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Medicaid and Medicare payer status are associated with worse surgical outcomes in gynecologic oncology

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HIGHLIGHTS

- We studied the association between primary payer status (Medicaid, Medicare, private) and postoperative outcomes.
- Medicaid and Medicare patients had longer hospital stays, mobilized late, and were admitted to the ICU at a higher rate.
- Medicaid patients had higher total hospital costs.

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ABSTRACT

Objective. To compare postoperative outcomes by primary payer status for patients with gynecologic malignancies.

Methods. We retrospectively reviewed patients who underwent elective surgery for gynecologic malignancies between 2015 and 2019. Patient outcomes were compared by payer status using logistic regression. Sociodemographic and clinical covariates were selected a priori and included age, American Society of Anesthesiologists physical status classification, body mass index, smoking status, malignancy site, surgery type, race, estimated income, marital status, and medical interpreter requirement.

Results. A total of 1894 patients comprised the study sample. In the multivariate model, compared to patients with private insurance, Medicaid and Medicare patients were more likely to mobilize >24 h after surgery (OR 1.9, $p < 0.05$ and OR 3.2, $p < 0.001$, respectively), to require ICU admission (OR 4.0, $p < 0.05$ and OR 5.0, $p < 0.05$, respectively), and to have longer lengths of stay (OR 1.8, $p < 0.05$ and OR 2.2, $p < 0.001$, respectively). Medicaid patients were also more likely to have higher total hospital costs (OR 1.7, $p < 0.05$). Payer status was not associated with postoperative pain, postoperative opiate use, or 30-day readmission rates.

Conclusions. Medicaid and Medicare payer status are associated with worse postoperative outcomes in patients with gynecologic malignancies. The poor outcomes of Medicaid patients – a cohort defined by limited income – are noteworthy. The etiology is likely multifactorial, arising from a complex interplay of factors ranging from system issues such as access to care to the unique health status of a population bearing a high burden of disease and socioeconomic adversity.

1. Background

The number of uninsured Americans declined from 45 million to 28 million following implementation of the Affordable Care Act (ACA) in 2014. While private insurance remains the most prevalent form of coverage for roughly two-thirds of Americans, Medicaid now insures 1 in 5 people [1]. Medicaid provides coverage for many low-income individuals earning <133% of the poverty level, which amounts to approximately $35,000 for a family of four [2].

While health insurance is an important prerequisite to accessing health care in the U.S., coverage does not ensure access [3]. Providers are less likely to accept Medicaid compared to private insurance, creating challenges for many patients, particularly in rural areas and when seeking specialty care [4]. Sequelae of low socioeconomic status including lack of access to transportation and food insecurity pose further barriers to care and competing priorities [5,6]. In addition to impaired access to care, Medicaid enrollees have a higher incidence of chronic

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health conditions and psychosocial comorbidities compared to privately insured individuals [7].

Previous studies have demonstrated an association between primary payer status and health outcomes in a variety of clinical settings, with patients on Medicaid faring worse than those with private insurance [8,9]. To our knowledge, this has not been studied in the gynecologic cancer population. Previous studies have also demonstrated worse outcomes for patients enrolled in Medicare. Medicare is designed for older adults and patients with chronic medical conditions, whereas Medicaid is a financial needs-based program. Thus, Medicaid patients were the primary focus of our study.

2. Methods

2.1. Participants

This is a retrospective study of patients undergoing elective, or non-emergent, surgery for gynecologic malignancies at the University of California, San Francisco (UCSF) Medical Center between February 2015 and March 2019. Data were obtained from the UCSF Perioperative Pathway program, which compiles data from the electronic health record.

2.2. Outcomes

The primary outcomes were length of stay (LOS), cost of hospitalization, postoperative pain, postoperative morphine milligram equivalents (MMEs), hours to first postoperative ambulation, 30-day readmission, and ICU admission. Postoperative pain was adjusted by the patient's preoperative pain level. Postoperative MMEs were averaged over the patient's hospital stay to provide an average daily requirement.

