Factors Influencing Healthcare Costs for Lithotripsy: Analysis using Premier Healthcare Data (PINC™ AI)

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BACKGROUND

- Urolithiasis is a common urological condition associated with high morbidity.
- It is commonly treated with outpatient lithotripsy using thulium fiber (TFL) or holmium: YAG (Ho:YAG) lasers.
- Prior comparisons of these lasers lacked nationally representative real-world cost analyses.

AIM

Premier Healthcare Database (PINC™ AI) 2021–2025 q2 was used to compare patient discharge (healthcare) costs while adjusting for socioeconomic, clinical, and facility characteristics.

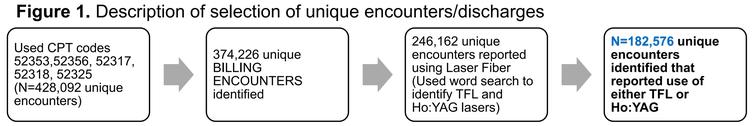
METHODS

- Patients undergoing lithotripsy were identified via CPT codes:
  - 52353 - Cystourethroscopy, with ureteroscopy and/or pyeloscopy; with lithotripsy (ureteral catheterization is included)
  - 52356 - Cystourethroscopy, with ureteroscopy and/or pyeloscopy; with lithotripsy including insertion of indwelling ureteral stent
  - 52317 - Litholapaxy: crushing or fragmentation of calculus by any means in bladder and removal of fragments; simple or small (< 2.5 cm)
  - 52318 - Litholapaxy: crushing or fragmentation of calculus by any means in bladder and removal of fragments; complicated or large (> 2.5 cm)
  - 52325 - Cystourethroscopy (including ureteral catheterization); with fragmentation of ureteral calculus
- Laser type determined from chargemaster file using key word search;
- Independent variables:
  - Laser type
  - Socio-economic factors: age, gender, health insurance type, race, ethnicity,
  - Clinical factors: Admission type, Charlson's comorbidity scores, Elixhauser scores, Operating room (OR) time, discharge status
  - Facility characteristics: facility size, and teaching status
- Outcome variable:
  - Patient discharge/ healthcare costs (2025 USD)
- Given skewed cost distribution, costs were categorized as ≤50th percentile (low), >50th–≤90th (mid), and >90th (high) and converted to 2025 US dollars using the medical care CPI for 2021–2024
- Analyses comprised descriptive statistics followed by statistical models
  - Bivariate model was followed by multivariate model
  - Generalized linear models (GLMs) accounted for clustering, and used a normal distribution with identity link, significance was defined at p<0.05
- Analysis done using SAS 9.4

RESULTS

- From 2021–2025 q2, 182,576 unique encounters were identified; 99.6% (N=181,920) were outpatient, so analyses focused on outpatient encounters.

Figure 1. Description of selection of unique encounters/discharges



- In both laser type groups (**table 1**), there were more females than male, the procedure was mostly elective, most of the patients were discharged to home, the comorbidity scores (Elixhauser and Charlson) were higher for TFL, and teaching hospitals mostly used Ho:YAG.

REFERENCES

- GBD 2021 Urolithiasis Collaborators. **The global, regional, and national burden of urolithiasis in 204 countries and territories, 2000-2021: a systematic analysis for the Global Burden of Disease Study 2021**. EClinicalMedicine. 2024 Nov 21;78:102924.
- Premier Applied Sciences, Premier Inc. **Premier Healthcare Database: Data that informs and performs (White Paper).** December 2024

