

Study on Ward-Based Practice of Vasopressor Administration for Patients with Sepsis, in National Hospital of Sri Lanka (NHSL)

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Background: Vasopressors are administered peripherally in hemodynamically unstable patients with sepsis in the initial period. International guidelines are available for peripheral administration of vasopressors, including Surviving Sepsis guidelines 2021.

Objective: Assess the ward-based practice regarding peripheral administration of vasopressors in patients with sepsis, in NHSL.

Methods: A prospective cross-sectional study, during a period of six weeks in 2022, setting of Medical and surgical wards in NHSL, in a group of 52 patients.

Results: Noradrenaline was the vasopressor used for all patients with septic shock. 93% of patients had peripheral noradrenaline infusions for a medium duration of 77.7 hours. Peripheral cannula for noradrenaline was sited in the forearm at 46% and in the dorsum of the hand at 34%. Only 7% had a central line for vasopressors. Other infusions along with noradrenaline in the same cannula were given in 75%. Approximately 90% were monitored hourly during the infusion of vasopressors. ICU referral was done only in 5.7% of patients. Adverse reactions were noted in 38% of patients, all minor complications.

Conclusion: Peripheral administration of vasopressors was prolonged compared to standard. Adverse reactions were identified, but all were minor complications.

Keywords: Vasopressor, Sepsis, Noradrenaline, Hemodynamics

Introduction

Inotropes and vasopressors are used to establish hemodynamic stability, in septic patients. In this regard, surviving in sepsis guidelines 2021 gave guidance for initial vasopressor therapy in sepsis¹.

The NHSL is a leading teaching hospital in Sri Lanka, which addresses critically ill patients with sepsis. Vasopressors, the most commonly noradrenaline is used in wards to manage patients with septic shock,

initially peripherally. This audit was done to identify the practices of administration of vasopressors in the wards.

Objectives

Main Objective was to assess ward-based practice regarding administration of vasopressors for patients with sepsis, in medical and surgical wards, in the NHSL.

Specific objectives were to identify,

1. The basic characteristics of patients who were started on vasopressors
2. Selection of vasopressor, duration, infusion-related practices, and monitoring during vasopressor therapy.
3. Complications related to peripheral administration of vasopressors.

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Methods

The study was a prospective cross-sectional study, during a period of six weeks from March to May 2022, in the setting of medical and surgical wards in the NHSL. Adult patients admitted with sepsis and started on vasopressors were included. Pregnant patients and children less than 15 years were excluded. Data was collected, using a questionnaire, with ethical clearance from NHSL ethics review committee. Standards were derived from surviving sepsis guidelines 2021.

Results

A sample of 52 patients were included, (29 males, 23 females) within ages of 15 to 94 years. (Figure 1).

The comorbidities identified were diabetes mellitus (57.6%), diabetes related complications (34.6%), hypertension (36.5%), IHD (40.3%), CLCD (11.5%), and CKD (21.1%). 11.5% were previously healthy.