For the analysis, numeric outcomes were dichotomized using clinically-meaningful cutoffs if available and medians otherwise. The expected LOS for patients undergoing laparoscopic or robotic surgery is ≤1 day; thus, LOS was dichotomized as ≤1 day vs. >1 day. LOS for open surgeries is more variable; therefore, the median LOS of 3 days was used as a cutoff, with LOS dichotomized as ≤3 days vs. >3 days. Cost of hospitalization varies by geographic region and hospital in addition to surgical factors; thus, the median hospital costs for our sample, stratified by surgery type (open, laparoscopic, robotic), were used as cutoffs. Postoperative pain was compared to preoperative pain and then dichotomized as decreased or stable vs. increased, which was defined as an increase in pain by >2 pain points, the median increase for all patients. Postoperative MMEs was dichotomized at 50 MMEs per day, the limit recommended by the Centers for Disease Control and Prevention (CDC) [10]. Early mobilization after surgery is frequently cited in Enhanced Recovery After Surgery (ERAS) protocols, however there is no accepted definition. Ambulation occurring within 24 h of surgery was defined as early based on available data in the orthopedics literature [11].

2.3. Statistical analysis

In addition to the primary predictor of payer status, variables considered to confound the association between payer status and postoperative outcomes were selected a priori. These included patient age, American Society of Anesthesiologists (ASA) physical status classification, body mass index (BMI), smoking status, malignancy site (ovarian, uterine, cervical, vulvar/vaginal), surgery type (open, laparoscopic, robotic), race/ethnicity, marital status, median income (estimated by ZIP code using Census data [12]), and medical language interpreter requirement.

Univariate and multivariate logistic regression analyses were performed to calculate the unadjusted and adjusted effects of payer status on outcomes. All covariates were retained in the final models due to significant differences between payer groups. Results are reported as odds ratios (OR) with a 95% confidence interval. Statistical significance was defined a priori as $p < 0.05$. Data were analyzed using STATA software version 15 (StataCorp, College Station, TX).

3. Results

3.1. Patient characteristics

A total of 1894 patients comprised the study sample, including 704 (37%) with Medicaid, 465 (25%) with Medicare, and 725 (38%) with private insurance. Patient characteristics by payer group are shown in Table 1. Mean age was highest in the Medicare group (69.5 ± 9.6). Uterine cancer was the most common malignancy overall (44%) followed by ovarian cancer (28%). Forty-eight percent of patients underwent open surgery, but patients with private insurance were most likely to undergo laparoscopic surgery (35%). Medicaid patients were more likely than patients in the other payer groups to be non-White (60%), non-English-speaking (28%), smokers (6%), and in the lowest income quartile (39%). They also had a significantly higher average BMI (32.2±9.5).

3.2. Unadjusted outcomes

Table 2 shows the effect of payer group on postsurgical outcomes in univariate regression analysis. Compared to patients with private insurance, Medicaid patients were more likely to have longer lengths of stay (OR 1.8, $p < 0.001$), higher hospital costs (OR 1.6, $p < 0.001$), and higher rates of ICU admission (OR 2.0, $p < 0.05$). They were also more likely to mobilize late after surgery (OR 1.4, $p < 0.05$). They did not have higher pain levels, postoperative opiate requirements, or 30-day readmission rates. Similar trends were observed for Medicare patients.

3.3. Adjusted outcomes

Table 3 shows the effect of payer group on postsurgical outcomes in multivariate regression analysis. All significant associations in univariate analysis remained significant in the multivariate model for Medicaid patients. Compared to privately insured patients, Medicaid patients were four times more likely to require ICU admission (OR 4.0, $p < 0.05$) and nearly two times more likely to have longer lengths of stay (OR 1.8, $p < 0.05$). They were also more likely to incur higher hospital costs (OR 1.7, $p < 0.05$) and to mobilize late (OR 1.9, $p < 0.05$). Medicare patients had similarly worse outcomes compared to privately insured patients, however they did not incur higher hospital costs. Table 4 shows the associations between covariates and outcomes in the multivariate models. Older age, non-White race, higher ASA class, open surgery (as compared to laparoscopic), and ovarian malignancy (as compared to vulvar/vaginal) were generally associated with poorer outcomes.