Table 1: Describing patient characteristics of outpatient (N=181,920) cases

Patient Characteristics		Ho:YAG (N=151,299)	TFL (N=30,621)	P-value
Age (in yrs.)	Mean (SD)	58 (16.0)	59 (15.8)	<.0001
Sex	Male	77,388 (53.3%)	14,932 (52.5%)	0.0583
	Female	67,846 (46.7%)	13,488 (47.5%)	
Admit Type	Emergency	13,964 (9.6%)	2,534(8.9%)	<.0001
	Urgent	2,236(1.5%)	435(1.5%)	
	Elective	118,946 (82%)	22,165(78%)	
Race	White	119,613 (82.4%)	24,325 (85.6%)	<.0001
	Black	9,252 (6.4%)	1,492 (5.3%)	
	Asian	3,830 (2.6%)	760 (2. 7%)	
Ethnicity	Hispanic	12,147 (8.4%)	2,222 (7.8%)	<.0001
Discharge Status	Discharged To Home or Self Care	143,093 (98.5%)	28,037 (98.7%)	<.0001
	Discharged/Transferred to Other Facility	102(0.07%)	8 (0.03%)	
	Discharged/Transferred to SNF	798(0.6%)	174 (0.6%)	
Payor-mix	Commercial	17,794 (12.3%)	4,729 (16.6%)	<.0001
	FFS Medicaid	3,974 (2.7%)	656 (2.3%)	
	FFS Medicare	28,742 (19.8 %)	5,835 (20.5%)	
	Mgd care Commercial	45,099 (31.1%)	7,179 (24.7%)	
	Mgd care Medicaid	11,109 (7.7%)	2,381 (8.4%)	
	Mgd care Medicare	29,498 (20.3%)	6,289 (22.1%)	
	Other	6,378 (4.4 %)	836 (2.9%)	
	Other Govt	2,589 (1.8%)	504 (1.8%)	
	Workers Comp	53 (0.04%)	11 (0.04%)	
Charlson comorbidity index	Mean (SD)	0.54 (0.85)	0.62 (0.92)	<.0001
Elixhauser score	Mean (SD)	1.36 (1.47)	1.48 (1.51)	<.0001
OR Time	Mean (SD)	102.2 (300.16)	74.7 (33.9)	<.0001
Facility characteristics				
Teaching status	No	71,954 (49.5%)	16,936 (59.6%)	<.0001
	Yes	73,282 (50.5%)	11,484 (40.4%)	
Bed Size	000-099	9,544 (6.6%)	3,581 (12.6%)	<.0001
	100-199	29,806 (20.5%)	3,993 (14.1%)	
	200-299	29,492 (20.3%)	4,866 (17.1%)	
	300-399	22,393 (15.4%)	6,283 (22.1%)	
	400-499	10,536 (7.3%)	3,625 (12.8%)	
	500+	43,465 (29.9%)	6,072 (21.4%)	

- Table 2 describes the cost distribution and cut-off that was used in defining low-, mid- and high-healthcare costs
- Table 3 is a bivariate model of TFL vs. Ho:YAG when healthcare costs is the outcome
  - Costs were significantly lower for TFL irrespective of the healthcare cost group

Table 2: Healthcare Costs Distribution

Range (2025 USD)	Percentile	Group
<= $5,832	<= 50th	Low-healthcare (patient) costs
$5,833 – $10,414	51st – 90th	Medium-healthcare (patient) costs
>=$10,414	>= 91st	High-healthcare (patient) costs

Table 3: Healthcare Costs (2025 USD) by healthcare cost groups (low, mid, and high)

	Coefficient	Std. Error	P-value
Low-healthcare costs			
Intercept (TFL)	$ 4,133.5	$ 9.79	<.0001
Tech			
HOL (N= 72,322)	**$ 188.56**	**$ 10.42**	**<.0001**
TFL (ref) (N=14,528)	0		
Mid-healthcare costs			
Intercept (TFL)	$ 7,523.86	$ 11.85	<.0001
Tech			
HOL (N=58,568)	$21.64	$ 12.9	0.0934
TFL (ref) (N=10,876)	0		
High-healthcare costs			
Intercept (TFL)	$13,193.78	$55.09	<.0001
Tech			
HOL (N=14,346)	**$ 361.45**	**$74.7**	**<.0001**
TFL (ref) (N=3,016)	0		

CONTACTS

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- Tables 4 and 5 describe the influence of laser type after adjusting for socioeconomic, clinical and facility characteristics on low- and high-healthcare costs group, respectively.

