

Acquisition of Medicaid at the time of injury: An opportunity for sustainable insurance coverage

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INTRODUCTION:	Uninsured trauma patients are at higher risk of mortality, limited access to postdischarge resources, and catastrophic health expenditure. Hospital Presumptive Eligibility (HPE), enacted with the 2014 Affordable Care Act, enables uninsured patients to be screened and acquired emergency Medicaid at the time of hospitalization. We sought to identify factors associated with successful acquisition of HPE insurance at the time of injury, hypothesizing that patients with higher Injury Severity Score (ISS) (ISS >15) would be more likely to be approved for HPE.
METHODS:	We identified Medicaid and uninsured patients aged 18 to 64 years with a primary trauma diagnosis (<i>International Classification of Diseases, Tenth Revision</i>) in a large level I trauma center between 2015 and 2019. We combined trauma registry data with review of electronic medical records, to determine our primary outcome, HPE acquisition. Descriptive and multivariate analyses were performed.
RESULTS:	Among 2,320 trauma patients, 1,374 (59%) were already enrolled in Medicaid at the time of hospitalization. Among those uninsured at arrival, 386 (40.8%) acquired HPE before discharge, and 560 (59.2%) remained uninsured. Hospital Presumptive Eligibility patients had higher ISS (ISS >15, 14.8% vs. 5.7%; $p < 0.001$), longer median length of stay (2 days [interquartile range, 0–5 days] vs. 0 [0–1] days, $p < 0.001$), were more frequently admitted as inpatients (64.5% vs. 33.6%, $p < 0.001$), and discharged to postacute services (11.9% vs. 0.9%, $p < 0.001$). Patient, hospital, and policy factors contributed to HPE nonapproval. In adjusted analyses, Hispanic ethnicity (vs. non-Hispanic Whites: aOR, 1.58; $p = 0.02$) and increasing ISS ($p \leq 0.001$) were associated with increased likelihood of HPE approval.
CONCLUSION:	The time of hospitalization due to injury is an underused opportunity for intervention, whereby uninsured patients can acquire sustainable insurance coverage. Opportunities to increase HPE acquisition merit further study nationally across trauma centers. As administrative and trauma registries do not capture information to compare HPE and traditional Medicaid patients, prospective insurance data collection would help to identify targets for intervention. (<i>J Trauma Acute Care Surg.</i> 2021;91: 249–259. Copyright © 2021 American Association for the Surgery of Trauma.)
LEVEL OF EVIDENCE:	Economic, level IV.
KEY WORDS:	Medicaid; Affordable Care Act; Hospital Presumptive Eligibility; insurance status; health care utilization.

Traumatic injury is a major public health concern; trauma is the leading cause of death for those under the age of 45 years, and trauma patients are twice as likely to be uninsured as the general population.^{1,2} Compared with those who are insured, uninsured trauma patients have even higher rates of mortality, and survivors have far more limited access to essential postinjury resources (e.g., rehabilitation, mental health services).³ Insurance-related disparities are markedly exacerbated among racial and ethnic minorities; trauma-related mortality is 44% higher for uninsured Blacks/African Americans and Hispanics/Latinos than for uninsured White patients.^{3,4} Moreover, nearly 90% of all uninsured trauma survivors are subject to catastrophic health expenditures, and hospitals that emergently treat uninsured trauma patients are strained by uncompensated care.^{5–8} Improving outcomes of uninsured trauma patients is an urgent priority, as the number of uninsured Americans has been on the rise since 2016 and has recently further spiked with unemployment and the loss of employer-based health care coverage because of the COVID-19 pandemic.^{9,10}

A potential solution, Hospital Presumptive Eligibility (HPE), was enacted as part of the Affordable Care Act of 2014 in all states, regardless of Medicaid expansion status.^{11,12} Hospital Presumptive Eligibility enables participating hospitals' financial counselors to

screen patients and initiate emergency HPE Medicaid insurance applications for hospitalized uninsured patients. If approved for HPE by county Medicaid offices, patients are granted *temporary* Medicaid coverage for up to 60 days; *sustainment* of coverage requires that patients subsequently enroll in long-term Medicaid (Fig. 1). With the increase in uninsured persons because of COVID-19, several states are broadening their HPE eligibility criteria. There is a timely need to identify factors that impede HPE approval and sustainment of Medicaid coverage post-HPE to design evidence-based strategies that increase coverage among uninsured individuals.

In this context, the study of uninsured trauma patients has been limited by inadequate data. Trauma registries, administrative databases, and hospital electronic medical records document expected payer status at the time of discharge. These data accurately reflect neither patients' insurance status at the time of admission nor when status changes from uninsured to insured during hospitalization. Consequently, information about HPE among trauma patients is sparse.

The aims of our study were to identify key patient and system-level factors associated with successful HPE approval during trauma hospitalization and to understand reasons why HPE was not approved. Given that patients with more severe injury would be more likely to have prolonged hospital lengths of stay and require access to postacute services for which insurance coverage would be beneficial, we hypothesized that patients with a greater Injury Severity Score (ISS) (ISS >15) would be more likely to be approved for HPE.

