surgery. Models controlled age, sex, race, smoking status, diabetes, hypertension, emergent presentation, ASA class, and operative approach.

Statistical significance was determined with an alpha value of 0.05. All statistical analyses were performed using SAS enterprise guide v7.1.

Results

The study sample included 17,036 patients who underwent ventral hernia repair. Private insurance was the largest group (85.8%), followed by public insurance (8.4%) and self-pay

(5.8%). The study population was majority male and white, with public insurance representing the greatest proportion of female and minority race patients (Table 1). Publicly insured patients were the youngest and had the highest comorbidity burden of all groups (Table 1). Major depression and anxiety disorders, as well as recent opioid use, were also most prevalent among those publicly insured. The majority of the sample underwent elective repair, with nearly one quarter of repairs performed for a recurrent hernia. Repairs were performed in open (64.1%), robotic (19.2%), and laparoscopic (12.7%) approaches and were not significantly different between groups (Table 2).

Univariate results

Publicly insured patients demonstrated the highest rate of ED utilization after surgery at 9.3% ($p < 0.01$). (Table 3). Postoperative complications and readmission were also significantly more common among publicly insured patients (Table 3).

Multivariable results—primary outcome (ED visits)

Multivariable analysis demonstrated that unplanned ED visits within 30 days were significantly more common among patients with public insurance, with this group exhibiting 70% greater odds of returning to the ED as patients who were privately insured (Table 4). Similarly, patients who were self-pay exhibited 1.6 times greater odds of experiencing an unplanned ED visit. Other predictors of ED visits included postoperative complications, black race, female sex, tobacco use, and mesh repairs (Table 4).

Multivariable results—secondary outcomes (complications and readmissions)

Multivariable analyses found that publicly insured and self-pay patients had significantly greater odds of experiencing any postoperative complication compared to privately insured patients (Table 5). Similar results were identified in terms of readmission, with publicly insured and self-pay exhibiting 1.54 and 1.82 times greater odds of being readmitted, respectively (Table 6).

Discussion

This study found that publically insured/low socioeconomic status (L-SES) patients have higher rates of adverse events, including ED visits, complications, and readmission after ventral hernia repair. This is consistent with other studies which have shown that publicly insured patients have worse outcomes after hernia repair [5, 7–9]. This study was unique in including patients who were uninsured in direct comparison to private and public insurance groups. Furthermore, this is the first study to describe differences in unplanned postoperative ED visit rates. Improving outcomes in this group represents a significant opportunity to address care disparities and potentially save costs that are conferred by ED visits and readmissions.

Publicly insured/L-SES patients have higher rates of ED utilization across many surgical fields [10, 11]. These trends may be indicative of a larger issue regarding access to healthcare for these groups, such as inability to follow-up with a primary care provider and instead presenting directly to ED. A greater prevalence of emergent repairs in the publicly insured cohort may also be reflective of the difficulties patients face in obtaining specialized surgical care in an elective setting, perhaps having to wait until their hernia has incarcerated or strangulated. These patients may be unable to access elective repair or a multitude of reasons, ranging from availability of a provider to inability to pay. Regardless of the individual circumstance that necessitate delay in care, publicly insured and uninsured patients often present with larger hernias and overall worsened disease state (i.e., greater comorbidity burden, greater rate of emergent repair), as demonstrated in this study, and subsequently face increased risk of complication and poor outcomes. Our results confirm these findings and suggest that publicly insured patients may warrant special intervention/monitoring after discharge to prevent readmission and ED utilization. Previous studies seeking to address insurance-related gaps in care through specialized interventions have found evidence of improved outcomes and reduced readmissions and ED visits for patients participating in these programs [12–15], as well as beneficial cost savings to the health system in terms of reduced healthcare utilization [15]. While similar models may be beneficial among patients undergoing hernia repair, including coordination with community health sites, increased follow-up, and additional instruction regarding appropriate postdischarge care, data regarding the efficacy of these types of interventions in the hernia disease space are limited and should be an area of focus for future studies.