4. Discussion

To our knowledge, this is the first study investigating the effect of payer status on postoperative outcomes for patients undergoing surgery for gynecologic malignancies. We demonstrate that, during the years 2015 to 2019, Medicaid and Medicare patients had significantly worse postoperative outcomes compared to privately insured patients, independent of clinical and sociodemographic covariates. Medicaid patients were more likely to mobilize late, require ICU admission, stay in the hospital longer, and incur greater hospital costs. Medicare patients had similarly worse outcomes, however they did not have higher hospital costs.

Payer status has been shown to affect health care outcomes in surgical and non-surgical clinical settings. In a large study of nearly 900,000 surgeries, uninsured, Medicaid, and Medicare patients had significantly worse postoperative outcomes compared to patients with private insurance, including higher complication rates, longer lengths of stay, higher hospital costs, and higher mortality [8]. Another study of >400,000 patients undergoing colectomy demonstrated similar results, with

Table 1
Characteristics for study sample of patients undergoing surgery for gynecologic malignancies.

Characteristic	Medicaid	Medicare	Private	P-Value
N (%)	704 (37.2%)	465 (24.5%)	725 (38.3%)	
Age, mean ± SD	48.0 ± 12.4	69.5 ± 9.6	50.1 ± 11.8	<0.001
ASA rating, mean ± SD	2.2 ± 0.6	2.4 ± 0.5	2.0 ± 0.6	<0.001
BMI, mean ± SD	32.2 ± 9.5	29.2 ± 8.2	27.9 ± 8.0	<0.001
Smokers (%)	46 (6.5%)	12 (2.6%)	16 (2.2%)	<0.001
Surgery type				
Laparoscopic	161 (22.9%)	125 (26.9%)	256 (35.3%)	<0.001
Open	352 (50.0%)	225 (48.4%)	329 (45.4%)	
Robotic	191 (27.1%)	115 (24.7%)	140 (19.3%)	
Malignancy site				
Cervical	129 (24.8%)	12 (3.6%)	109 (23.4%)	<0.001
Ovarian	144 (27.6%)	94 (28.5%)	135 (29%)	
Uterine	214 (41.1%)	166 (50.3%)	194 (41.6%)	
Vulvar/vaginal	34 (6.5%)	58 (17.6%)	28 (6.0%)	
Race/ethnicity				
American Indian, Alaska Native, and Native Hawaiian	14 (2.1%)	6 (1.3%)	17 (2.4%)	<0.001
Asian	80 (11.9%)	45 (9.9%)	103 (14.6%)	
Black or African American	42 (6.2%)	17 (3.7%)	21 (3.0%)	
Hispanic or Latino	230 (34.2%)	34 (7.5%)	83 (11.8%)	
Other	40 (5.9%)	17 (3.7%)	26 (3.7%)	
White - not Hispanic or Latino	266 (39.6%)	336 (73.8%)	456 (64.6%)	
Median household income by ZIP, sample quartiles				
$22,500–$47,000	268 (38.8%)	93 (20.4%)	109 (15.4%)	<0.001
$47,000–$65,000	222 (32.1%)	107 (23.5%)	129 (18.2%)	
$65,00–$86,000	123 (17.8%)	140 (30.7%)	205 (28.9%)	
>$86,000	78 (11.3%)	116 (25.4%)	266 (37.5%)	
Marital status				
Divorced/legally separated	86 (12.9%)	67 (15.2%)	48 (6.9%)	<0.001
Partnered	261 (39.1%)	186 (42.1%)	444 (63.5%)	
Single	284 (42.6%)	110 (24.9%)	193 (27.6%)	
Widowed	36 (5.4%)	79 (17.9%)	14 (2.0%)	
Medical interpreter required	196 (27.8%)	43 (9.2%)	36 (5.0%)	<0.001

Medicaid and Medicare payer status independently associated with worse outcomes [13]. In both studies, Medicaid patients had the worst outcomes. Significant disparities in cancer survival have also been shown by payer status, with Medicaid patients experiencing higher mortality [6,9,14].

In this study, while Medicaid patients fared worse than privately insured patients on a greater number of outcome measures compared to Medicare patients, the magnitude of the differences were generally smaller. Patients are eligible for Medicare with certain chronic medical conditions or at age 65, at which time healthcare utilization costs are known to rise significantly [15]. In contrast, Medicaid is a financial needs-based program. Thus, the poor health outcomes observed for Medicaid patients – a cohort defined by limited income – suggest socioeconomic-related health vulnerabilities.