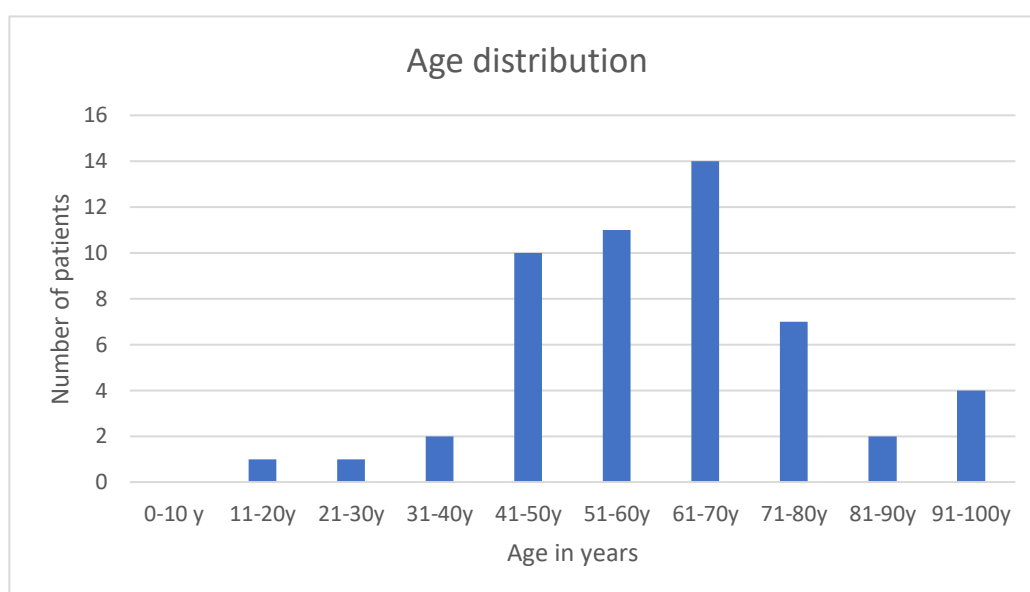


Figure 1: Age distribution

The vasopressor used in all patients was, noradrenaline.

The starting parameters for vasopressors were, systolic blood pressure between 50-90mmHg (mean-72mmHg), diastolic blood

pressure between 30 and 72mmHg (mean-47mmHg).

The duration of therapy varied from 12 to 384 hours, with a median of 77.76 hours, and a mode of 21-40 hours. (Figure 2)

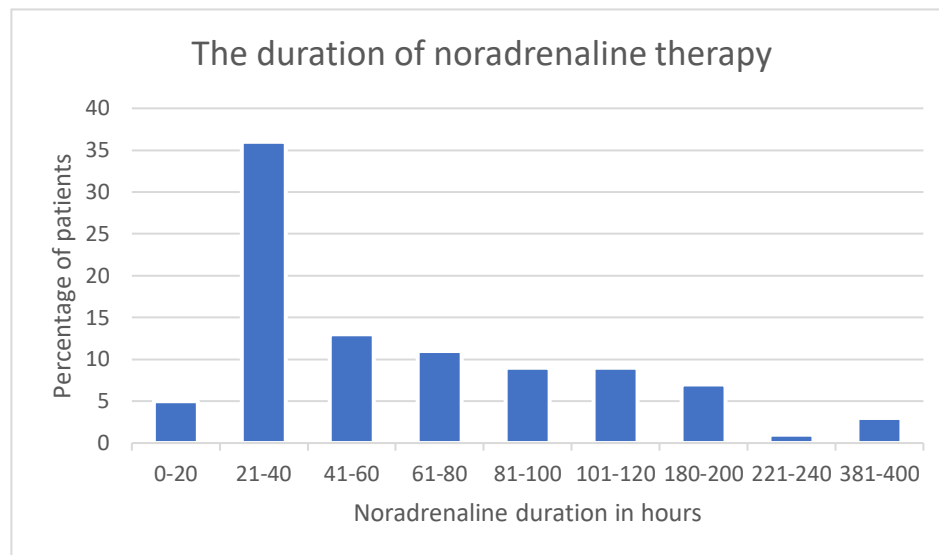


Figure 2: Duration of noradrenaline

In all patients, infusion pumps were used. Two concentrations were used, which were, 4mg/50ml in 25% and 8mg/50ml in 75%.

Only 7% had a central line, and 93% had peripheral infusions.

Four canula sizes were used (16,18,20, 22G). 53% had 18G cannulae, while 26% and 5% had 20G and 22G respectively (Table 1). 46% had cannulae on the forearm and 34% of cannulae were in the hands. Only 3.8% patients had external jugular cannulae (Table 2).

Table 1: Cannula Gauge used

Cannula gauge	Number of patients	Percentage
16	3	5%
18	28	53%
20	14	26%
22	3	5%

Table 2: Cannula site

Site	Number of patients	Percentage
Arm	2	3.8%
Antecubital fossa	2	3.8%
Forearm	24	46%

Hand	18	34%
External jugular	2	3.8%

Separate cannula was dedicated for the noradrenaline only in 25%. Other 75% of patients had the same cannula used for IV fluids and other infusions.