While this work is important in the field of hernia and surgery as a whole, there are several limitations that must be addressed. Data obtained from the national ACHQC registry may have discrepancies between participating sites. However, the ACHQC has previously adopted standards for data entry which seek to minimize this variation. The ACHQC consists of primarily high-volume hernia surgeons, so results may not be generalizable to everyone. The comparison groups in this study are also limited by a lack of specificity in regards to self-pay insurance, because it may also contain patients who elect to pre-pay for surgery instead of billing through insurance. As a result, the self-pay group may not

Table 1 Demographics by insurance type

	Private *N*=13,980 (85.8%)	Medicaid *N*=2451 (8.4%)	Self-pay *N*=605 (5.8%)	Total *N*=17,036 (100%)	*p*-value
Age; Mean (SD)	49.3 (10.1)	45.2 (11.4)	46.3 (10.4)	48.6 (10.4)	<0.01**
Sex					<0.01*
Male	7671 (54.9%)	885 (36.1%)	306 (50.6%)	8862 (52.0%)	
Female	6309 (45.1%)	1566 (63.9%)	299 (49.4%)	8174 (48.0%)	
Race					<0.01*
Black	1207 (8.7%)	579 (23.8%)	61 (10.1%)	1847 (10.9%)	
White	11,800 (85.2%)	1576 (64.9%)	431 (71.7%)	13,807 (81.8%)	
Other[a]	835 (6.0%)	273 (11.2%)	109 (18.1%)	1217 (7.2%)	
Baseline promis pain summary[b]					<0.01**
Mean (SD)	44.6 (9.6)	50.5 (10.1)	46.6 (8.9)	45.4 (9.9)	
Baseline HerQLes summary					<0.01**
Mean (SD)	48.8 (27.8)	35 (27.2)	44.6 (26.2)	46.8 (28.1)	
BMI					<0.01**
Mean (SD)	32.5 (7.2)	33.7 (8.4)	33.6 (7.9)	32.5 (7.2)	
Hepatic insufficiency					<0.01*
No	12,133 (99.4%)	2049 (98.1%)	498 (99%)		
Yes	76 (0.6%)	40 (1.9%)	5 (1%)		
Hypertension					0.08*
No	8924 (64.2%)	1520 (62.3%)	401 (66.6%)		
Yes	4975 (35.8%)	920 (37.7%)	201 (33.4%)		
Diabetes					<0.01*
No	12,090 (87.0%)	2046 (83.9%)	525 (87.2%)		
Yes	1809 (13.0%)	394 (16.1%)	77 (12.8%)		
COPD					<0.01*
No	13,531 (97.4%)	2233 (91.5%)	579 (96.2%)		
Yes	368 (2.6%)	207 (8.5%)	23 (3.8%)		
Tobacco use					<0.01*
Current (<1m)	1477 (10.6%)	648 (26.4%)	129 (21.3%)		
Former (<1y)	505 (3.6%)	200 (8.2%)	29 (4.8%)		
Former (1y+)	2417 (17.3%)	402 (16.4%)	73 (12.1%)		
Never	9500 (68.0%)	1190 (48.6%)	371 (61.3%)		
Mental health[c]					<0.01*
Major depression	86 (0.6%)	44 (1.8%)	5 (0.8%)		
Anxiety disorder	113 (0.8%)	47 (1.9%)	4 (0.7%)		
Other psychiatric	32 (0.2%)	16 (0.6%)	1 (0.2%)		
None	11,817 (84.2%)	2024 (81.4%)	522 (85.9%)		
Unknown	1990 (14.2%)	354 (14.2%)	76 (12.5%)		
Substance use[c]					<0.01*
Recent opioid (<30d)	52 (0.4%)	23 (0.9%)	3 (0.5%)		
Provider Rx opioid (>90d)	52 (0.4%)	25 (1%)	4 (0.7%)		
Non-provider Rx (>90d)	5 (0%)	4 (0.2%)	0 (0%)		
Other substance	11,274 (80.5%)	1965 (79.7%)	497 (81.7%)		
None	632 (4.5%)	94 (3.8%)	28 (4.6%)		
Unknown	1990 (14.2%)	354 (14.4%)	76 (12.5%)		

