



## Correspondence

**Buprenorphine charges to uninsured patients at top-ranked U.S. hospitals**

**Keywords:**

Buprenorphine  
Hospital charges  
Emergency department  
Overdose deaths  
Medication-assisted treatment

Opioid-related overdose deaths (OD) in the United States (U.S.) have increased substantially [1], with counties with increased poverty and unemployment rates at higher risk [2]. Evidence-based treatment for Opioid Use Disorder (OUD) exists, such as buprenorphine (a partial opioid agonist medication), and can be initiated in the Emergency Department (ED) and hospital settings [3–5]. Although the majority of Medicare Part B plans cover buprenorphine, the medication can be prohibitively expensive for uninsured patients [6–8]. Little is known about the potential financial burden for patients who are started on buprenorphine for OUD in the ED setting.

For fiscal year 2019 (FY2019), the Centers for Medicare and Medicaid Services (CMS) newly required all U.S. hospitals to publicly report the standard charges for all items and services, such as for buprenorphine [9]. This study therefore sought to determine the burden of buprenorphine charges to uninsured patients and its association with opioid-related deaths.

This cross-sectional study of a nonprobability sample of top-ranked U.S. hospitals used publicly available data and did not require Institutional Review Board approval. Included hospitals were those ranked in the top-20 by the *U.S. News and World Report Honor Roll 2018–2019* or in the top-20 for specialties (cancer, cardiology/heart surgery, diabetes/endocrinology, ear/nose/throat, gastroenterology/GI surgery, geriatrics, gynecology, nephrology, neurology/neurosurgery, orthopedics, and pulmonology). Hospitals with missing or non-CMS compliant chargemasters [9] were excluded from analysis.

Available online chargemasters were extracted from each hospital's public website from January 27–29, 2019 and searched for uninsured charges for buprenorphine 2 mg sublingual (SL) tabs (2mgSL), as well as oxycodone 5 mg tablets and epinephrine 0.1 mg/mL injectable, which were used as common reference points to detect isolated buprenorphine charge disparities. The CDC WONDER registry (<https://wonder.cdc.gov/wonder/help/mcd.html#>) was used to identify crude death rates attributed to opioids in 2017, using methods previously described [1]. Median incomes for each hospital's surrounding zip code were extracted from the U.S. Census Bureau and adjusted for FY2019 inflation.

Data were summarized with descriptive statistics. Kruskal-Wallis was used to assess differences in charges between pharmaceuticals, while Spearman's Rank-Order Correlation was used to assess the association between 2mgSL buprenorphine charges, median income, and OD. The likelihood of OD given 2mgSL buprenorphine charges was modeled with linear regression after adjusting for median income. An interaction term (median income  $\times$  2mgSL buprenorphine charges) was not incorporated into the model after unadjusted analysis found no correlation between the two. Finally, the effect of median income on pharmaceutical charges was assessed with simple linear regression. P-values  $\leq .05$  were considered statistically significant. All statistical analyses were conducted using Jamovi v. 0.9.5.12 (<https://www.jamovi.org/>).

CMS-compliant chargemasters for 55 of 63 (84%) hospitals were included for analysis. Among these, 32 (58%) hospitals reported charges for one buprenorphine 2mgSL, with a median charge of \$7.38 (IQR: \$3.34–\$17.60; Table 1). There was a significant difference in per-unit charges of buprenorphine vs. oxycodone (\$7.38 vs. \$0.70,  $p = .0002$ ) and buprenorphine vs. epinephrine (\$7.38 vs. \$4.54,  $p = .02$ ). Each \$10,000 increase in median income was associated with a 9.2% (95% CI: –13.6%–32%) increase in charge per buprenorphine 2mgSL. Similar trends were observed for oxycodone tabs and epinephrine injections (Table 1).

The 2017 crude-death rate attributable to opioids surrounding each hospital was 18.8 per 100,000 (IQR: 15.6–34.1). There was a positive monotonic association between charge per buprenorphine 2mgSL and opioid-related deaths ( $\rho = 0.22$ ; 95% CI: –0.23–0.60,  $p = .3$ ). In the adjusted analysis, deaths increased 1 per 100,000 for each \$0.25 increase in charge per buprenorphine 2 mg SL (95% CI: \$0.10–\$0.40,  $p = .003$ ). Median income did not significantly predict opioid-related deaths ( $p = .25$ ).

In this study of pharmaceutical charges at highly ranked U.S. hospitals, uninsured charges for buprenorphine were significantly higher than a common pain medication (oxycodone) and a life-saving medication (epinephrine). Fewer than two-thirds of highly-ranked hospitals offer buprenorphine 2 mg SL in their pharmaceutical formulary. We found buprenorphine charges were associated with OD; deaths increased 1 per 100,000 for each 25-cent increase per tab of sublingual buprenorphine. Conservatively estimating one 2 mg SL buprenorphine tab per day for maintenance of OUD, the estimated charge faced by persons without insurance is \$2693 per year, which likely underestimates the yearly cost of treatment [10]. Median income surrounding each hospital was not a significant predictor of buprenorphine charges.

This study was limited to charges of sublingual buprenorphine and did not explore other drivers of healthcare pricing. Additionally, our convenience sample may not represent all hospitals where patients seek medical care nationally.

As mentioned above, there is differential access to buprenorphine treatment nationally [2,6–8,11], which thus requires emergency departments initiating buprenorphine treatment for patients with OUD who lack insurance to account for the financial

**Table 1**

Reported charges of sublingual buprenorphine and other pharmaceuticals at America's top hospitals.

Pharmaceutical	Median charge (\$US), IQR	Charge increase <sup>a</sup>
Buprenorphine 2 mg sublingual/tab	\$7.38 (\$3.34–\$17.60)	9.2% (–13.6%–32%)**
Oxycodone 5 mg tabs/tab	\$0.70 (\$0.28–\$3.68)	8.9% (–14.6%–32.3%)**
Epinephrine 0.1 mg/mL injectable/mL	\$4.54 (\$1.82–\$5.84)	18% (–8.5%–44.7%)**

Abbreviations: \$US, United States Dollar; IQR, interquartile range; mg, milligram; mL, milliliter.

<sup>a</sup> Parameter estimate reported as percent change in charge for every \$10,000 increase in median income from separate linear regression models.

\*\*  $p > .05$ .

burden from out-of-pocket costs these patients face upon discharge. These barriers may be mitigated by insuring buprenorphine access at hospitals, registering patients for public insurance during the ED visit, and insuring follow-up outpatient care at clinics that do not only accept cash-payment [12].

### Sources of support

No external funding was provided for the planning or conduct of this study.

### Conflict of interest

The authors have no conflicts of interest to report.

### Author contributions

JN, SD, RP, AR conceived the study. JN, SD were responsible for data collection. JN, SD, RP, AR provided statistical advice on study design, and JN analyzed the data. JN drafted the manuscript, and all authors contributed substantially to its revision. JN takes responsibility for the paper as a whole.

### Acknowledgements

The authors would like to thank Laura Peterson, RN for her assistance in reviewing this manuscript.

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19 April 2019

<https://doi.org/10.1016/j.ajem.2019.04.041>