

INTRODUCTION

Crotaline snake envenomation is a potentially serious medical condition that affects thousands of Americans each year. (1,2) There continues to be variation in treatment practices by physicians in the United States despite guidelines establishing the use of antivenom and supportive care as the mainstays for treating crotaline snake envenomation. (3,4,5,6)

OBJECTIVE

This study sought to determine associations between physician treatment strategies, snake identification (ID), venom effects, bite location and patient presentation.

METHODS

A cross-sectional review of electronic medical records (EMR) for patients diagnosed with venomous snake bites from July 1, 2014 to August 31, 2019 was completed. Data collected from the EMR included: patient demographics, transfer information, length of hospital and ICU stays, snake ID, bite site, progression of local tissue effects, additional clinical and lab results, patient comorbidities and complications, and provider treatment strategy.

RESULTS & CONCLUSION

- 1 Of the 83 patients who met inclusion criteria, 68 patients (81.9%) received antivenom (Table 1).

Table 1. Treatment of Patients Presenting for Snake Envenomation

Snake	Patients (#)	Antivenom	Observation (no Antivenom)
Copperhead	44	36	8
Pygmy Rattlesnake	13	13	0
Unknown Rattlesnake	2	2	0
Cottonmouth	1	1	0
Unknown snake	23	16	7
Total	83	68	15

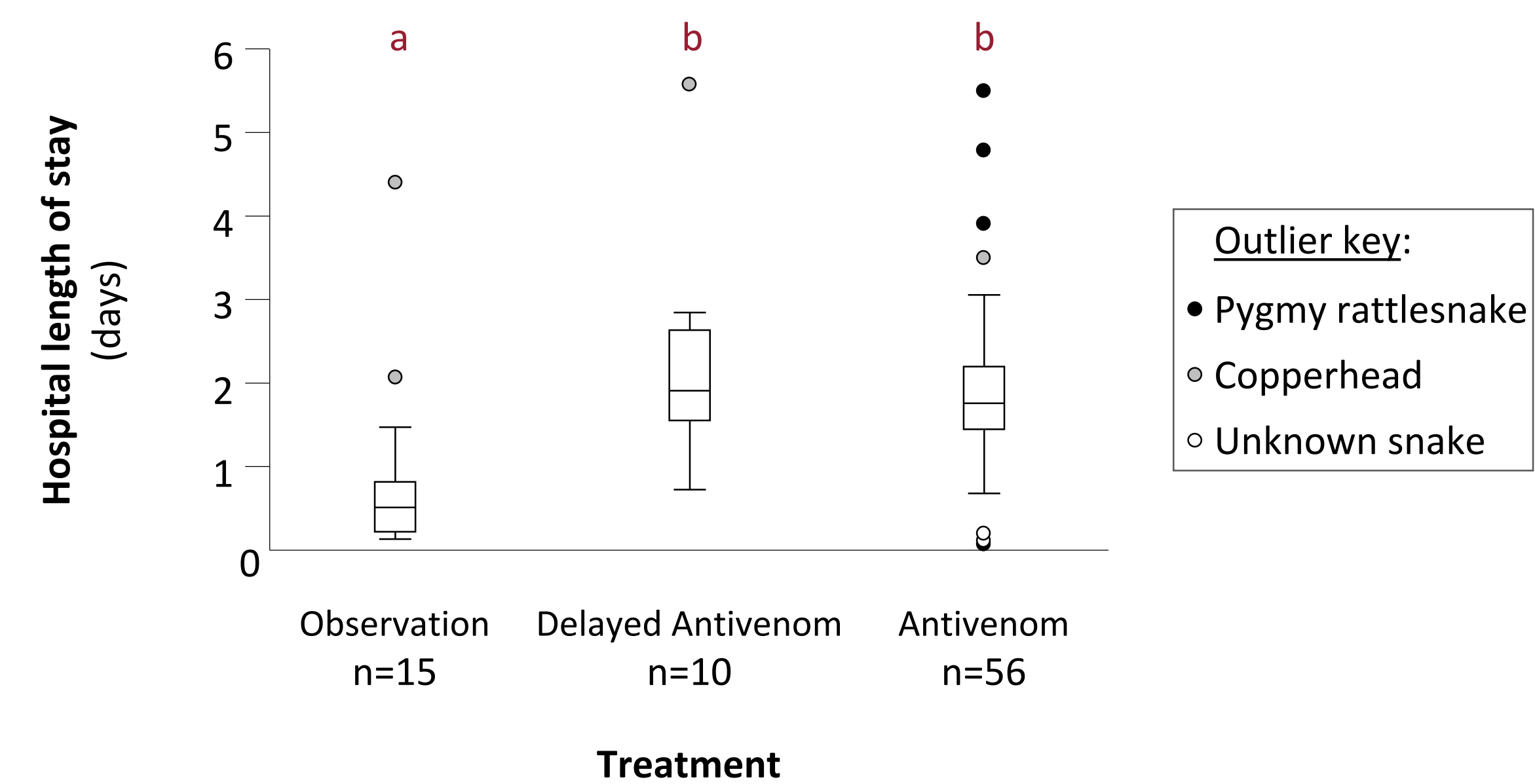
- 4 In a regression model of treatment strategy, progression of local tissue effects was a statistically significant predictor of receiving antivenom (Table 2).