[a]Other Race = American Indian or Alaskan, Asian or Pacific Islander, Hispanic, or Middle Eastern

[b]Promis pain summary score = calculated NIH pain intensity 3a scales scores

[c]"Select all" variable (values may exceed total number of patients)

*Chi-Square test

**Kruskal–Wallis test

Table 2 Operative characteristics by insurance type

	Private *N*=13,980 (85.8%)	Public *N*=2451 (8.4%)	Self-pay *N*=605 (5.8%)	Total *N*=17,036 (100%)	*p*-value
Operative approach					0.4*
Open	8951 (64.0%)	1559 (63.6%)	404 (66.8%)	10,914 (64.1%)	
Lap	1767 (12.6%)	315 (12.9%)	80 (13.2%)	2162 (12.7%)	
Robotic	2698 (19.3%)	470 (19.2%)	106 (17.5%)	3274 (19.2%)	
Other	564 (4%)	107 (4.4%)	15 (2.5%)	686 (4%)	
ASA class					<0.01*
I	1940 (13.9%)	233 (9.5%)	81 (13.4%)	2254 (13.2%)	
II	7139 (51.1%)	955 (39%)	315 (52.1%)	8409 (49.4%)	
III	4730 (33.9%)	1180 (48.2%)	198 (32.7%)	6108 (35.9%)	
IV	154 (1.1%)	82 (3.3%)	11 (1.8%)	247 (1.5%)	
Elective					<0.01*
No	333 (2.4%)	105 (4.3%)	42 (6.9%)	480 (2.8%)	
Yes	13,647 (97.6%)	2346 (95.7%)	563 (93.1%)	16,556 (97.2%)	
Recurrent					<0.01*
No	10,735 (77.2%)	1744 (71.5%)	490 (81.4%)	12,969 (76.5%)	
Yes	3165 (22.8%)	696 (28.5%)	112 (18.6%)	3973 (23.5%)	
Hernia type					<0.01*
Incisional	7548 (52.4%)	1583 (61.9%)	328 (52.3%)	9459 (53.8%)	
Parastomal	453 (3.1%)	129 (5.0%)	25 (4.0%)	607 (3.5%)	
Primary	6327 (44.0%)	841 (32.9%)	273 (43.5%)	7441 (42.3%)	
Diastasis recti	65 (0.5%)	6 (0.2%)	1 (0.2%)	72 (0.4%)	
Hernia width (cm)					<0.01**
Mean (SD)	5.2 (5.4)	5.9 (5.9)	5.3 (5.0)	5.3 (5.5)	
Hernia length (cm)					<0.01**
Mean (SD)	7.3 (7.9)	8.7 (8.4)	7.5 (7.7)	7.5 (7.9)	
Mesh used					0.92*
No	2419 (17.3%)	429 (17.5%)	108 (17.9%)	2956 (17.4%)	
Yes	11,561 (82.7%)	2022 (82.5%)	497 (82.1%)	14,080 (82.6%)	

be fully representative of the uninsured patient population. Importantly, insurance was used as a marker of low socioeconomic status and therefore older patients were excluded as all adults 65 or older become publicly insured and therefore lose the nuance of SES in analysis. However, there are likely important socioeconomic differences within this older cohort which should be explored in future studies which have more granular data available. Finally, some outcomes may be subject to response bias wherein the patients who returned to the ED for additional care have an increased opportunity to have complications indicated in their record, as opposed to patients who do not return for additional care and may therefore appear to exhibit lower rates of these outcomes. However, by utilizing multivariate analysis to control for these factors, this analysis is strengthened and the results are made more reliable.