PATIENTS AND METHODS

Data Source and Study Population

We selected patients aged 18 to 64 years with Medicaid insurance or no insurance coverage (uninsured) at the time of hospital discharge from the trauma registry of Stanford University

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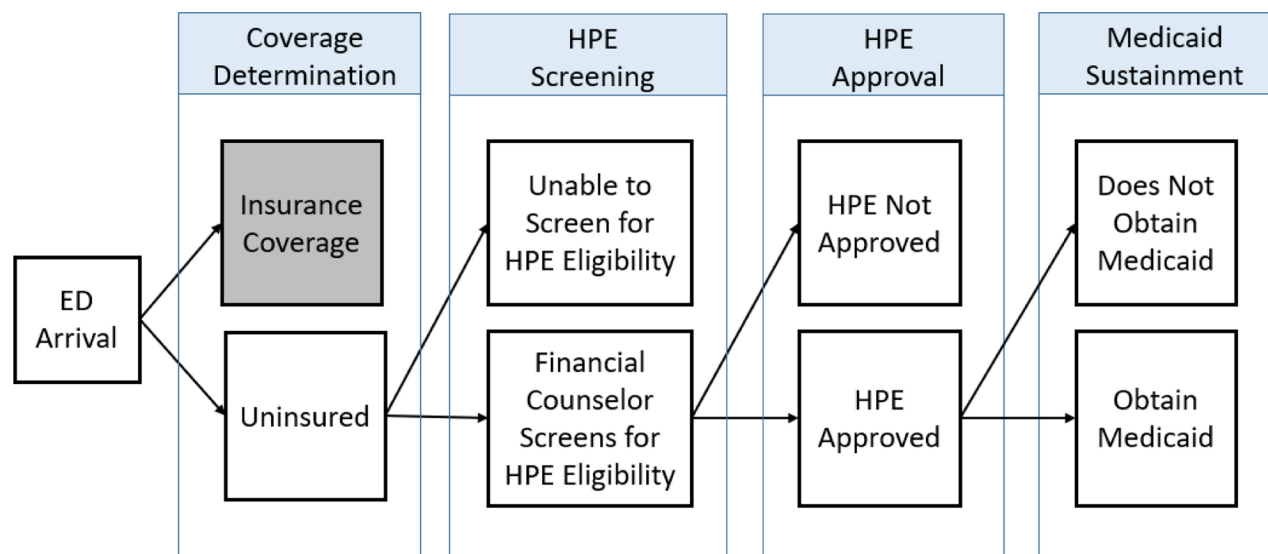


Figure 1. Flow diagram depicting HPE screening, approval, and opportunities for Medicaid sustainment among uninsured patients.

Medical Center, a level I trauma center. We included all Medicaid and uninsured patients admitted between March 2015, when financial counselors started documenting patient HPE application status in the electronic medical record, and December 2019. We excluded patients who died in hospital or had additional non-Medicaid insurance coverage (e.g., worker's compensation). For patients with multiple trauma visits during the relevant period, we selected only their first visit.

Four raters reviewed financial counselor and social worker notes in patient electronic medical records to determine each patient's insurance status at arrival, financial counselor screening for insurance coverage, receipt of in-hospital HPE insurance, referral for follow-up Medicaid coverage services, and reasons for coverage denial if applicable. Chart review results were combined with data maintained in the trauma registry, including demographics, such as age, sex, race, and ethnicity, and clinical information, such as type of injury, ISS, mechanism of injury, hospital and intensive care unit (ICU) length of stay (LOS), and emergency department (ED) and hospital discharge disposition.

A subset of charts ($n = 99$) was scored by two raters to determine interrater reliability. In three rounds of review, scoring discrepancies were discussed, and scoring rules were refined. In the first round, raters demonstrated 93% agreement and $\kappa = 0.76$ ($n = 5$ charts); in the second round, raters improved to 98% agreement and $\kappa = 0.94$ ($n = 20$); and in the final round, raters achieved 95% agreement and $\kappa = 0.84$ ($n = 74$). Overall, strong agreement was demonstrated for all 99 charts (96% agreement, $\kappa = 0.86$).¹³

Statistical Analysis

Our primary outcome was the proportion of uninsured trauma patients approved for HPE. Our secondary outcomes included clinical and discharge outcomes, as well as reasons behind why patients were not approved for HPE. We evaluated unadjusted differences between uninsured and HPE-approved patients at discharge, as well as between HPE-approved and preenrolled Medicaid patients, using χ^2 tests for categorical

variables and nonparametric Wilcoxon rank-sum tests for continuous variables.

We calculated a logistic regression model for our primary outcome, HPE acquisition, adjusted for selected covariates. Model covariates were determined a priori based on review of insurance screening and HPE application processes as well as discussions with financial counselors. Preselected model covariates included information typically known within the first 24 hours of ED arrival: demographics (patient age, sex, race, ethnicity), clinical severity (ISS, Glasgow Coma Scale score at admission, requirement for a surgical procedure), and timing of hospital arrival (weekday vs. weekend, Monday–Friday vs. Saturday–Sunday; and day vs. night, 7 AM to 7 PM vs. 7 PM to 7 AM). All preselected covariates were included in the final logistic regression model. The primary outcome, HPE acquisition, was then calculated for subgroups of patients by post-ED health care utilization: ED discharge disposition, hospital discharge disposition, hospital LOS, ICU LOS, and duration of ICU ventilation. These health care utilization variables were ultimately not included in the HPE explanatory model, as they were considered downstream effects of patient and clinical variables present at the time of admission and HPE screening, and many were interrelated with a high degree of multicollinearity.

Statistical significance was assessed at the level of $\alpha = 0.05$ (two-tailed test). Analyses were conducted using Stata 15.1 (StataCorp LLC, College Station, TX).¹⁴ The Stanford University Institutional Review Board approved this research study (protocol number 54789).

