

Venous Thromboembolism in the ICU and Reversal of Bleeding on Anticoagulants

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Patients in intensive care units are at high risk for venous thromboembolism; studies have documented a venous thrombosis rate of 12%–33% in this patient group [1–5]. Certain patients are at particularly high risk [6,7]. For example, trauma patients have venous thrombosis rates of up to 60%, 60% of stroke patients will develop thrombosis, and in patients with traumatic spinal cord damage, thrombosis rates approach 100%. Venous thromboembolic disease is one of the most common challenges ICU doctors face.

Prevention

Given the high rates of venous thrombosis in ICU patients, and the fact that clinical signs of deep venous thrombosis (DVT) are unreliable, it is better to attempt to prevent venous thromboembolism in ICU patients than to treat it when it presents clinically [8]. Only 10%–20% of patients with DVT are symptomatic in most large screening studies, and the first sign of pulmonary embolism (PE) in 10%–30% of patients is sudden death. Many ICU patients also have risk factors that place them at higher-than-normal risk of bleeding should they require full anticoagulation therapy. Multiple methods exist to prevent venous thromboembolism, which makes it possible for the clinician to tailor a specific regimen to a particular patient's clinical situation [6,9]. Studies have consistently shown that aspirin alone does NOT prevent venous thrombosis, despite its widespread use for this purpose. Use of other thromboprophylactic modalities is, therefore, mandatory. [Table 1](#) summarizes suggested methods to prevent venous thrombosis

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Table 1
Deep venous thrombosis and pulmonary embolism prevention in intensive care patients

Clinical setting	Methods of prevention
Medical patient	Unfractionated heparin 5000 units BID Low molecular weight heparin ^a Intermittent compression stockings ^b
Trauma	Low molecular weight heparin ^a Intermittent compression stockings ^b
Lower extremity	
Orthopedic surgery	Low molecular weight heparin ^a Fondaparinux
Hip fracture	Fondaparinux Low molecular weight heparin ^a
Stroke	Low molecular weight heparin ^a Intermittent compression stockings ^b

^a Dose varies with the specific LMWH.

^b Patients at high risk of bleeding.

in particular clinical settings. Intermittent compression stockings are a mechanical means of preventing DVT by squeezing the patient's calves, which leads to increased blood flow through the venous system. This compression also stimulates fibrinolysis by stimulating the endothelium [10,11]. Although the use of compression stockings is particularly useful in patients unable to tolerate any degree of anticoagulation, the disadvantages include patient discomfort, non-compliance, and risk of mechanical breakdown.

Unfractionated heparin in the dose of 5000 units two to three times a day is the traditional prophylactic regimen [12], and has proven efficacy in surgical patients at average risk of thrombosis [13], in patients with medical illness, and in critical care patients [6]. In high risk surgical patients, low molecular weight heparin (LMWH) is currently the standard for prevention of thrombosis [14]. LMWH has also been proven very effective for this purpose when studied in medical patients [15].

Fondaparinux is a synthetic pentasaccharide that binds to antithrombin. It has been shown to be effective in thromboprophylaxis in both medical and surgical patients [16]. Fondaparinux is renally cleared and should not be used in patients with renal insufficiency or failure.

There have been multiple trials of all the above mentioned agents for prevention of DVT [6,8,9], most of which have been in the surgical, rather than the ICU setting. However, the data do allow for some specific recommendations in critical care patients (see Table 1).

It is clear that prophylaxis should be considered in all ICU patients [6,8,17]. In surgical ICU patients at high risk for thrombosis (neurosurgery, orthopedics, trauma, and so forth), LMWH is superior to other forms of prophylaxis and should be used [6,18,19]. LMWH is also the most effective method of thrombosis prevention in stroke patients. Medical ICU patients have been less well studied, but trials exist confirming the efficacy of low molecular weight heparin,

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