Editorial

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Shiraz Trauma Transfusion Score: A Scoring System for Blood Transfusion in Trauma Patients

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Uncontrolled hemorrhage is a major preventable cause of death after trauma [1]. Hemorrhagic shock can result in a critical reduction in tissues perfusion and oxygenation, which may produce profound tissue lactic acidosis and cellular dysfunction. In such a condition, rapid restoration of oxygen delivery is essential to prevent end-organ damage [1,2]. Parallel to advances in the field of trauma treatment, resuscitation guidelines have evolved and developed. However, there are still ongoing discussions about various aspects of the application of these guidelines in clinical practice; particularly, about blood products transfusion [3].

In the field of transfusion, two basic, important issues are the start and end point of the process and how long each patient will benefit from a transfusion. It would be very simplistic to consider only one factor, like hemoglobin level, when starting or ending the procedure. In fact, making the decision to transfuse is multifactorial, comprising the following factors: (1) the type of acute event that resulted in the patient's hospitalization; (2) the patient's underlying medical conditions; (3) the blood pressure needed for preserving vital organs function (particularly that of the central nervous system) in different situations; (4) the patient's heart rate as an early indicator of the inability of compensatory mechanisms to maintain oxygen flow to tissues (cardiovascular system); (5) hemoglobin level as a general index for the blood's ability to carry oxygen (the suitable level differs in various conditions); and (6) base deficit (BD) level of blood as an available indicator of shock severity (the appropriate level of BD varies in different situations) [4-7]. It seems that by considering these factors and carrying out individualized risk stratification for each patient, more precise decisions can be made regarding patients who are more likely to benefit from blood transfusion. These targeted transfusions will be more beneficial in reducing the currently occurring significant percentage of inappropriate transfusions [8].

All the above-mentioned factors should be assessed not only for beginning a blood transfusion, but also for continuing and ending it. For example, in the field of trauma, the most important principle is to preserve the body's circulatory function in an acceptable manner to avoid (or minimize) any possible damage to brain (and heart) tissue. The

second aim is to prevent the patient's coagulopathy. Finally, preventing irreversible damage to other body organs is a priority. Therefore, higher blood pressure levels are needed to preserve the brain in situations where its autoregulatory mechanisms are disturbed, concomitant brain damage exists, or brain tissue is susceptible to injury following a relative decrease in blood flow and the consequential deoxygenation. The best witness for this claim is the significant increase in mortality rates among major trauma patients with traumatic brain injury when their systolic blood pressure (SBP) decreases to less than 100 mmHg; whereas, penetrating trauma patients that have not experienced traumatic brain injury will well tolerate SBP levels of 80 mmHg.

Obviously, underlying conditions affecting the cardiovascular system limit its function and lead to a patient's decreased physiologic reserves, thus requiring the implementation of early interventions, including blood transfusion [9]. Moreover, it is evident that critical and goal levels of blood pressure vary in different situations. This is also true for BD levels. For instance, it has been shown that mortality rates increase in patients with trauma when the BD value is more than 6 mMol/L [6,9].

In the busy trauma center of Shahid Rajaee Trauma Hospital, not all patients are resuscitated in the same way. Considering the aforementioned facts and based on our previous clinical and research experiences, we developed a transfusion guide scoring system for trauma patients, named Shiraz Trauma Transfusion Score (Table 1). This score considers patients' pre-existing medical conditions, blood pressure levels, pulse rate, hemoglobin level, and the amount of base excess. In this scoring system, patients are being categorized into 3 groups based on the mechanism of injury, including cases of multiple traumas with and without concomitant brain injury, and those with penetrating injuries. Shiraz Trauma Transfusion Score is applicable after early hydration with 2 liters of crystalloids. This scoring system was assessed based on experts' opinions in systematic method. The experts' opinion regarding current transfusion guidelines was assessed and was compared to the results obtained from Shiraz Trauma Transfusion Score. The agreement between these two approaches validated clinical application of this scoring system.

In conclusion, a comprehensive view is needed when applying treatment protocols of trauma resuscitation. Each trauma patient needs an individualized resuscitation measure, with specific intravenous transfusion threshold and endpoint. The usage of scoring systems, similar to what presented in this paper can be significantly helpful in proper decision making for starting and ending resuscitation approaches and will be effective in improving the patients' outcome.

Conflict of Interest: None declared.

Table 1. Scoring system transfusion guide in trauma patients after hydration with 2lit of crystaloid

Mechanism	Score A	Pre-existing condition	Score B	B.P.[c]	Score C	P.R.[d]	Score D	Hb[e]	Score E	B.E[f]	Score F
Multiple Trauma with Brain injury	3	Cardio Vascular Dis[a], Lung Dis	2	80<BP	4	P.R>120	2	Hb<7	4	BE<-10	4
Multiple Trauma without Brain injury	2	D.M.[b] old age	1	100>BP >80	2	100<P.R. <120	1	10>Hb >7	3	-10>BE >-6	2
Penetrating Trauma	1	Beta blocker / Anticoagulants	1	>100	0	<100	0	16>Hb >10	0	>-6	0

[a]Dis.: Disease; [b]D.M.: Diabetes Mellitus; [c]B.P.: Blood Pressure; [d]P.R.: Pulse Rate; [e]Hb: Hemoglobin level; [f]B.E.: Base Excess; Shiraz Trauma Transfusion Score (STTS)=A+B+C+D+E+F; No Transfusion if score is <5; Transfuse P.C. one by one if score is 5=<score<8; Transfuse P.C. two by two+1:1 FFP(or 2 gr Fibrinogen)+(1+1) Tranexamic Acid if score=>8; If Hb>16 but TTS>5: continue resuscitation with crystalloids or colloids

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