RESULTS

During the study period, a total of 2,481 trauma patients with Medicaid or uninsured status at the time of discharge were included in the trauma registry. Among the 2,320 patients who met the inclusion criteria, 1,374 (59%) had Medicaid at the time of hospitalization and 946 (41%) were uninsured. Compared

with those with Medicaid on arrival, the uninsured were more often male (79.7% vs. 65.9%, $p < 0.001$) and more likely to be Hispanic than non-Hispanic White (55.3% vs. 44.2%, $p < 0.001$).

Among 946 trauma patients who were uninsured at the time of injury, 86% ($n = 812$) were screened by a financial counselor during their hospital admission, and 48% ($n = 386$) of those who were screened successfully acquired HPE by the time of discharge. A majority (59.2%) of uninsured patients remained uninsured at the time of discharge ($n = 560$, including 134 who were not screened and 426 who were screened but were not approved for HPE) (Fig. 2).

We first compared characteristics of uninsured patients who remained uninsured and those who were approved for HPE at time of discharge using unadjusted analyses (Table 1). Patient demographics, including age, race, and ethnicity, were similar between these two groups. However, ISS was greater among HPE-approved patients compared with nonapproved HPE patients who remained uninsured, with a higher proportion sustaining major injury (ISS >15 , 14.8% vs. 5.7%; $p < 0.001$). We also found significant differences in health care utilization (Table 2). Higher rates of inpatient admission (64.5% vs. 33.6%, $p < 0.001$) were observed among HPE-approved trauma patients. Intensive care unit admission and discharge from the ED to operative intervention was also higher among HPE-approved patients (vs. remaining uninsured, 22.3% vs. 8.4% and 13.7% vs. 6.6%, respectively; $p < 0.001$). Hospital Presumptive Eligibility–approved patients had longer median hospital LOS (vs. remaining uninsured, 2 vs. 0 days; $p < 0.001$) and longer median ICU LOS (vs. preexisting Medicaid, 3 vs. 2 days; $p < 0.001$). Hospital Presumptive Eligibility–approved patients also had higher rates of discharge to postacute services (vs. remaining uninsured, 11.9% vs. 0.9%; $p < 0.001$).

We compared trauma patients who had preexisting Medicaid at the time of injury and uninsured patients who obtained HPE by the time of discharge (Table 3). Hospital Presumptive Eligibility–approved patients were more often male compared with preexisting Medicaid trauma patients (80.8% vs. 65.9%, $p < 0.001$). Hospital Presumptive Eligibility–approved patients were also more commonly of Hispanic-Latino ethnicity compared with preexisting Medicaid patients (56.0% vs. 44.2%, $p < 0.001$). Injury Severity Score was greater among HPE-approved patients compared with preexisting Medicaid trauma patients (ISS >15 , 14.8% vs. 12.9%; $p = 0.009$). Hospital Presumptive Eligibility–approved trauma patients had higher rates of inpatient admission (64.5% vs. 53.1%, $p = 0.001$) (Table 4). Discharge from the ED to operative intervention was more frequent among patients with HPE approval (vs. preexisting Medicaid, 13.7% vs. 10.8%; $p = 0.001$). Hospital Presumptive Eligibility–approved patients had longer median hospital LOS (vs. preexisting Medicaid, 2 vs. 1 days; $p = 0.006$) but tended to have lower rates of discharge to postacute services, although the difference was not statistically significant (vs. preexisting Medicaid, 11.9% vs. 15.2%; $p = 0.104$).

Overall, trauma patient hospitalizations were evenly split between daytime and nighttime hours (7 AM to 7 PM vs. 7 PM to 7 AM, 50.9% vs. 49.1%). In both unadjusted and adjusted analyses, there were no significant temporal differences between time of hospitalization of uninsured trauma patients who ultimately were approved for HPE versus those who were not approved and remained uninsured. Patients who were screened

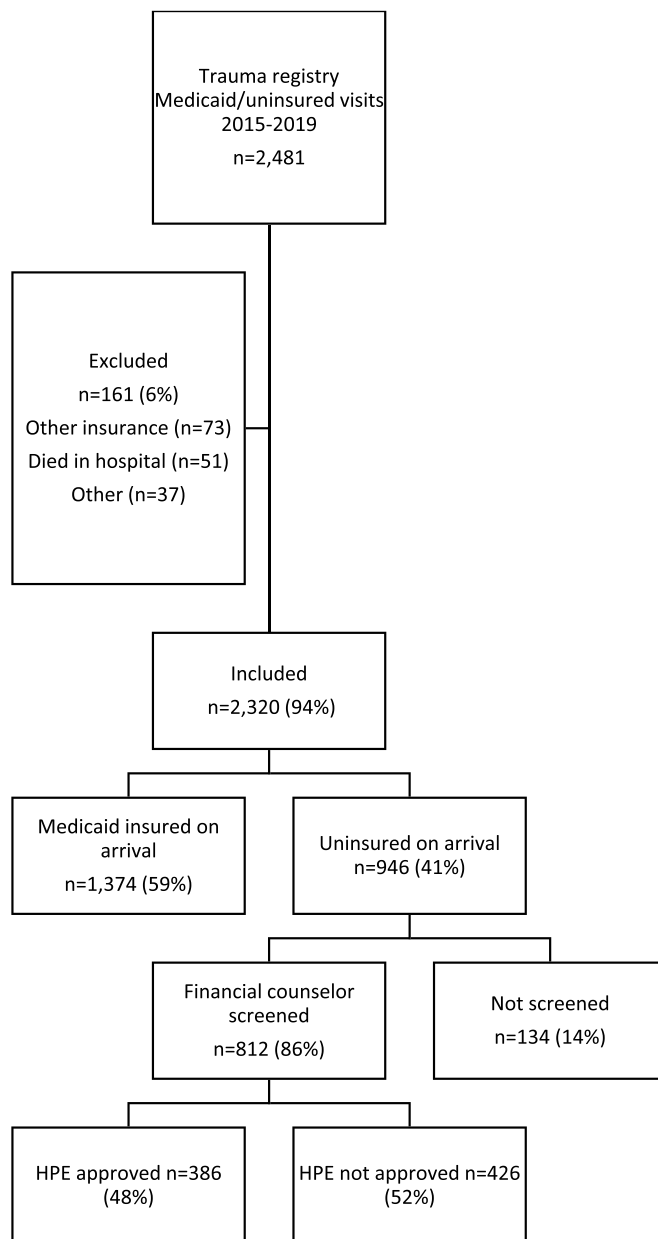


Figure 2. Study participant flow diagram for Medicaid status among trauma patients.

