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NON-COVID PATIENTS

Prophylaxis. We recommend daily exercise activities, weight reduction, and smoking cessation.

Diagnosis. For outpatients with low risk (Wells score of 0 for deep venous thrombosis [DVT] and <2 for pulmonary embolism [PE]) or moderate risk (Wells score of 1-2 for DVT and 2-6 for PE) and D-dimer level of <500 ng/mL, we recommend no further testing. For moderate-risk patients and D-dimer level of \geq 500 ng/mL or high-risk patients (Wells score of >2 for DVT and >6 for PE), we recommend venous duplex ultrasound or computed tomography at an outpatient imaging center.

Management. For stable patients, we recommend outpatient management with direct oral anticoagulants, and inpatient management with parenteral anticoagulation for unstable cases.

COVID-19 PATIENTS

Prophylaxis. In addition to early ambulation, we recommend prophylaxis for all patients, favoring enoxaparin over unfractionated heparin.

Diagnosis. Based on clinical suspicion, and D-dimer level in patients with low risk, we cautiously suggest imaging studies in order to reduce viral transmission and interruption of intensive care.

Management. We recommend prophylaxis, low- or regular-intensity full anticoagulation based on imaging availability and bleeding risk. We favor enoxaparin over unfractionated heparin to reduce the need for monitoring of activated partial thromboplastin time, which can be affected by the viral infection. Direct oral anticoagulants may be considered in patients who do not require a procedure.

Extended prophylaxis. Extended prophylaxis is considered in patients with moderate clinical suspicion and low bleeding risk.

Further research is needed for standardized management recommendations for VTE in the era of COVID-19.

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Pulmonary embolism response teams in the challenging era of venous thromboembolism associated with COVID-19



We read with enthusiasm and interest the manuscript written by Obi and colleagues entitled "Practical diagnosis and treatment of suspected venous thromboembolism during the COVID-19 pandemic."¹ The manuscript was based on consensus between a number of vascular experts together with input from intensivists, pulmonologists, and hematologists "for critique and vetting of the algorithms that resulted." This type of consensus work is precisely how and why the evolving concept of pulmonary embolism response teams (PERTs) has become so widely accepted.^{2,3}

We believe that multidisciplinary PERTs are invaluable in the care of patients with suspected or proven venous thromboembolism (VTE) associated with severe pneumonic COVID-19. Complex acute pulmonary embolism (PE) cases are particularly likely to benefit.^{2,3} During this pandemic, PERTs have been particularly challenged to arrive at practical and effective approaches to the diagnosis and treatment of acute VTE while minimizing exposure to health care staff and other patients. There is clearly a balance that must be achieved between an acceptable diagnostic yield and unnecessary testing as well as offering an acceptable, effective therapy that again minimizes exposure and carefully uses resources. Skill in point-of-care transthoracic ultrasound, for example, may provide valuable clues for ruling in or ruling out PE when we cannot easily do more specific imaging.^{4,5}

The guidelines offered by Obi and colleagues are helpful. However, the lack of a strong evidence base in some of these newly found clinical scenarios requires us to fall back on our clinical experience and gestalt! Gestalt has proven useful in the diagnosis of acute PE—witness the interesting receiver operating characteristic curve published by Peñaloza et al⁶; gestalt and consensus with experts are critical in these complex times. The markedly elevated D-dimer

levels we see together with severely elevated inflammatory markers may arouse suspicion of PE, but it may not be. Insightful decision-making and clear communication are required, and PERTs are well equipped to aid in these decisions.

A key aspect of the COVID-19 pandemic is the assignment of clinicians with various skill sets to care for COVID patients. A pediatric neurologist, for example, might be working in an adult medical intensive care unit. A general surgeon may be rounding on a general medical ward. Such scenarios are likely to render PERTs even more valuable when clinicians are managing patients in areas in which they are not used to working.

We understand that the current paradigm proposed by the authors emphasizes preventing VTE-related morbidity and mortality, often with empirical anticoagulation at the expense of potential bleeding complications while imaging is delayed.⁶ Difficult decisions need to be made, and patients should be individualized as we wait for carefully conducted randomized trials. There may not be one answer for all. We believe PERTs can play a key role here. While we must “first, do no harm” and not take the bleeding risks of full-dose anticoagulation lightly, the practical approach offered in the document by Obi and colleagues is well thought out, savvy, and, importantly, multidisciplinary. We believe that such an approach together with the multidisciplinary PERT concept can further enhance the care of patients.

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Reply



We appreciate the review of our recent article summarizing our process of prescribing diagnostic vascular unit laboratory testing in those with or suspected of having COVID-19 and algorithms for empirical anticoagulation. Porres-Aguilar and colleagues propose that a pulmonary embolism response team (PERT) may be ideally suited for assisting and managing the venous thrombotic complications in COVID-19-infected patients. The coagulopathy associated with COVID-19 is significant and characterized by elevated D-dimer and factor VIII as well as venous thrombosis, and pulmonary embolism and pulmonary artery thrombosis. They state that our recommended algorithms lack a strong evidence base, and we agree. The basis for our recommendations for obtaining diagnostic imaging is extrapolated from existing evidence-based guidelines, with the goal of allocating imaging to patients most likely to benefit in a resource-scare environment. Our recommendation for empirical heparin anticoagulation was largely based on prior experience with treating H1N1 infection, for which the pulmonary artery embolism or thrombosis rate was very high.¹ Since our article came out, more data have accrued that heparin may be beneficial for these patients, including an observed mortality benefit among >300 intensive care unit patients in New York City,² in part because of direct antithrombotic but also antiviral binding effects.³ Of note, we are tracking very closely bleeding complications associated with our protocols,