

The Use of Vasopressin in Shock Versus Gastrointestinal Hemorrhage



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INTRODUCTION

- Vasopressin is commonly used in the intensive care unit, primarily for vasodilatory shock.
 - In shock, first treat underlying cause and reverse hypotension with fluid resuscitation prior to adding vasopressors.
- Norepinephrine is the first line vasopressor in all types of vasodilatory shock after which other vasopressors may be added [3,4].
- Low-dose vasopressin (0.04 units/minute) is preferred for both effectiveness and reduction in adverse effects [2].
- Vasopressin performs vasoconstriction without using the catecholamine pathway, giving another way of treating refractory hypotension [2].
- Vasopressin is also used off-label for gastrointestinal hemorrhage.
 - Other uses of vasopressin include diffuse mucosal oozing, controlling multiple sites of hemorrhage in high risk surgical patients, and treating lesions not amenable to transcatheter embolization.
- Recommended dosing for GI hemorrhage is continuous IV infusion at 0.2-0.4 units/minute.
 - This may be titrated to a maximum of 0.8 units/minute for a maximum duration of 24 hours at the highest effective dose to reduce adverse effects.
 - IV nitroglycerin (40-400 micrograms/minute) should be considered to prevent vasopressin-associated ischemic complications [1,5].

AIM STATEMENT

The goal of this quality improvement project is to limit misuse and waste of vasopressin by educating all physicians, pharmaceutical staff, and nursing on proper dosing and indications of this valuable medication to improve patient safety and minimize cost.

METHODS

- OSU Medical Center former EMR, Meditech®, was used to identify patients from June 2018 to December 2019 who received vasopressin during their hospitalization
- The above medical records were deidentified
- Medical charts were reviewed for vasopressin use, including dosage, indication for use, and other relevant clinical data
- Results were analyzed and summarized for how vasopressin can be utilized for better patient care and cost efficiency moving forward

RESULTS

Vasopressin was ordered, but not used, in any indication in 110 of 263 (41.8%) reviewed encounters. The remaining 153 (58.2%) encounters were used for the following analysis.

Vasopressin Dosing Assessment		
Dosed Appropriately*	Number of Encounters	Percentage of Use
Yes	77	50.3
No	76	49.7

* Dose was considered appropriate if the encounter had an indication for either (1) shock at a dose of 0.04 units/min or (2) gastrointestinal bleed with a dose between 0.4-0.8 u/min

Other Doses of Vasopressin Used		
0.01 x2	0.06 x2	0.09 x1
0.02 x12	0.2 x1	1 unit bolus 5 times x1
0.03 x16	0.3 x2	20 units bolus x1
0.05 x2	0.5 x1	0.05 and 0.4 x1
0.015 x1	0.08 x4	4 units bolus x1

Octreotide Use in Conjunction with Vasopressin		
Use in GI Bleeding	Number of Encounters	Percentage of Use
Yes	11	50.0%
No	11	50.0%

*In addition, vasopressin was used in 2 encounters (1.3%) of shock without the use of vasopressin

Order of Vasopressin Use in Shock		
Agent Order	Number of Encounters	Percentage of Use
First (no other vasopressors)	3	3.1
First (with other vasopressors)	28	28.9
Second	44	45.4
Third	19	19.6
Fourth	3	3.1

*First (with other vasopressors) indicates that vasopressin was initiated simultaneously with other vasopressors.

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Documented Indications for Use		
Indication	Number of Encounters	Percentage of Use
Shock	94	61.4
GI bleeding	16	10.5
Shock+GIB	3	2
Other	40	26.1
Vasopressin Dose		
0.04 u/min	100	65.4
0.4 u/min	5	3.3

*GIB = gastrointestinal bleeding

Correct Indications for Use		
Indication	Number of Encounters	Percentage of Use
Shock	86	56.2
GI bleeding	8	5.2
Overall	94	61.4

Other/inappropriate indications include sepsis (7, 4.6%), hypotension (6, 3.9%), post-CABG (2, 1.3%), etc. No diagnosis of shock or gastrointestinal bleeding was documented during hospitalization for these encounters.

NEXT STEPS

- Vasopressin is a frequently utilized pressor within OSUMC for several different indications, but oftentimes is not indicated or ordered at appropriate doses
- We identified that about 37% of the time vasopressin was prescribed it was at inappropriate doses or for inappropriate indications leading to increased hospital costs
- We recommend the appropriate education of the involved parties, including the type of pressors, indication, dosing, titration, and associated cost of vasopressin

CONCLUSIONS

- Vasopressin ordered and used appropriately just over half the time (50.3%) in the hospital. Unless a pharmacist reaches out to the physician about its urgency of use, the medication is prepared when it is ordered. It then has a 24-hour window with which it can be used before it needs to be discarded.
 - This leads to >40% of vasopressin that is ordered possibly being wasted rather than used due to becoming expired after 24 hours.
 - Quad-strength norepinephrine (Levophed), the first line vasopressor in shock, costs 16.4% that of vasopressin.
- The primary indications for use at OSUMC is shock (septic, cardiogenic, etc.) and the off-label use of gastrointestinal hemorrhage. It is properly ordered and documented for shock in 61.4% and gastrointestinal hemorrhage (10.5%).
 - Therefore, over one-quarter of vasopressin is either being used for other reasons it is not indicated for or improperly documented.
 - Even though vasopressin has an off-label indication for GI hemorrhage, it is less preferred due to risk of mesenteric ischemia.
- Vasopressin was incorrectly used in 12.4% of encounters, such as incorrect dosing. Other inappropriate uses included not properly documenting its indication of use or using it for an unapproved use.
 - The most inappropriate use of vasopressin was incorrect dosing, such as too high for shock or too low for gastrointestinal hemorrhage.
 - Documented unapproved indications included sepsis (without shock), post-CABG, mesenteric ischemia, hysterectomy, etc.
- When vasopressin was used for shock, it was most commonly used as a second-line vasopressor or in conjunction with other vasopressors. This is appropriate, as it is not indicated as a first line vasopressor in any type of shock.
- Octreotide is the preferred agent for use in gastrointestinal hemorrhage due to lower risk of mesenteric ischemia. Of the 22 encounters for GIB (not in conjunction with shock), octreotide was used in conjunction with vasopressin in 11 (50%) encounters.
 - Octreotide costs ~1.5% that of vasopressin for the same treatment regimen for gastrointestinal hemorrhage.