for HPE did have a longer median LOS (vs. patients with no screen, 2 vs. 0 days; $p < 0.001$). There were various patient, hospital, and policy factors that prevented HPE approval among patients who remained uninsured at discharge (Fig. 3). Patients may have had more than one reason for not being approved; therefore, the percentages in this figure add up to more than 100%. Among these remaining 560 uninsured patients, 24% ($n = 134$) were not screened by a financial counselor for HPE. Among those who were screened, 35% ($n = 195$) were denied for exceeding the income threshold for HPE, and 12% ($n = 65$) were denied based on nonresident status (out of state or international visitors). Approximately 3% ($n = 16$) were denied HPE because they had been previously approved during another admission and had

TABLE 1. Patient and Clinical Utilization Characteristics of Uninsured Trauma Patients Who Were Either Discharged Still Uninsured or Who Obtained HPE Medicaid by the Time of Discharge

	Total (n = 946)		Uninsured (n = 560)		HPE (n = 386)		p
	n	%	n	%	n	%	
Demographics							
Age, median (IQR), y	32	(25–44)	30	(24–43)	33	(26–44)	0.054
Age category, y							0.244
18–24	223	23.6	145	25.9	78	20.2	
25–44	499	47.8	285	50.9	214	55.4	
45–54	130	15.9	75	13.4	55	14.2	
55–64	94	13.4	55	9.8	39	10.1	
Sex							0.475
Female	192	20.3	118	21.1	74	19.2	
Male	754	79.7	442	78.9	312	80.8	
Race							0.098
American Indian	1	0.1	0	0.0	1	0.3	
Asian	51	5.4	35	6.3	16	4.1	
Black or African American	44	4.7	23	4.1	21	5.4	
Native Hawaiian/Pacific Islander	15	1.6	7	1.3	8	2.1	
Other	570	60.3	353	63.0	217	56.2	
White	254	26.8	137	24.5	117	30.3	
Unknown	11	1.2	5	0.9	6	1.6	
Ethnicity							0.853
Hispanic or Latino	523	55.3	307	54.8	216	56.0	
Non-Hispanic or Latino	410	43.3	246	43.9	164	42.5	
Unknown	13	1.4	7	1.3	6	1.6	
Clinical characteristics							
GCS on arrival							0.001
Severe (≤ 8)	29	3.1	8	1.4	21	5.4	
Moderate (9–12)	35	3.7	23	4.1	12	3.1	
Mild (13–15)	851	90.0	515	92.0	336	87.0	
Unknown	31	3.3	14	2.5	17	4.4	
ISS category							<0.001
Minor (0–8)	612	64.7	391	69.8	221	57.3	
Moderate (9–15)	152	16.1	68	12.1	84	21.8	
Major (16–25)	62	6.6	27	4.8	35	9.1	
Severe (>25)	27	2.9	5	0.9	22	5.7	
Unknown	93	9.8	69	12.3	24	6.2	
Injury type							0.708
Burn	1	0.1	1	0.2	0	0.0	
Blunt	862	91.1	510	91.1	352	91.2	
Penetrating	83	8.8	49	8.8	34	8.8	
Mechanism of injury							0.169
Assault	76	8.0	42	7.5	34	8.8	
Bicycle	76	8.0	40	7.1	36	9.3	
Cut	3	0.3	3	0.5	0	0.0	
Fall	143	15.1	78	13.9	65	16.8	
Gunshot wound	33	3.5	17	3.0	16	4.1	
Impalement	0	0.0	0	0.0	0	0.0	
Motorcycle crash	84	8.9	48	8.6	36	9.3	
Motor vehicle crash	402	42.5	258	46.1	144	37.3	
Other blunt	34	3.6	19	3.4	15	3.9	

Continued next page

TABLE 1. (Continued)

	Total (n = 946)		Uninsured (n = 560)		HPE (n = 386)		p
	n	%	n	%	n	%	
Other penetrating	23	2.4	17	3.0	6	1.6	
Pedestrian	44	4.7	22	3.9	22	5.7	
Stabbing	28	3.0	16	2.9	12	3.1	
Temporal characteristics of ED presentation							
Day							0.483
Weekend (Saturday–Sunday)	338	35.7	195	34.8	143	37.0	
Weekday (Monday–Friday)	608	64.3	365	65.2	243	63.0	
Time							0.364
Day (7 AM to 7 PM)	466	49.3	269	0.48	197	51.0	
Night (7 PM to 7 AM)	480	50.7	291	0.52	189	49.0	

IQR, interquartile range; GCS, Glasgow Coma Scale.

failed to obtain long-term insurance in the interim. Another 28% (n = 152) of patients did not obtain HPE because they either declined coverage, were unable to be contacted after discharge, or erroneously indicated that they had insurance by other means.

