

## Editorial

## Introduction to the Special Issue: 'Update on Pulmonary Embolism'

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The present focus issue of the Journal is dedicated to acute pulmonary embolism (PE) and its chronic sequelae. Several international experts critically review the current state of the art in the diagnosis and management of the disease, and outline the implications for optimal contemporary patient care.

Venous thromboembolism (VTE), clinically presenting as PE or deep vein thrombosis (DVT), is globally the third most frequent manifestation of thrombosis and acute cardiovascular syndrome behind myocardial infarction and stroke.<sup>1,2</sup> The annual incidence of PE has been reported to range from 39 to 115 per 100,000 population; it is even higher for DVT without clinically evident PE.<sup>3</sup> Beyond absolute numbers at a given time point, however, it is mostly the alarming trends that emphasize the growing importance of the disease. In fact, the incidence of VTE is almost eight times higher in individuals aged 80 years or older than in the fifth decade of life.<sup>3</sup> In parallel, longitudinal studies have shown a steadily rising tendency in annual PE incidence<sup>4,5</sup> and PE-related mortality rates<sup>6,7</sup> over the past 20 years. Based on these data, and viewed from the perspective of the global demographic change towards an aging population, it becomes obvious that the clinical and epidemiological impact of acute PE in terms of morbidity and mortality, and the financial burden imposed by PE on health care systems, will all continue to increase substantially in the years to come.

In the focus article by Drs. Righini and Robert-Ebadi, published in Issue 1 of *Hämostasologie*, the authors reviewed the diagnostic modalities and strategies for patients with suspected acute PE.<sup>8</sup> Despite the uninterrupted and undisputed dominance of computed tomographic pulmonary angiography (CTPA) in diagnostic algorithms since 2006, the first steps of assessing the clinical or 'pre-test' probability by clinical decision rules and D-dimer testing have by no means lost their importance. On the contrary, efforts continue to concentrate on optimizing the performance of these scores to reduce as much

as possible the number of unnecessary time-consuming, costly and potentially hazardous CTPA examinations. Scintigraphic and magnetic resonance technology are also making progress, although the clinical data not yet suffice to justify modifications in current recommendations for clinical practice. Furthermore, the article focuses on clinically relevant gaps of knowledge and areas of uncertainty, notably imaging findings in patients with a previous history of VTE and the diagnostic challenge of isolated symptomatic sub-segmental PE.

In this issue of *Hämostasologie*, Drs. Donadini and Ageno then discuss advances in risk assessment of patients with confirmed acute PE as well as the initial anticoagulation regimens in these patients.<sup>9</sup> Direct, non-vitamin K-dependent oral anticoagulants are increasingly becoming the first-line option for patients with acute PE, but this does not mean that the anticoagulation chapter can be considered 'closed'. In fact, the most critical question on anticoagulation is also the one that remains most difficult to answer in everyday practice: 'How long to anticoagulate the patient after PE and with what dose?' The authors provide guidance by critically reviewing existing scores for assessment of VTE recurrence versus bleeding, also in light of the results of recent studies, which investigated the safety and efficacy of extended, reduced-dose anticoagulation.

Following the recommendations for management of the general population, Drs. Werth and Beyer-Westendorf highlight the difficulties in specific situations and in patients at particularly high risk.<sup>10</sup> It is well known that solid evidence derived from randomized trials does not exist for pregnant patients. Therefore, practice in this setting is shaped by extrapolations, pathophysiological considerations, cohort data and personal experience. Nevertheless, or rather exactly because of this, clinicians need guidance and recommendations by experts in the field. Similar challenges exist in patients with chronic kidney disease and particularly those

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with severe renal failure, a further focus of this chapter. Fortunately, progress is visible in the field of anticoagulation for cancer-associated thrombosis, with recent data on the efficacy and safety of direct oral anticoagulants compared with prolonged parenteral heparin treatment.

Most patients with acute PE are treated with anticoagulant drugs, but for carefully selected patients, mechanical or pharmacomechanical re-perfusion can be a life-saving option. Drs. Engelberger and Kucher review the promising recent evidence and continuing progress related to catheter-directed techniques and regimens of locally delivered thrombolytic drugs.<sup>11</sup> This is a field that had remained stagnant for many decades; now, thanks to the contribution of the authors and other interventional experts, it is moving forward to fill an important gap in PE management.

Last but not least, it is becoming increasingly clear that neither the problems related to PE are confined to the first few days nor the need for patient follow-up and post-PE care ends after discharge from the hospital. Moreover, the critical decisions during the follow-up phase are not limited to determining the 'optimal' duration of anticoagulation, which was mentioned earlier. This was highlighted by the article by Drs. Klok and Barco in Issue 1 of this year in which they focus on our rapidly evolving knowledge—and perception—of what comes *after* PE.<sup>12</sup> Importantly, the spectrum of late PE sequelae includes but is not synonymous with chronic thromboembolic pulmonary hypertension. It extends to broadly defined clinical symptoms and signs of functional limitation, for which the umbrella 'post-PE syndrome' is at present the working title. The authors discuss the challenging task to develop and validate reliable and cost-effective follow-up and screening strategies, and provide guidance based on our current state of knowledge in a rapidly evolving area.

We hope that the readers of *Hämostaseologie* will find in this focus issue a comprehensive update of the most relevant recent advances in the diagnosis and management of PE, combined with useful advice and guidance for challenging situations encountered in clinical practice.

#### Disclosures

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heim, MSD Sharp & Dohme, Daiichi-Sankyo, Pfizer – Bristol-Myers Squibb, and BTG Biocompatibles Group; and institutional grants from Boehringer Ingelheim, Bayer HealthCare, Daiichi-Sankyo, Pfizer, and Actelion.

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