Table 2. Standardized Coefficients from an OLS Regression Model of Treatment Strategy

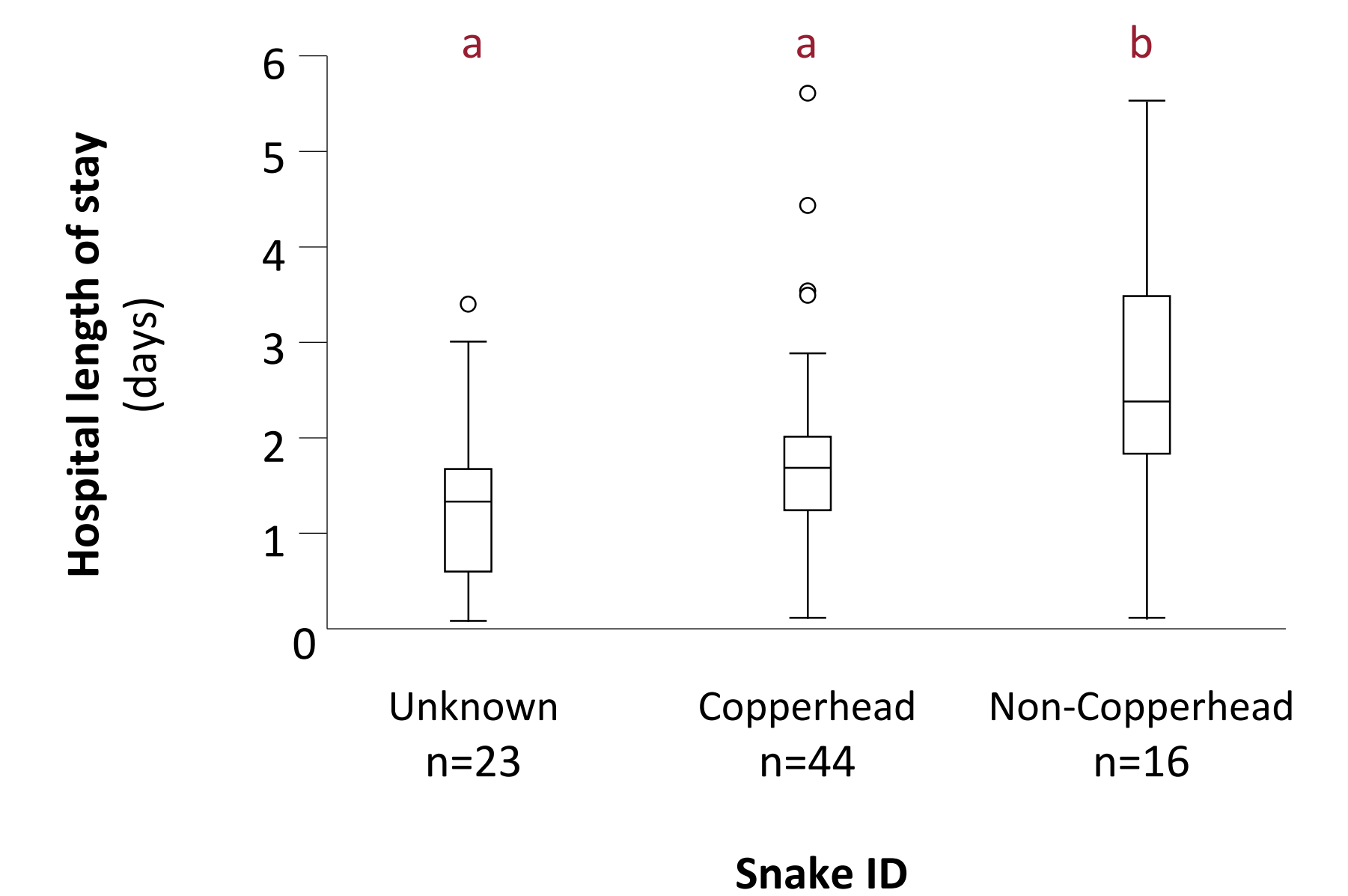
Constant	1.075*** (0.234)
Age	-0.039 (0.004)
Gender	-0.092 (0.167)
Transfer	-0.154 (0.177)
Snakebite Site	-0.169 (0.175)
Tissue Progression	0.423*** (0.140)
Hemotoxicity	0.166 (0.224)
Systemic Symptoms	-0.060 (0.187)
Complications	0.161 (0.242)
Comorbidities	0.229 (0.100)