Logistic models were calculated to identify factors related to HPE approval among patients who were uninsured at the time of injury (Table 5). Trauma patients who were of Hispanic or Latino ethnicity had increased odds of acquiring HPE during their hospitalization (vs. non-Hispanic White:

aOR, 1.58; $p = 0.02$). Trauma patient ISS was significantly associated with a progressive increased likelihood of HPE approval (vs. minor ISS 0–8 [moderate ISS 9–15: aOR, 2.28 ($p < 0.001$); major ISS 16–25: aOR, 2.16 ($p = 0.006$); severe ISS >25: aOR, 6.28 ($p < 0.001$)]).

DISCUSSION

Nearly 14% of the US population remain uninsured as of the end of 2018.¹⁵ This number has consistently increased since 2016, when rates of uninsured reached historic lows after implementation of the Affordable Care Act.¹⁵ With the recent health and economic impact of the COVID-19 pandemic, the number of uninsured Americans is further increasing. To date, there has been a 15% increase in national unemployment, and less than one third of the newly unemployed have retained insurance coverage.¹⁰ Across medical disciplines, uninsured patients consistently have worse health care access and outcomes.^{16–18} Trauma patients disproportionately lack insurance or experience insurance instability. Our previous work revealed that trauma patients are twice as likely to be uninsured as the rest of the general population seeking medical care.² In addition, among the insured trauma patients who return to hospital within 1 year, 21% have lost or changed insurance.² To date, the reasons for such insurance churn have been challenging to study given the constraints of traditional datasets. There is a particularly urgent need to identify programs targeted at acquisition and sustainment of insurance coverage for vulnerable uninsured trauma patients.

Among uninsured trauma patients who are hospitalized because of injury, HPE programs provide a valuable opportunity to secure lasting insurance coverage. Although Medicaid policy and HPE eligibility varies across states, HPE is mandated and hospitals providing trauma care should be incentivized to participate. If approved, HPE provides immediate insurance coverage that will offset costs of care for both patients and health systems and potentially improve access to postdischarge care. Many level I trauma centers are located within safety net hospitals that deliver a significant proportion of their health care to the uninsured

TABLE 2. Health Care Utilization Characteristics of Uninsured Trauma Patients Who Were Either Discharged Still Uninsured or Who Obtained HPE Medicaid by the Time of Discharge

	Total (n = 946)		Uninsured (n = 560)		HPE (n = 386)		p
	n	%	n	%	n	%	
ICU health care utilization	n = 133		n = 47		n = 86		
ICU admission	133	14.1	47	8.4	86	22.3	<0.001
ICU LOS, median (IQR)	3 (2–5)		2 (2–4)		3 (2–6)		0.073
ICU LOS, mean (SD)	5.3 (7.4)		2.8 (1.5)		6.6 (8.8)		
ICU vent days, median (IQR)	0 (0–1)		0 (0–0)		0 (0–2)		0.051
ICU vent days, mean (SD)	2.4 (6.7)		0.5 (1.0)		3.4 (8.1)		
Hospital health care utilization	n = 946		n = 560		n = 386		
Hospital LOS, median (IQR)	1 (0–3)		0 (0–1)		2 (0–5)		<0.001
Hospital LOS, mean (SD)	3.0 (8.1)		1.2 (2.6)		5.5 (11.8)		
ED discharge disposition							<0.001
Home/observation/AMA/other	509	53.8	372	66.4	137	35.5	
Floor admission	249	26.3	112	20.0	137	35.5	
ICU	98	10.4	39	7.0	59	15.3	
Operating room/interventional radiology	90	9.5	37	6.6	53	13.7	
Hospital discharge disposition							<0.001
Home/AMA/jail	895	94.6	555	99.1	340	88.1	
To postacute services	51	5.4	5	0.9	46	11.9	

AMA, against medical advice; IQR, interquartile range.

TABLE 3. Comparison of Patient and Clinical Characteristics Between Trauma Patients Who Obtained HPE Medicaid and Those Who Arrived With Preexisting Medicaid

	Total (n = 1,760)		HPE (n = 386)		Medicaid (n = 1,374)		p
	n	%	n	%	n	%	
Demographics							
Age, median (IQR), y	34	(26–49)	33	(26–44)	35	(26–50)	0.07
Age category, y							0.001
18–24	387	22.0	78	20.2	309	22.5	
25–44	825	46.9	214	55.4	611	44.5	
45–54	293	16.6	55	14.2	238	17.3	
55–64	255	14.5	39	10.1	216	15.7	
Sex							<0.001
Female	542	30.8	74	19.2	468	34.1	
Male	1,218	69.2	312	80.8	906	65.9	
Race							0.056
American Indian	9	0.5	1	0.3	8	0.6	
Asian	99	5.6	16	4.1	83	6.0	
Black or African American	146	8.3	21	5.4	125	9.1	
Native Hawaiian/Pacific Islander	37	2.1	8	2.1	29	2.1	
Other	890	50.6	217	56.2	673	49.0	
White	561	31.9	117	30.3	444	32.3	
Unknown	18	1.0	6	1.6	12	0.9	
Ethnicity							<0.001
Hispanic or Latino	823	46.8	216	56.0	607	44.2	
Non-Hispanic or Latino	912	51.8	164	42.5	748	54.4	
Unknown	25	1.4	6	1.6	19	1.4	
Clinical characteristics							
GCS on arrival							0.504
Severe (≤ 8)	79	4.5	21	5.4	58	4.2	
Moderate (9–12)	60	3.4	12	3.1	48	3.5	
Mild (13–15)	1,523	86.5	336	87.0	1,187	86.4	
Unknown	98	5.6	17	4.4	81	5.9	
ISS category							0.009
Minor (0–8)	1,060	60.2	221	57.3	839	61.1	
Moderate (9–15)	299	17.0	84	21.8	215	15.6	
Major (16–25)	140	8.0	35	9.1	105	7.6	
Severe (>25)	95	5.4	22	5.7	73	5.3	
Unknown	166	9.4	24	6.2	142	10.3	
Injury type							0.861
Burn	0	0.0	0	0.0	0	0.0	
Blunt	1,601	91.0	352	91.2	1,249	90.9	
Penetrating	159	9.0	34	8.8	125	9.1	
Mechanism of injury							0.145
Assault	136	7.7	34	8.8	102	7.4	
Bicycle	118	6.7	36	9.3	82	6.0	
Cut	6	0.3	0	0.0	6	0.4	
Fall	331	18.8	65	16.8	266	19.4	
Gunshot wound	65	3.7	16	4.1	49	3.6	
Impalement	2	0.1	0	0.0	2	0.1	
Motorcycle crash	124	7.0	36	9.3	88	6.4	
Motor vehicle crash	693	39.4	144	37.3	549	40.0	
Other blunt	77	4.4	15	3.9	62	4.5	
Other penetrating	39	2.2	6	1.6	33	2.4	
Pedestrian	120	6.8	22	5.7	98	7.1	
Stabbing	49	2.8	12	3.1	37	2.7	