A multifactorial etiology has been hypothesized to account for the observed associations between payer status and health outcomes. We summarize two major categories of responsible factors: 1) the effect of payer status on health care access and quality, and 2) the health profiles of patients insured by the major payer groups. These factors are invariably related and non-mutually-exclusive.

Despite preliminary evidence suggesting improved access to care for Medicaid patients as a result of the ACA [16], providers remain less likely to accept Medicaid compared to private insurance. Difficulties accessing care are especially profound for patients in rural areas and patients seeking specialty care [4,17]. Cancer patients with Medicaid are more likely to present with advanced-stage disease and less likely to undergo cancer-directed surgery and/or radiation, suggesting impaired access to adequate treatment [9]. Additionally, payer populations may seek care in different hospitals with variable performance on metrics of health care quality, resulting in disparities in the quality of care received. Within-hospital quality may even vary by insurance status [18], and Medicaid patients have reported perceived bias and discrimination in treatment due to having “state insurance” [5].

Table 2
Unadjusted effect of payer group on postoperative outcomes for patients undergoing surgery for gynecologic malignancies.

Outcome	Medicaid	Medicare	Private
Length of stay (*>1 day for minimally invasive, >3 days for open*)	1.8 (1.4–2.3)**	2.7 (2.1–3.5)**	1
Total hospital cost (*>median by surgery type*)	1.6 (1.3–1.9)**	2.1 (1.6–2.6)**	1
Postoperative pain (*increased by >2 points from baseline*)	1.2 (1.0–1.6)	0.8 (0.6–1.0)	1
Postoperative opiate use (*>50 MMEs*)	1.3 (0.9–1.9)	1.1 (0.8–1.7)	1
Postoperative mobilization (*>24 h*)	1.4 (1.0–2.0)*	2.4 (1.7–3.3)**	1
30-day readmission	0.88 (0.6–1.3)	1.02 (0.6–1.6)	1
ICU admission	2.0 (1.2–3.3)*	3.4 (2.1–5.7)**	1

*$p < 0.05$, **$p < 0.001$. Outcomes are reported as unadjusted odds ratios (95% confidence interval). Numeric outcomes were dichotomized using clinically-meaningful cutoffs and medians. Reference group: private payer status.

Table 3
Adjusted effect of payer group on postoperative outcomes for patients undergoing surgery for gynecologic malignancies.

Outcome	Medicaid	Medicare	Private
Length of stay (*>1 day for minimally invasive, >3 days for open*)	1.8 (1.2–2.5)*	2.2 (1.4–3.4)**	1
Total hospital cost (*>median by surgery type*)	1.7 (1.2–2.4)*	1.4 (0.9–2.1)	1
Postoperative pain (*increased by >2 points from baseline*)	1.0 (0.7–1.5)	1.1 (0.7–1.6)	1
Postoperative opiate use (*>50 MMEs*)	1.6 (0.8–3.3)	1.1 (0.5–2.5)	1
Postoperative mobilization (*>24 h*)	1.9 (1.1–3.3)*	3.2 (1.7–6.0)**	1
30-day readmission	0.8 (0.4–1.5)	1.0 (0.5–2.1)	1
ICU admission	4.0 (1.6–9.8)*	5.0 (1.9–13.2)*	1

*$p < 0.05$, **$p < 0.001$. Outcomes are reported as unadjusted odds ratios (95% confidence interval). Numeric outcomes were dichotomized using clinically-meaningful cutoffs and medians. Reference group: private payer status. Outcomes are adjusted for age, BMI, ASA rating (proxy for medical comorbidities), smoking status, surgery type (open, laparoscopic, robotic), malignancy site (ovarian, uterine, cervical, vulvar/vaginal), income (estimated using ZIP code), race/ethnicity, marital status, and medical interpreter requirement.

There is also strong evidence that the Medicaid population carries a unique health burden. Medicaid patients have been shown to have higher rates of preventable chronic health conditions and psychiatric disorders, and to rate their health poorly [19,20]. Additionally, though Medicaid reduces financial barriers, other sequelae of low socioeconomic status – such as homelessness, food insecurity, poor psychosocial support, and lack of access to transportation – pose additional barriers to care and competing priorities to maintaining good health [5].