Notes: N=81. Adj R²=0.225. Numbers in parentheses are standard errors. ***p<0.001

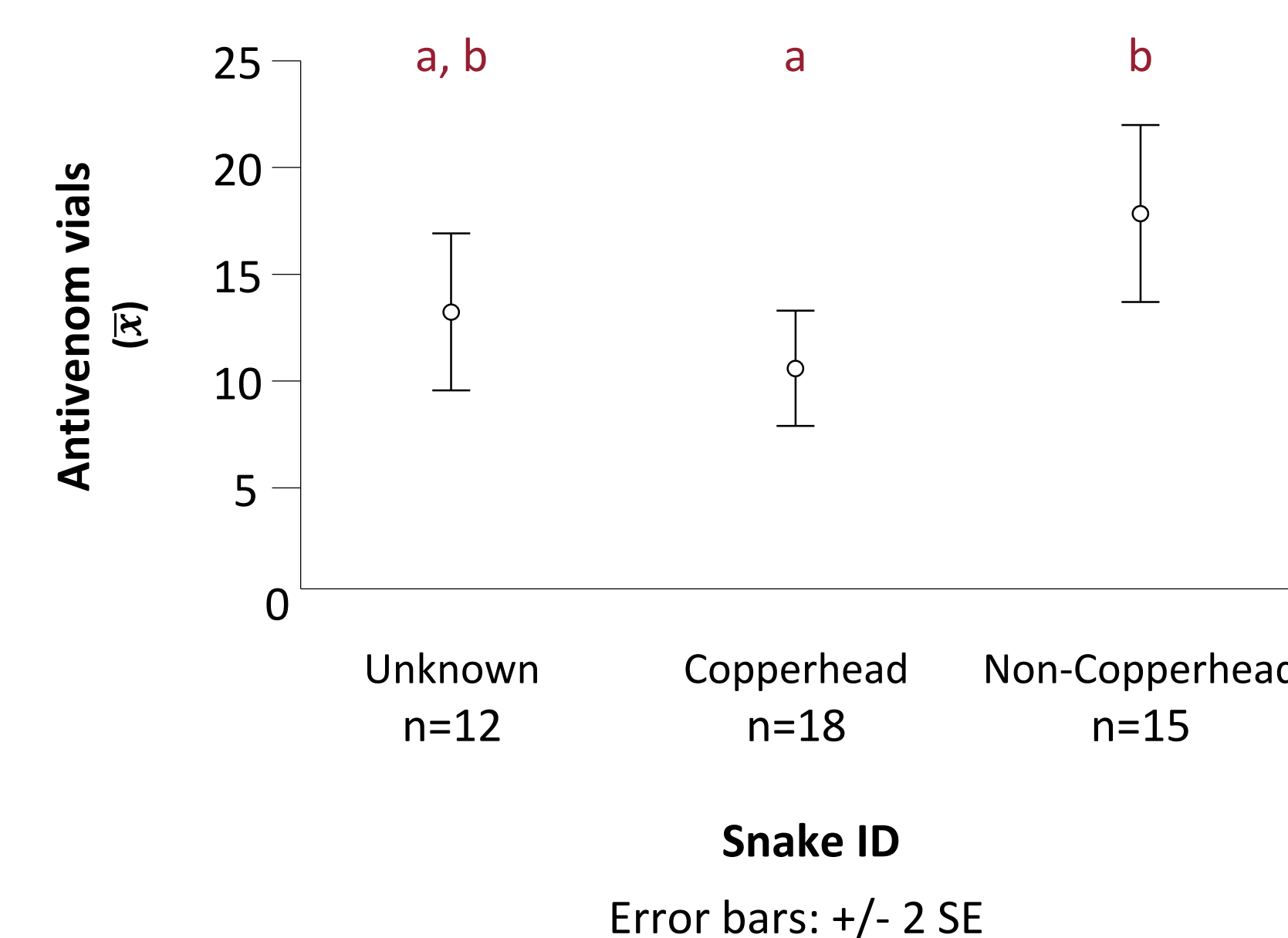
- 2 None of the 15 patients who were under observation (no antivenom) for treatment went to the ICU. These patients experienced the shortest hospital stays ($\chi^2(2)=16.76$, p<0.001).*