Continued next page

TABLE 3. (Continued)

	Total (n = 1,760)		HPE (n = 386)		Medicaid (n = 1,374)		p
	n	%	n	%	n	%	
Temporal characteristics of ED presentation							
Day							0.029
Weekend (Saturday–Sunday)	571	32.4	143	37.0	428	31.1	
Weekday (Monday–Friday)	1,189	67.6	243	63.0	946	68.9	
Time							0.709
Day (7 AM to 7 PM)	913	51.9	197	51.0	716	52.1	
Night (7 PM to 7 AM)	847	48.1	189	49.0	658	47.9	

GCS, Glasgow Coma Scale; IQR, interquartile range.

and should be incentivized by programs that will help offset the costs of uncompensated care.⁵ Our prior work evaluating the financial impact of HPE programs in the State of California estimated that hospital participation in HPE is associated with an average 9.7% increase in annual net patient Medicaid revenue, suggesting the potential for HPE as a mechanism to increase hospitals' financial stability.¹⁹

It is currently unclear how effectively hospitals are screening patients for HPE and what factors promote or limit successful HPE approval. We evaluated all patients with a discharge insurance status of Medicaid or uninsured at our level I trauma center, to determine the characteristics of patients who acquired HPE at the time of their injury hospitalization. Among the 2,320 participants included in this study, 1,374 (59%) had Medicaid at

the time of hospitalization and 946 (41%) were uninsured. We compared HPE-approved trauma patients both to patients who remained uninsured by the time of discharge (not approved for HPE) and to patients who were admitted with preexisting Medicaid. Demographic characteristics of HPE versus uninsured at discharge patients were understandably similar. Both patient groups were uninsured at the time of hospitalization, and higher rates of young males who are of minority race and ethnicity were consistent with prior studies evaluating uninsured trauma patients.⁶ Among patients who were uninsured at the time of injury, there were several clinical factors that were associated with an increased likelihood to be approved for HPE. Patients who were HPE-approved had a more complex clinical course, reflected by higher ISS, increased likelihood of hospital and ICU admission, operative intervention, and nonroutine discharge. In adjusted analyses, the most significant predictors of HPE approval were non-White Hispanic ethnicity and ISS. These findings may reflect the fact that patients with higher injury severity are more likely to be admitted and have the opportunity to be screened. Complex multisystem injuries and protracted admissions also increase the likelihood of nonroutine discharge to postacute services such as rehabilitation. Hospital Presumptive Eligibility approval during hospitalization is likely to increase access to postacute care. In theory, hospitals would similarly be incentivized to facilitate HPE applications that, if approved, would help to offset the costs of lengthy admissions and increase access to postdischarge rehabilitation and long-term care for patients who are in greatest need and might otherwise rehabilitate as hospital inpatients.

The reasons behind HPE nonapproval are multifactorial. Among patients in our study who were discharged as uninsured, nearly 25% were never screened by a financial counselor for HPE eligibility. Emergency department financial counselors and social workers are typically available to screen patients between 7 AM and midnight. There are a multitude of reasons why certain patients may be missed. Because patients who were not screened had shorter lengths of stay, financial counselors may have missed patients who had arrival and discharge from the ED after hours or those who left against medical advice before being screened. Among those who were screened, denial was attributable partly to income restrictions related to state Medicaid policy or current HPE legislation allowance for only one HPE approval within a 12-month period. However, there

TABLE 4. Comparison of Health Care Utilization Characteristics Between Trauma Patients Who Obtained HPE Medicaid and Those Who Arrived With Preexisting Medicaid