This paper fills an important gap in the literature and provides a foundation for future studies which further explores the complex interplay of socioeconomic vulnerability, public health, and surgery. Patients with public insurance required increased ED care, had more complications, and were more frequently readmitted. Evidencing these inequities on the basis of insurance type serves as a small step toward supporting L-SES patients and understanding their unique care needs, while contextualizing their experience of hernia disease. Future studies should continue to explore this area and provide additional context for patients undergoing VHR.

Conclusion

This study demonstrated that public and self-pay insurance are associated with worse postoperative outcomes compared to private insurance, including increased odds of postoperative complication, ED visit, and readmission. In an effort

Table 3 Univariate 30-day postoperative outcomes by insurance type

	Private *N*=13,980	Public *N*=2451	Self-pay *N*=605	Total *N*=17,036	*p*-value
ED visit					<0.01*
No	11,534 (96.2%)	1815 (90.7%)	414 (91.6%)	13,763 (95.3%)	
Yes	454 (3.8%)	186 (9.3%)	38 (8.4%)	678 (4.7%)	
Any complication					<0.01*
No	10,699 (87.2%)	1692 (81.2%)	384 (80.2%)	12,775 (86.1%)	
Yes	1573 (12.8%)	391 (18.8%)	95 (19.8%)	2059 (13.9%)	
Complication type: SSI					<0.01*
No	1200 (97.8%)	1995 (95.8%)	455 (95.0%)	14450 (97.4%)	
Yes	272 (2.2%0	88 (4.2%)	24 (5.0%)	384 (2.6%)	
Complication type: SSO					<0.01*
No	11119 (90.6%)	1781 (85.5%)	405 (84.6%)	13305 (89.7%)	
Yes	1153 (9.4%)	302 (14.5%)	74 (15.4%)	1529 (10.3%)	
Readmission					<0.01*
No	11,876 (96.8%)	1948 (93.5%)	449 (93.7%)	14,273 (96.2%)	
Yes	396 (3.2%)	135 (6.5%)	30 (6.3%)	561 (3.8%)	
Reoperation					<0.01*
No	12150 (99.0%)	2036 (97.7%)	471 (98.3%)	14657 (98.8%)	
Yes	122 (1.0%)	47 (2.3%)	8 (1.7%)	177 (1.2%)	
Recurrence					<0.01*
No	12241 (99.8%)	2068 (99.3%)	476 (99.4%)	14785 (99.7%)	
Yes	30 (0.2%)	15 (0.7%)	3 (0.6%)	48 (0.3%)	
Postoperative HerQLes summary score (30d)					<0.01**
Mead (SD)	60.14 (28.55)	48.91 (29.89)	56.36 (30.87)	58.76 (28.98)	
Difference in HerQLes summary score (baseline to 30d)					0.33**
Mean (SD)	10.21 (28.43)	12.2 (27.11)	15.19 (31.1)	10.53 (28.3)	
Postoperative Promis pain summary Score[@] (30d)	44.26 (8.49)	48.97 (9.41)	44.56 (9.15)	44.82 (8.74)	<0.01**
Difference in Promis pain summary score (baseline to 30d)					0.02**
Mean (SD)	−0.28 (10.3)	1.25 (10.9)	2.37 (11.52)	−0.05 (10.41)	
Postoperative HerQLes summary score (1y)					<0.01**
Mean (SD)	75.53 (25.52)	64.69 (32.32)	61.85 (34.84)	74.19 (26.72)	
Difference in HerQLes summary score (baseline to 1 year)					0.53**
Mean (SD)	29.63 (27.99)	32.91 (32.4)	37.64 (32.37)	30.09 (28.57)	
Postoperative Promis pain summary score[@] (1y)					<0.01**
Mean (SD)	38.09 (9.02)	42.38 (11.32)	41.36 (9.32)	38.59 (9.38)	
Difference in postoperative Promis pain summary score (baseline to 1y)					0.26**
Mean (SD)	7.19 (10.31)	9.36 (10.83)	8.24 (11.01)	7.45 (10.39)	

*Chi-Square test

**Kruskal-Wallis test

to promote health equity, surgical providers need to assess how parameters beyond physical presentation may impact a patient's health and take these into consideration when weighing operative intervention for VHR, while working to support vulnerable patients in the perioperative period as they have demonstrated increased risk for poor outcomes.