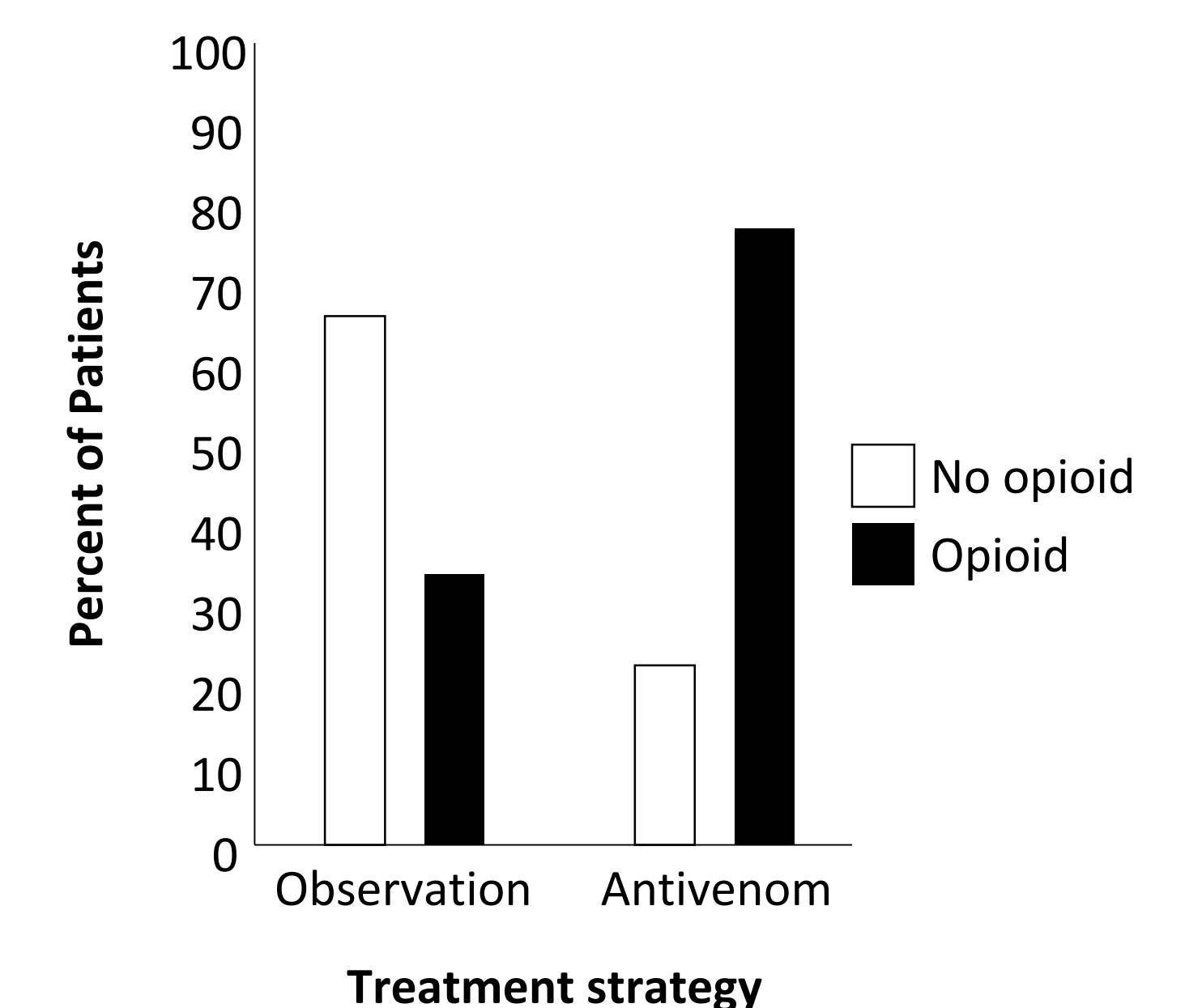
- 3 Hospital stays were longest for patients envenomated by an identified rattlesnake or cottonmouth (“Non-Copperhead”) compared to patients envenomated by an unknown snake or copperhead ($\chi^2(2)=14.32$, p<0.05).*



