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LETTER TO THE EDITOR

A shortcut for preparing doses of positive inotropic drug infusions in emergency patient management—"fast inotrope bag (FiB) coefficient"

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Abstract

The most basic rule for the management of patients in the emergency departments (EDs) and critical & intensive units (ICUs) are quick decision and quick order medication. For this reason, calculator applications are a necessary part of EDs in order to calculate some drug doses quickly. With the simple formula we discovered, it will be much easier to place an order for the 4 most frequently used drugs of the EDs (dopamine, dobutamine, norepinephrine, epinephrine). We recommend this simple and fast calculation method to all EDs and ICUs with fast inotrope bag (FiB) coefficient. This coefficient has been developed especially for simple pump devices or dosing devices that do not use ready-made inotropic drug bags and that, if needed, first control the preparation of the solution and then the hourly infusion of the prepared solution. These devices are used only because the amount of solution to be given to the patient per hour can be monitored. Taking advantage of this coefficient, the inotrope needed by the patient can be administered easily and quickly with only the patient's weight information, and the initial dose corresponds to the dose range recommended by the guidelines for inotropes.

Keywords

Inotrope bags; Dopamine; Dobutamine; Norepinephrine; Epinephrine; Coefficient

Dear Editor,

The inotrope agents dopamine, dobutamine, norepinephrine, and epinephrine are among the most commonly used drugs in critically ill patients in the prehospital emergency care, emergency departments (EDs) and critical & intensive units (ICUs). When starting inotropic therapy in these acute care areas that necessitate urgent intervention, administration doses and forms of drugs should be formulated in the simplest way possible. These inotropic treatments are generally hard to order, taking into account complex formulas and multiple calculations for initial administration doses.

As far as the utilization of powerful inotrope dopamine, The American Heart Association (AHA) has provided the following formula: Multiply 6 times the weight in kg times the desired dose in μg/kg/min, divided by the desired amount of fluid to infuse in mL/h which produces the amount of dopamine in mg to add to each 100 mL solution prepared) [1, 2]. In a survey conducted on this issue, only 4 out of 50 physicians were able to bring this formula into practice correctly [3]. The remaining ones used calculation methods they had developed themselves.

Since the calculations of norepinephrine and epinephrine dosages are similarly challenging, we have devised a formula in mL/h for more rapid applicability and simplification of the initial doses of all these inotropes [4, 5]. While deriving this formula, the amount of drugs were taken into consideration as available in vials in hospital EDs and ICUs and prehospital emergency care in Turkey. In the derived formula, the initial infusion rate can be conceived for all four inotropes *via* the same method (Table 1).

When the Fast inotrope bag (FiB) Coefficient is multiplied by the patient weight (kg), the initial rate of the prepared standard solution is produced. In this way, the clinician is able to initiate treatment with a single formula for the initial dose of these three agents. Another advantage of this approach is that the calculation can be performed in a standard fashion in each of these four inotropic agents.

The advantages of this formula are its easy computability, no need for additional mathematical operations at any stage, starting the treatment by applying the same coefficient for all four inotropes, and calculating the result in mL/hour, which has been readily accustomed by a majority of healthcare personnel. At the same time, the infusion dose can be modified with a simple calculation, even if the amount of fluid in which the drug is administered changes. For example, if we use a bottle of 500 mL (instead of 100 mL taken in the standard formula), the infusion rate can be adjusted by multiplying the result in the formula by 5.

We know that the value of our formula is limited by the widespread availability in many countries of pre-mixed in-

TABLE 1. Calculation of initial infusion rate in solutions prepared with "FiB Coefficient" for dopamine, noradrenaline, adrenaline, and doputamine [2–5].