Importantly, patients may enroll in Medicaid retroactively, following a new diagnosis or health event. Indeed, health care providers often assist patients in applying for Medicaid when they become ill. The Medicaid population therefore includes stably-insured patients as well as recently uninsured patients who experienced a catastrophic or unexpected health event. Research suggests that cancer patients intermittently enrolled in Medicaid or not enrolled until after diagnosis are more likely to have late-stage disease compared to patients enrolled in Medicaid prior to diagnosis [21,22,23]. Thus, the unfavorable outcomes of Medicaid patients may reflect, at least in part, the consequences of prior uninsured status.

In this study, we used ASA rating as a proxy for overall health status, in addition to age, BMI, smoking status, and malignancy site. We also accounted for socioeconomic indicators including income, race, marital status, and language barriers. However, we were unable to control for specific medical comorbidities and stage of disease. As such, Medicaid patients' worse outcomes may reflect poorer overall health status, system issues such as impaired access to care, and still other clinical and

Table 4
Adjusted effects of covariates on postoperative outcomes for patients undergoing surgery for gynecologic malignancies.

Outcome	Age	BMI	ASA Rating	Smoking status (Ref: non-smoker)	Surgery type (Ref: laparoscopic)	Malignancy site (Ref: vulvar/vaginal)	Income	Race (Ref: white)	Marital status (Ref: married)	Interpreter required (Ref: no)
Length of stay (*>1 day for minimally invasive, >3 days for open*)	*	–	**	–	Open** Robotic*	Cervical** Ovarian** Uterine**	–	Native Am.* Asian Black Latino Other	–	–
Total hospital cost (*>median by surgery type*)	**	*	**	–	–	Cervical** Ovarian** Uterine**	–	Native Am.* Asian* Black Latino Other	–	–
Postoperative pain (*increased by >2 points from baseline*)	*	–	–	–	Open* Robotic	Cervical Ovarian Uterine	–	–	–	–
Postoperative opiate use (*>50 MMEs*)	–	–	–	–	Open** Robotic	Cervical Ovarian* Uterine	–	Native Am. Asian Black Latino* Other	Single Divorced Widowed	–
Postoperative mobilization (*>24 h*)	–	–	*	*	Open* Robotic	Cervical* Ovarian** Uterine*	–	Native Am.* Asian Black Latino Other	–	–
30-Day readmission	–	–	*	–	Open* Robotic	–	–	Native American Asian Black* Latino Other	Single Divorced Widowed*	–
ICU admission	–	**	**	–	Open* Robotic	–	–	–	–	–

*$p < 0.05$, **$p < 0.001$. All significant associations were predictive of worse outcomes. Native American includes American Indians, Alaskan Natives, and Native Hawaiians. Married includes those with a significant other. Divorced includes those legally separated.

social factors. Nevertheless, our study of nearly 1900 patients at a large tertiary cancer care center suggests insurance status may reasonably be considered an important social risk factor for postoperative outcomes.

Further research is required to increase understanding of the complex relationships between biologic, health care system, and socioeconomic factors influencing health. Characterizing the drivers of worse outcomes may identify specific policy areas or clinical practices which may be targeted to improve outcomes. Meanwhile, Sastow et al. propose integrating biopsychosocial risk factors into ERAS protocols to reduce health disparities [13]. Simultaneously, clinicians, in their one-on-one relationships with patients, may improve outcomes by seeking to understand patients' social contexts in order to develop tailored treatment plans which acknowledge barriers to optimal care.

5. Conclusion

This study demonstrates that Medicaid and Medicare patients undergoing surgery for gynecologic malignancies have significantly worse postoperative outcomes compared to privately insured patients. The poor outcomes of Medicaid patients – a cohort defined by limited income – likely reflect a complex interplay between health system issues such as access to care and the health status of a population with a high burden of disease and socioeconomic adversity. Given the results presented here, we propose to use Medicaid payer status as a proxy for social risk factors in quality improvement protocols. This information may aid clinicians and patients in diagnostic and therapeutic planning with a goal to improve outcomes for this vulnerable population.

Author contributions

The first author conceived the research question. All authors contributed to the study design, analysis of the results, and writing of the manuscript.

Declaration of competing interest

There are no author conflicts to disclose.

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