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In patients with hypotension, are push-dose pressors safe and effective?

Clinical Bottom Line: Push dose pressors are safe and effective in the management of patients with hypotension in practice settings outside of the operating room, including the emergency department and intensive care unit settings. However, in the two studies that we examined, there were some errors in dosing and some patients experienced overcorrection of vital sign abnormalities or received doses when not indicated, although there were no lasting serious adverse effects. Push dose pressors should not be used in patients with bradycardia.

PICO Question: In emergency department patients with hypotension, are push-dose pressors safe and effective?

Background: There is a body of evidence suggesting that the use of push-dose pressors within the controlled setting of the operating rooms can be safe and effective at transiently raising the blood pressure of a patient, such as during procedural sedation or peri-arrest periods. However, we wanted to search and see if the use of push-dose pressors in the emergency department would be just as efficacious at raising blood pressure without causing harm to patients.

Article 1

Rotando, A., Picard, L., Delibert, S., Chase, K., Jones, C.M.C, & Acquisto, N.M. (2019). Push dose pressors: Experience in critically ill patients outside of the operating room. *The American Journal of Emergency Medicine 37*(3), 494-498. https://doi.org/10.1016/j.ajem.2018.12.001

Pubmed link: https://pubmed.ncbi.nlm.nih.gov/30553634/

Summary:
This is a retrospective, observational analysis that was conducted via electronic medical record review at a single university hospital from November 2015 through March 2017, capturing the use of push-dose phenylephrine or ephedrine in areas outside of the OR. A guideline of indications was provided for providers, along with pre-filled syringes with bolus doses of phenylephrine and ephedrine.

Inclusion Criteria:
All patients 18 years and older who received at least 1 dose of phenylephrine or ephedrine in an area outside of the OR and PACU.

Exclusion Criteria:

Patients who received phenylephrine for priapism, patients who received these medications in the PACU. Patients with incompletely documented vital signs before or after administration. Patients seen in the emergency department were excluded from analysis as well.

Results:
The primary goal of this study was determining the usage patterns of push-dose pressors, efficacy, and identifying any adverse drug events or safety concerns. The conclusion from the study was that there were medication errors and adverse drug events, but there was no apparent harm in giving phenylephrine in push doses for trauma or medical resuscitations. The adverse event rate was 11.6%, broken down into those who received too high of a dose and those who received a dose inappropriately, either while with a normal blood pressure or high heart rate, or while already on a continuous infusion of another pressor. There were no documented instances of post-pressor MI or troponin elevations, or reflex bradycardia. As for patterns of usage, it was found that 57.3% of patients received a push dose during the peri-intubation period and only 26.7% of patients received fluids concurrently.

Limitations:
Demographic information was lacking in the study including age and ethnicity. Small sample size, data collected from only 1 urban academic trauma center in New Mexico, which limits ability to capture low adverse events rate and harm rate. Would have also been nice to have comparison data to compare one pressor to the other, or if there were blood pressure reducing agents administered and stopped prior to use of pressors, such as during induction for intubation. Additionally, due to differences in documentation, the actual adverse dosing range may not be accurate, as several push doses may have been utilized and documented as a total dose.

Article 2

Swenson K, Rankin S, Daconti L, Villarreal T, Langsjoen J, Braude D. Safety of bolus-dose phenylephrine for hypotensive emergency department patients. Am J Emerg Med. 2018 Oct;36(10):1802-1806. doi: 10.1016/j.ajem.2018.01.095. Epub 2018 Feb 19. PMID: 29472039.

Pubmed link: https://pubmed.ncbi.nlm.nih.gov/29472039/

The Basics:
This is a retrospective structured chart review. To assess the utility and safety of push dose phenylephrine in the emergency room setting. There are studies that look at the use of push dose phenylephrine in the operating room in the anesthesia literature but there is limited information regarding its use in other settings. There were two reviewers and 12% of the charts reviewed by both reviewers to establish an interrater reliability of 96%.

Inclusion Criteria:
All patients over 18 who received push dose phenylephrine over the defined 42 month period

Exclusion Criteria:
Patients under 18
Patients that did not receive phenylephrine
Patients who received phenylephrine outside of the defined 42 month period

Primary Outcome:
Mean arterial pressure(MAP)
Mean change in heart rate (HR)
Systolic blood pressure (sBP) and diastolic blood pressure (dBP) before and after phenylephrine

Secondary (Adverse) Outcomes:
Elevation of blood pressure (<180 systolic or <110 diastolic)
HR <50 within 30 minutes of receiving phenylephrine
Severe adverse events defined vital sign derangements that meet the above but required intervention.

Results:
The mean change in MAP was statistically significant across all three dose ranges observed and increases in blood MAP corresponded to increasing doses of phenylephrine. The mean change in heart rate was not statistically significant. There were five (5) recorded adverse and no severe adverse events. Three (3) of the adverse events were elevated blood pressures and two (2) were bradycardia. Bradycardia was noted to be present in both cases prior to administration of phenylephrine. None of these patients required pharmacologic intervention to correct their vital sign abnormalities.

Limitations/Biases:
The study had a low level of evidence due to being a retrospective chart review. It was conducted a single center. There was not a control group assessed and thus making it impossible to draw conclusions about efficacy. The ability to comment on safety is limited due to the low number of the patients in the study (under 200). To comment on safety a larger number of participants will be required. Overall more research is required to draw conclusions about the safety or efficacy of push dose phenylephrine in the emergency department.