Positive inotrope	Dose in guidelines	Amount of positive inotrope in a standard vial	Preparation of the solutions	Calculation of initial infusion rate	Initial infusion rate
Dopamine	5–20 mcg/kg/min	200 mg/5 mL	100 mL normal saline or 5% water in dextrose + 1 vial NA/DA/EPI/DBA	Body weight ×0.15* (mL/hr)	5 mcg/kg/min
Noradrenaline	0.05–0.15 mcg/kg/min	4 mg/4 mL			0.1 mcg/kg/min
Epinephrine	0.01–0.5 mcg/kg/min	1 mg–1/1000			0.025 mcg/kg/min
Dobutamine	2–5 mcg/kg/min	250 mg/20 mL			5 mcg/kg/min

** FiB Coefficient: 0.15, NA: noradrenaline, DA: dopamine, EPI: adrenaline, DBA: dobutamine.*

TABLE 2. Calculation of initial infusion rate in sample populations [2–5].

Positive inotrope dose in guidelines (mcg/kg/min)	Populations	Mean weight	Preparation of inotropic bag	Initial infusion rate (mL/hour)
DA: 5.00–20.00 NA: 0.05–0.15 EPI: 0.01–0.50 DBA: 2.00–5.00	Infant	5 kg	100 mL normal saline or 5% water in dextrose + 1 vial NA/DA/EPI/DBA	5 × 0.15 = 0.75
	Toddler	10 kg		10 × 0.15 = 1.50
	Child	20 kg		20 × 0.15 = 3.00
	Adult	70 kg		70 × 0.15 = 10.50
	Adult	100 kg		100 × 0.15 = 15.00

NA: noradrenaline, DA: dopamine, EPI: adrenaline, DBA: dobutamine.

otrope bags and smart infusion pumps that do the involved math.

When we consider all the EDs of the world, disaster conditions and EDs managed with limited facilities, we think that our formula will be used very frequently and will contribute to both emergency medicine and intensive care literature.

This coefficient will not only enable physicians to calculate the preparation rate of inotrope bags, but also will enable nurses preparing inotropic bags to check whether the inotropic bag orders given are in the appropriate dose range or will enable paramedics to initiate inotropes easily and practically for patients who may need inotropes in the prehospital period. Preparation examples for different age and weight groups are given in Table 2. The following two important notes should be kept in mind by anyone using this formula:

Note 1: Calculated initial doses are recommended starting doses for patients in need of inotropes. "Standard" doses of each drug differ in various clinical situations.

Note 2: The doses calculated by the formula are within the recommended ranges for the beginning, and doses can be adjusted up and down in accord with the given clinical situation.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on reasonable request from the corresponding author.

AUTHOR CONTRIBUTIONS

SA, SY and RA—conceived the study, designed the trial; supervised the conduct of the trial and data collection; takes responsibility for the paper as a whole; undertook recruitment managed the data, including quality control; drafted the manuscript. All authors contributed substantially to its revision.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Magid DJ, Aziz K, Cheng A, Hazinski MF, Hoover AV, Mahgoub M, *et al*. Part 2: evidence evaluation and guidelines development: 2020 American heart association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation. 2020; 142: S358–S365.

[2] UpToDate. Dopamine: drug information. 2021. Available at: https://www.uptodate.com/contents/dopamine-drug-information?search=dopamine&source=panel_search_result&selectedTitle=1~148&usage_type=panel&kp_tab=drug_general&display_rank=1 (Accessed: 30 November 2021).

[3] Gupta P, Tuli V. Dopamine infusion: a simpler formula. Indian Pediatrics. 1994; 31: 868.

[4] UpToDate. Epinephrine (adrenaline) (systemic): drug information. 2021. Available at: https://www.uptodate.com/contents/epinephrine-adrenaline-systemic-drug-information?search=epinephrine&source=panel_search_result&selectedTitle=1~142&usage_type=panel&display_rank=1&showDrugLabel=true (Accessed: 30 November 2021).

[5] UpToDate. Norepinephrine (noradrenaline): drug information. 2021. Available at: https://www.uptodate.com/contents/norepinephrine-noradrenaline-drug-information?search=norepinephrine&source=panel_search_result&selectedTitle=1~148&usage_type=panel&kp_tab=drug_general&display_rank=1 (Accessed: 30 November 2021).

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