Table 4: Influence of socio-economic, clinical and facility characteristics on **low-healthcare patient costs** (2025 USD)

	Coefficient	Std. Error	P-value	P-value (overall)
Intercept	$3918.74	$ 15.30	<.0001	
Tech				
Ho:YAG	$408.859	$13.01	<.0001	
TFL (Ref)	0			
OR Time	$0.21	$ 0.01	<.0001	
Elixhauser score	$10.81	$0.01	<.0001	
	$28.04	$7.63	0.0002	
Gender				
Female	$10.71	$7.88	0.1740	
Male	0			
Admission Type				<.0001
Emergency	$503.78	$ 15.42	<.0001	
Urgent	$108.71	$ 32.3	0.0008	
Elective (ref)	0			
Race				<.0001
Asian	$230.85	$26.32	<.0001	
Black	$73.51	$17.12	<.0001	
Other	-$86.19	$19.33	<.0001	
White (ref)	0			
Payor-mix				<.0001
Commercial	-$107.93	$12.81	<.0001	
FFS Medicaid	-$45.33	$23.54	0.0542	
FFS Medicare	-$43.57	$11.25	0.0001	
Mgd care Medicaid	-$50.59	$16.60	0.0023	
Mgd care Medicare	-$35.09	$11.37	0.0020	
Other	-$30.71	$19.70	0.1191	
Other Govt	$38.60	$28.29	0.1724	
Workers Comp	-$304.89	$212.93	0.1522	
Mgd care Commercial (ref)	0			
Bed Size				<.0001
000-099	$167.68	$14.12	<.0001	
100-199	$4.04	$11.11	0.7160	
200-299	-$181.84	$12.03	<.0001	
300-399	$14.71	$11.52	0.2018	
400-499	$187.81	$15.15	<.0001	
500+ (ref)	0			

Table 5: Influence of socio-economic, clinical and facility characteristics on **high-healthcare patient costs** (2025 USD)

	Coefficient	Std. Error	P-value	P-value (overall)
Intercept	$ 13174.89	$ 193.95	<.0001	
Tech				
Ho:YAG	$ 241.02	$ 71.19	0.0007	
TFL (Ref)	0			
OR Time	$ 5.59	$ 0.88	<.0001	
Elixhauser score	$74.39	$26.59	0.0052	
Gender				
Female	-$230.42	$87.69	0.0086	
Male	0			
Admission Type				0.0002
Emergency	$ 383.72	$ 90.38	<.0001	
Urgent	$ 97.45	$163.75	0.5518	
Elective (ref)	0			
Hispanic				
No	-$324.89	$85.33	0.0001	
Yes (ref)	0			
Payor-mix				0.0034
Commercial	$262.79	$315.84	0.4054	
FFS Medicaid	$500.05	$195.27	0.0104	
FFS Medicare	$49.29	$92.34	0.5935	
Mgd care Medicaid	$218.34	$111.09	0.0494	
Mgd care Medicare	$ 236.59	$83.13	0.0044	
Other	-$ 437.60	$285.90	0.1259	
Other Govt	-$1792.59	$376.68	<.0001	
Workers Comp	0			
Mgd care Commercial (ref)				
Bed Size				<.0001
000-099	-$131.58	$237.61	0.5797	
100-199	-$701.09	$108.18	<.0001	
200-299	-$156.44	$199.31	0.4325	
300-399	-$396.28	$112.50	0.0004	
400-499	$69.27	$128.06	0.5886	
500+ (ref)	0			
Teaching				
Yes	-$738.39	$83.0185	<.0001	
No (ref)	0			

CONCLUSION

Beyond laser type, **socioeconomic, clinical, and facility factors** significantly influenced lithotripsy healthcare costs, indicating opportunities to reduce costs and improve procedural efficiency, warranting further study.

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