Table 4 Logistic regression model for unplanned ED visit within 30 days

Variable	Odds ratio	95% confidence limits		*p*-value
Insurance				<0.01
Private	Ref.	–	–	
Public	1.7	1.4	2.0	
Self-pay	1.6	1.1	2.4	
Postop complication				<0.01
No	Ref.	–	–	
Yes	5.6	4.7	6.7	
Gender				<0.01
Male	Ref.	–	–	
Female	1.3	1.1	1.6	
Race				<0.01
White	Ref.	–	–	
Other	1.6	1.2	2.2	
Black	1.3	1.0	1.6	
Tobacco Use				<0.01
Never	Ref.	–	–	
Current <1m	1.5	1.2	1.8	
Former <1y	1.1	0.9	1.4	
Former 1y+	1.3	0.9	1.9	
ASA class				<0.01
I	Ref.	–	–	
II	4.2	2.5	7.0	
III	5.4	3.2	9.1	
IV	5.7	2.6	12.2	
Mesh used				<0.01
No	Ref.	–	–	
Yes	1.8	1.3	2.4	

Table 5 Logistic regression model for any postoperative complication within 30 days

Variable	Odds ratio	95% confidence limits		*p*-value
Insurance				<0.01
Private	Ref.	–	–	
Public	1.29	1.13	1.48	
Self-pay	1.64	1.28	2.08	
Age	1.01	1.00	1.02	<0.01
Hypertension				0.02
No	Ref.	–	–	
Yes	1.14	1.03	1.27	
COPD				<0.01
No	Ref.	–	–	
Yes	1.53	1.24	1.89	
Elective case				<0.01
No	Ref.	–	–	
Yes	0.66	0.52	0.84	
ASA class				<0.01
I	Ref.	–	–	
II	2.14	1.67	2.74	
III	4.17	3.23	5.38	
IV	5.51	3.71	8.20	
Operative approach				<0.01
Open	Ref.	–	–	
Lap	0.77	0.67	0.90	
Robotic	0.59	0.51	0.68	
Other	0.93	0.73	1.17	
BMI in kg/m^2	1.03	1.02	1.03	<0.01

Table 6 Logistic regression model for readmission within 30 days

Variable	Odds Ratio	95% Confidence Limits		P-value
Insurance				<0.01
Private	Ref.	–	–	
Public	1.54	1.23	1.91	
Self-pay	1.82	1.23	2.70	
Gender				<0.01
Male	Ref.	–	–	
Female	1.38	1.16	1.65	
Tobacco use				<0.01
Never	Ref.	–	–	
Current <1m	1.11	0.86	1.44	
Former <1y	1.35	1.09	1.68	
Former 1y+	2.03	1.48	2.79	
Elective case				<0.01
No	Ref.	–	–	
Yes	0.56	0.38	0.81	
ASA class				<0.01
I	Ref.	–	–	
II	2.82	1.70	4.69	
III	5.98	3.57	10.04	
IV	8.30	4.14	16.65	
Operative approach				<0.01
Open	Ref.	–	–	
Lap	0.64	0.48	0.86	
Robotic	0.65	0.50	0.84	
Other	1.23	0.85	1.78	

Declarations

Disclosures Savannah Renshaw, Dahlia Kenawy, Rosevine Azap, Anand Gupta, and Courtney Collins have no conflicts of interest or financial ties to disclose. Benjamin Poulose has received research support from BD and Advanced Medical Solutions. He currently receives salary support from the Abdominal Core Health Quality Collaborative (ACHQC) as the Director for Quality and Outcomes.