- 5 Rattlesnake and cottonmouth envenomations (“Non-Copperhead”) used more vials of antivenom than copperhead envenomations ($\chi^2(2)=8.76$, p=0.01).*



- 6 77.9% of patients who received antivenom also received an opioid for pain management vs. 33.3% of patients under observation (no antivenom) who received opioids (Fisher Exact Probability Test, p=0.001).



CONCLUSION:

Envenomated patients are likely to be treated with antivenom if there was progression of local tissue effects. For patients in this study who were bitten by copperheads and unknown snakes, close observation without antivenom administration had favorable outcomes including shorter hospital stays and likely decreased hospital costs.

*_{a,b} Statistically significant groups, Dunn's post-hoc comparisons tests (p<0.05)

REFERENCES:

- (1) Lavonas EJ, Ruha A-M, Banner W, et al. Unified treatment algorithm for the management of crotaline snakebite in the United States: results of an evidence-informed consensus workshop. *BMC Emergency Medicine*. 2011;11(1). doi:10.1186/1471-227x-11-2.
- (2) Ruha AM, Kleinschmidt KC, Greene S. et al. The Epidemiology, Clinical Course, and Management of Snakebites in the North American Snakebite Registry. *Journal of medical toxicology: official journal of the American College of Medical Toxicology*. 2017;13(4):309-320. doi:10.1007/s13181-017-0633-5.
- (3) Whitley RE. Conservative Treatment of Copperhead Snakebites without Antivenin. *The Journal of Trauma: Injury, Infection, and Critical Care*. 1996;41(2):219-221. doi:10.1097/00005373-199608000-00004.
- (4) Walker JP, Morrison RL. Current management of copperhead snakebite. *Journal of the American College of Surgeons*. doi:10.1016/j.jamcollsurg.2010.12.049.
- (5) Correa JA, Fallon SC, et al. Management of pediatric snake bites: are we doing too much? *Journal of Pediatric Surgery*. 2014;49:1009-1015. doi:10.1016/j.jpedsurg.2014.01.043.
- (6) Gale SC, Peters JA, Allen L, Creath R, Dombrovskiy VY. FabAV antivenin use after copperhead snakebite: clinically indicated or knee-jerk reaction? *Journal of Venomous Animals and Toxins including Tropical Diseases*. 2016;22(1). doi:10.1186/s40409-016-