Syringe label was present in all infusions including drug name. Drug concentration was mentioned in the label in 80%, preparation date was mentioned only in 7.6%. None of the labels had identification details of the patient, and proximal or distal line labels. The prescribed concentrations varied from 0.05mic/kg/min to

0.3mic/kg/min. None of the prescriptions contained advice regarding drug dilution, route of infusion and escalation plan. Target blood pressure was mentioned in only 5.7% of patients and monitoring guidance given in only 19% of patients.

Considering monitoring, 90% monitored hourly, 3.8% monitored two and three hourly (blood pressure and heart rate). (Table 3). The mean arterial pressure was monitored only in 7.6%. None had arterial blood pressure monitoring.

Table 3: Monitoring frequency

Monitoring frequency	Number of patients	Percentage
Hourly	47	90%
Two hourly	2	3.84%
Three hourly	2	3.84%

Only 3.8% had plan for central line insertions. ICU referral was done in 9.6% and only 5.7% were admitted to the ICU.

Adverse reactions were noted in 38% of patients. Pain at site, in 30%, extravasation

in 7.6% and swelling in 11.5% (Table 4). Thrombophlebitis, tissue necrosis, erythema, localized cellulitis, and limb ischemia were not detected and documented. The cannulas were replaced in 38%.

Table 4: Adverse reactions

Adverse reaction	Number of patients	Percentage
Pain at site	16	30.7%
Extravasation	4	7.6%
Swelling	6	11.5%

Discussion

Intravenous vasopressors which increase cardiac output and systemic vascular resistance, have been used to treat shock since the early 1900.^{2,3} Vasopressors are indicated in sepsis when hypotension is refractory despite fluid resuscitation.^{1,4}

The surviving sepsis guidelines for management of sepsis 2021, recommend to use of norepinephrine first line to maintain mean arterial pressure (MAP) in patients with septic shock.¹ This can be administered via a peripheral line which is situated proximal to the cubital fossa initially, for a short period of time (< 6 hours)¹. If prolonged infusions are necessary, central lines should be used.

In this audit duration of peripheral noradrenaline infusion ranged from 12-384 hours (median 77.76 hours), and only 7% had central lines,.

According to original research published in the Journal of Hospital Medicine in 2015, the peripheral cannula used for vasopressor therapy should be at least 20G, and inserted to a vein more than 4mm on ultrasound, preferably, a brachial or cephalic vein.⁹ In our audit peripheral cannulae for noradrenaline were sited in the forearm in 46% and in the dorsum of hand at 34%.

The use of infusion pumps for vasopressor delivery, and to monitor blood pressure using an arterial line are good practices in vasopressor therapy.^{8,9,6}

All of our patients had infusion pumps in place, and 90% had regular hourly monitoring. None of them had arterial blood pressure monitoring which is not practical in wards.

Co-drug administration via the same port is discouraged as the delivery concentration may be varied.⁵ In our audit separate cannula was dedicated for the noradrenaline infusion only in 25% of patients. Other 75%

of patients had the same cannula used for noradrenaline, IV fluids and other infusions. Even in the presence of various guidelines and policies, a wide variability of administrating concentrations of vasopressors had been documented⁵. In our study population, two noradrenaline concentrations were used.

Labeling the syringe, and the infusion lines at proximal and distal end is important.⁵ In this audit, in regards to labeling, syringe label with drug name was present in 100%, and drug concentration in 80%, date in 7.6% of infusions. None had details of patient or proximal and distal line labels.

Administration of inotropes and vasopressors via peripheral line can give rise to various complications such as extravasation, infections, thrombophlebitis, skin necrosis, limb ischaemia and compartment syndrome.⁷ The peripheral line should be used as a bridge for therapy until central line inserted¹⁰

In our study population, adverse reactions were noted in 38%. The most common adverse reaction was pain at site, in 30%. Extravasation and swelling noted in 7.65% and 11.55%. Thrombophlebitis, tissue necrosis, erythema, localized cellulitis, and limb ischemia were not detected and documented. The cannulas were replaced in 38%.

Conclusion

Vasopressors are high risk, high alert, and essential drugs that should be administered carefully. In the audit it was found that noradrenaline was the vasopressor used in septic shock, and it was used peripherally for prolonged durations than suggested. Adverse reactions were detected, but all were minor complications.

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