References

1. Brown EE, Schwartz M, Shi C et al (2020) Understanding why urban, low-income patients miss primary care appointments: insights from qualitative interviews of West Philadelphians. J Ambulatory Care Manage. 43(1):30–40. https://doi.org/10.1097/JAC.0000000000000316
2. Nabi J, Tully KH, Cole AP et al (2021) Access denied: the relationship between patient insurance status and access to high-volume hospitals. Cancer. 127(4):577–585. https://doi.org/10.1002/cncr.33237
3. Halpern MT, Ward EM, Pavluck AL, Schrag NM, Bian J, Chen AY (2008) Association of insurance status and ethnicity with cancer stage at diagnosis for 12 cancer sites: a retrospective analysis. Lancet Oncol. 9(3):222–231. https://doi.org/10.1016/S1470-2045(08)70032-9
4. Allen H, Gordon SH, Lee D, Bhanja A, Sommers BD (2021) Comparison of utilization, costs, and quality of Medicaid vs Subsidized private health insurance for low-income adults. JAMA Netw Open. 4(1):e2032669. https://doi.org/10.1001/jamanetworkopen.2020.32669
5. Wolf LL, Scott JW, Zogg CK et al (2016) Predictors of emergency ventral hernia repair: targets to improve patient access and guide patient selection for elective repair. Surgery. 160(5):1379–1391. https://doi.org/10.1016/j.surg.2016.06.027
6. Wang DE, Chung PJ, Barrera R, Coppa GF, Alfonso AE, Sugiyama G (2021) Systemic determinants in surgery: nonclinical factors affecting time to operation for incarcerated ventral hernias. Am Surg. https://doi.org/10.1177/00031348211011118
7. Simon KL, Frelich MJ, Gould JC, Zhao HS, Szabo A, Goldblatt MI (2015) Inpatient outcomes after elective versus nonelective ventral hernia repair. J Surg Res. 198(2):305–310. https://doi.org/10.1016/j.jss.2015.03.073
8. London JA, Utter GH, Sena MJ, Chen SL, Romano PS (2009) Lack of insurance is associated with increased risk for hernia complications. Ann Surg. 250(2):331–337. https://doi.org/10.1097/SLA.0b013e3181ae9d27
9. Novitsky YW, Orenstein SB (2013) Effect of patient and hospital characteristics on outcomes of elective ventral hernia repair in the United States. Hernia J Hernias Abdom Wall Surg. 17(5):639–645. https://doi.org/10.1007/s10029-013-1088-5
10. Singh S, Zagadailov P, Turner AL, Merchant AM (2021) Socioeconomic risk factors for mortality and readmission after surgery for bowel obstruction: an analysis of the Nationwide Readmissions Database. Am J Surg. https://doi.org/10.1016/j.amjsurg.2021.04.026
11. Shaw JH, Wesemann LD, Ayoola AS, Les CM, Charters MA, North WT (2021) Comparison of area deprivation index, socioeconomic parameters, and preoperative demographics with postoperative emergency department visits after total knee arthroplasty. J Arthroplasty. 36(8):2788–2794. https://doi.org/10.1016/j.arth.2021.03.058
12. Hwang U, Dresden SM, Vargas-Torres C et al (2021) Association of a geriatric emergency department innovation program with cost outcomes among Medicare beneficiaries. JAMA Netw Open. 4(3):e2037334. https://doi.org/10.1001/jamanetworkopen.2020.37334
13. Grudzen C, Richardson LD, Baumlin KM et al (2015) Redesigned geriatric emergency care may have helped reduce admissions of older adults to intensive care units. Health Aff (Millwood). 34(5):788–795. https://doi.org/10.1377/hlthaff.2014.0790
14. Berkowitz SA, Parashuram S, Rowan K et al (2018) Association of a care coordination model with health care costs and utilization: the Johns Hopkins community health partnership (J-CHiP). JAMA Netw Open. 1(7):e184273. https://doi.org/10.1001/jamanetworkopen.2018.4273
15. Burton RA, Zuckerman S, Haber SG, Keyes V (2020) Patient-centered medical home activities associated with low Medicare spending and utilization. Ann Fam Med. 18(6):503–510. https://doi.org/10.1370/afm.2589