	Total (n = 1,760)		HPE (n = 386)		Medicaid (n = 1,374)		p
	n	%	n	%	n	%	
ICU health care utilization	n = 342		n = 86		n = 256		
ICU admission	342	19.4	86	22.3	256	18.6	0.109
ICU LOS, median (IQR)	3	(2–7)	3	(2–6)	3	(2–7)	0.518
ICU LOS, mean (SD)	5.9	(7.9)	6.6	(8.8)	5.6	(7.6)	
ICU vent days, median (IQR)	0	(0–2)	0	(0–2)	0	(0–2)	0.849
ICU vent days, mean (SD)	2.3	(5.3)	3.4	(8.1)	1.9	(3.9)	
Hospital health care utilization	n = 1,760		n = 386		n = 1,374		
Hospital LOS, median (IQR)	1	(0–5)	2	(0–5)	1	(0–5)	0.006
Hospital LOS, mean (SD)	4.6	(9.7)	5.5	(11.8)	4.3	(9.0)	
ED discharge disposition							0.001
Home/observation/AMA/ other	781	44.4	137	35.5	644	46.9	
Floor admission	569	32.3	137	35.5	432	31.4	
ICU	208	11.8	59	15.3	149	10.8	
Operating room/interventional radiology	202	11.5	53	13.7	149	10.8	
Hospital discharge disposition							0.104
Home/AMA/jail	1,505	85.5	340	88.1	1,165	84.8	
To postacute services	255	14.5	46	11.9	209	15.2	

AMA, against medical advice; IQR, interquartile range.

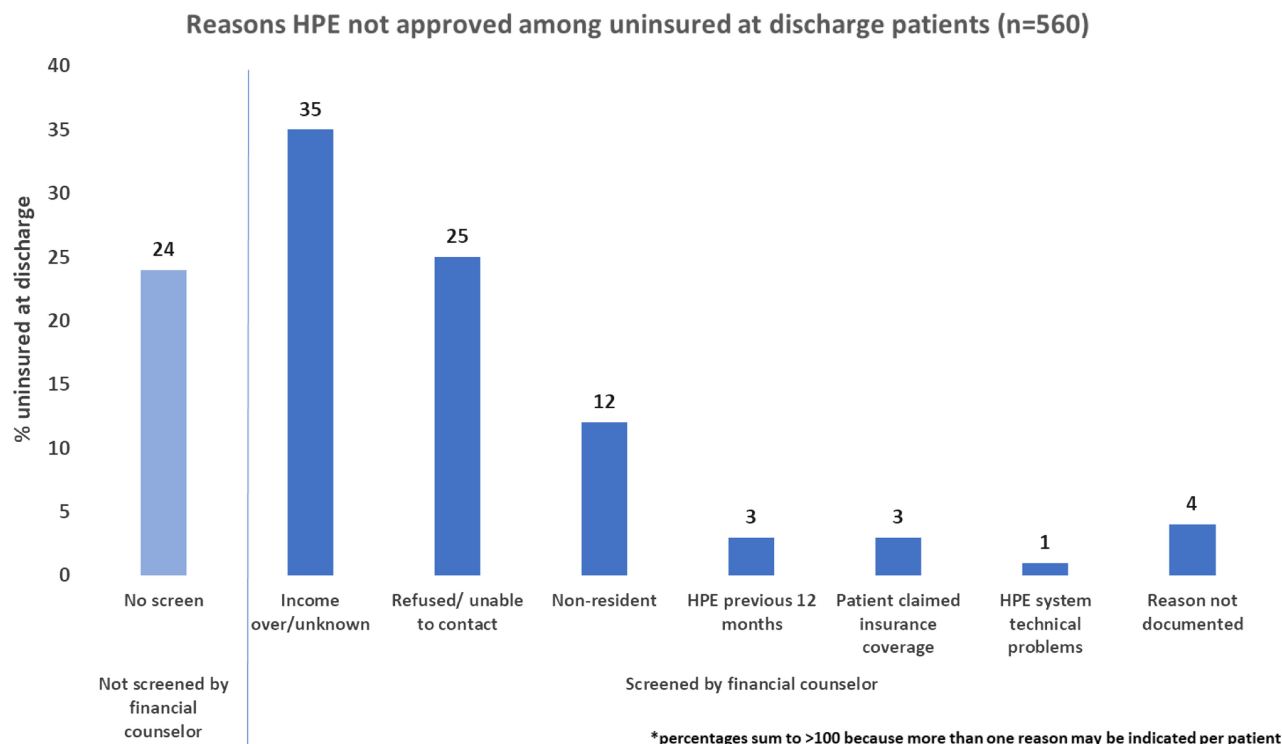


Figure 3. Health system factors that limit success of HPE among uninsured trauma patients.

were also modifiable patient and system factors contributing to HPE denial. Nearly 30% of HPE nonapprovals were related to patient refusal of insurance coverage, patient departure against medical advice and loss to follow up, confusion regarding patient insurance status, or technical errors with the HPE application system. At our institution, our results have provided opportunity for follow-up intervention studies aimed at patient education, as well as financial counselor and social worker training targeting increased HPE screening and eligibility determination. At the national level, inpatient HPE Medicaid screening ranges from manual processes that rely on paper applications mailed or faxed to the state to more sophisticated web-based training and enrollment models that require advanced personnel expertise and training.¹¹ Together, these issues suggest opportunity for patient education surrounding the benefits of sustained insurance coverage and potential for streamlining the HPE application process.

When comparing HPE Medicaid-approved patients to patients who were admitted with preexisting Medicaid, there were notable differences. Compared with patients with preexisting Medicaid, those with HPE Medicaid had higher mean ISS, more frequent rates of hospital and ICU admission, operative intervention, and longer hospital LOS. These marked differences between two patient cohorts who were ultimately both discharged with Medicaid (whether through HPE vs. traditional Medicaid programs) highlights the fact that not all Medicaid programs are created equal. It is also unclear as to whether HPE patients successfully transition to long-term Medicaid coverage after their 60-day HPE period expires; therefore, they may not sustain coverage and subsequently be reclassified as uninsured on future hospitalizations. Postdischarge insurance sustainment is an important area of future study and could help us to better

understand the mechanisms behind the marked insurance churn among trauma patients.

The notable differences between patients with preexisting Medicaid and those who present uninsured and become approved for HPE by the time of discharge are not well captured within our current trauma registries and administrative national data sets. Registrars enter an expected discharge status of Medicaid for both patient groups. Misclassification bias is therefore introduced when patients with HPE are counted as insured in retrospective research analyses. The misclassified patient with HPE approval more closely resembles uninsured patients and, in fact, may fail to transition to Medicaid enrollment after 60 days. The inability to distinguish dynamic changes in insurance status within existing data sets has been a significant barrier to advancing knowledge in the area of insurance-related health care disparities and merits further precision in future iterations.

To our knowledge, this is the first study to analyze HPE approval among trauma patients. We note several limitations, however. In an attempt to minimize misclassification bias among HPE Medicaid patients and patients with preexisting Medicaid at the time of injury, we performed detailed chart review of electronic medical records and financial counselor progress notes. There were patients for whom we were unable to retrospectively determine a clear etiology for HPE nonapproval. We were limited by financial counselor documentation, which was in the format of free text progress notes. While HPE approvals are tracked by county and state Medicaid offices, there is no formal internal hospital auditing process that explains why patients might be denied HPE or miss being screened. We also could not determine the exact time and date of patient screenings, to evaluate whether there are times of the day or week where screening rates are higher. We

TABLE 5. Logistic Regression Analysis of Significant Predictors of HPE Success Among Uninsured Trauma Patients

HPE Approval	Adjusted OR	95% CI	p
Male sex	0.94	(0.67–1.33)	0.74
Age, y			
18–24	Referent		
25–44	1.3	(0.92–1.83)	0.14
45–54	1.23	(0.76–1.98)	0.40
55–64	1.13	(0.66–1.94)	0.65
Race			
White	Referent		
Asian	0.51	(0.26–1.02)	0.056
Black or African American	1.36	(0.68–2.71)	0.38
Native Hawaiian/Pacific Islander	2.00	(0.68–5.89)	0.21
Other	0.65	(0.43–0.97)	0.03
Unknown	1.36	(0.09–20.49)	0.82
Ethnicity			
Non-Hispanic or Latino	Referent		
Hispanic or Latino	1.58	(1.07–2.33)	0.02
Unknown	0.76	(0.07–8.37)	0.83
Night admission (7 PM to 7 AM)	0.81	(0.62–1.07)	0.15
Weekend admission (Saturday–Sunday)	1.03	(0.78–1.37)	0.82
ISS			
Minor (0–8)	Referent		
Moderate (9–15)	2.28	(1.57–3.33)	<0.001
Major (16–25)	2.16	(1.25–3.73)	0.006
Severe (>25)	6.28	(2.20–17.95)	0.001
Unspecified	0.62	(0.37–1.02)	0.058
GCS			
Mild (13–15)	Referent		
Moderate (9–12)	0.8	(0.38–1.71)	0.57
Severe (≤8)	2.66	(1.06–6.66)	0.04
Unspecified	1.86	(0.89–3.92)	0.10
Operating room procedure	0.95	(0.72–1.26)	0.74

Model intercept coefficient (β) = -0.61.

CI, confidence interval; GCS, Glasgow Coma Scale; OR, odds ratio.

suspect that similar barriers might be encountered across institutions, where screening rates might vary based upon availability and level of training of personnel. Future multicenter studies can inform strategies for a more streamlined HPE screening process. Finally, we did not have access to patient Medicaid claims records after discharge that would enable us to determine whether insurance coverage was sustained after the 60-day HPE period. Future study opportunities include longitudinal prospective tracking of discharged trauma patients to evaluate their insurance status and health care access. Ultimately, further mixed methods prospective research is required to determine the patient, hospital, and state-level factors that optimize the success of HPE programs and likelihood of sustained Medicaid coverage.

CONCLUSION

The time-of-injury hospitalization is an underused opportunity for intervention, whereby uninsured patients can obtain

sustainable insurance coverage that will improve clinical outcomes and access to care. Because of the unpredictable and unanticipated nature of injury, trauma patients may be less likely to have obtained insurance coverage before their hospitalization. Hospital Presumptive Eligibility provides an opportunity to acquire Medicaid coverage at the time of hospitalization and to sustain insurance long term. We identified modifiable individual, hospital, and policy-level opportunities to increase HPE acquisition, which merit further study nationally across trauma centers. Because administrative and trauma registry data do not capture differences between HPE and traditional Medicaid patients, prospective insurance data collection could identify targets for intervention. More importantly, to better study dynamic changes in insurance status across institutions, improved accuracy of insurance status documentation in current datasets is required. Our results reflect an opportunity to more accurately capture insurance data within our national trauma registries, which would facilitate future study aimed at mitigating socioeconomic and insurance-related disparities.

AUTHORSHIP

J.D.J. contributed in the study design, chart review, data analysis, and article preparation. K.A. contributed in the chart review, statistical analysis, and article revisions. A.W.T. contributed in the study design, statistical analysis, and article revisions. K.D. contributed in the data collection and chart review. T.H.W. contributed in the study design, statistical analysis, and article revisions. A.H.S.H. contributed in the study design, statistical analysis, and article revisions. L.D.T. contributed in the data interpretation and article revisions. S.B. contributed in the data interpretation and article revisions. A.M.M. contributed in the study design, data interpretation, and article revisions. D.A.S. contributed in the data interpretation and article revisions. L.M.K. contributed in the study design, chart review, data analysis, article preparation, and revisions.

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DISCLOSURE

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