Cancer patients have a high incidence of venous thromboembolism (VTE), VTE recurrence, bleeding and reduced quality of life (1). Thrombosis is the second most common cause of death in cancer patients (2). VTE prophylaxis is not routinely recommended for all outpatients with cancer undergoing chemotherapy. Lymphoma patients are at a higher risk of VTE, compared to different cancer types, particularly with solid tumors (3). The evaluation of thrombosis risk to guide VTE prophylaxis is not routinely recommended for all outpatients with cancer undergoing chemotherapy.

Lymphoma patients are at a higher risk of VTE, compared to different cancer types, particularly with solid tumors (3). The evaluation of thrombosis risk to guide VTE prophylaxis is not routinely recommended for patients with newly diagnosed neoplastic diseases. Khorana et al. developed a prospectively validated risk assessment tool for predicting chemotherapy-associated VTE. However, in this cohort study, only a minority of patients (12.6%) had lymphomas (4).

Most of the available risk assessment tools are not specific for hematological tumors. Recently the Khorana score was used as an inclusion criterion (≥2) for two prospective, randomized controlled trials in VTE prevention in out-of-patient cancer patients receiving chemotherapy. The Cassini trial (5) compared rivaroxaban 10 mg once-daily versus placebo and the AVERT trial (6) compared apixaban 2.5 mg twice-daily to placebo as well. Both studies showed reductions around 60% of thrombotic events, with a slight increase of bleeding on the apixaban study. The Cassini trial included around 7% of lymphoma patients where the AVERT trial included only solid tumors. Subgroup analysis of these 2 trials are not possible comparing solid versus hematological tumors, and these are currently the largest studies in this setting. Table 1 describes the currently available VTE risk tools and its features.

VTE prophylaxis and treatment in patients with hematologic malignancies is challenging, particularly because severe thrombocytopenia can complicate the course of treatments or may exist since early diagnosis, increasing the chances of bleeding complications (13). The identification of patients with lymphomas who are at high risk of VTE are warranted to identify who might benefit from prophylactic anticoagulation strategies and those who will benefit from avoiding anticoagulation, preventing bleeding (3). We believe that a specific score to evaluate VTE risk assessment in hematological cancers should be developed and prospectively validated. Such score would include on top of the Khorana risk score, previous history of VTE, disease stage, potential pro-thrombotic associated treatments and biomarkers.

Recently, Borchmann et al. (14) evaluated thrombotic events in more than 5,000 patients from the GHSG HD13–15 trials in patients with Hodgkin lymphoma (HL). They have found an overall incidence of thrombosis of 3.3%. The authors reported an incidence of less than 1% events in early-favorable, 1.3% in early- unfavorale and 7.3% in advanced patients, the latter incidence being significantly higher (P<0.001). The majority of the events
were deep-venous thrombosis (DVT), and 7.8% arterial thrombosis. Interestingly, the majority of events occurred in the upper extremity (46.3%), mainly catheter associated thrombosis. In 24.6% of the patients, VTE occurred in the lower extremities. In advanced HL, the incidence of VTE events was increased upon more intensive treatment with BEACOPP-14. Applying the Khorana score, only age and smoking correlated with the development of VTE.

The authors concluded that the incidence of VTE in advanced stage HL is comparable to other high-risk cancer patients, with a higher incidence in patients that received dose-dense regimens. This study adds important data regarding incidence of thrombotic events and risk factors for VTE in patients with lymphoma. Previous studies in patients with hematologic malignancies have shown similar results (15). Patients with aggressive non-Hodgkin lymphoma (NHL) and advanced stage disease (III/IV), are also at a high risk to develop VTE. A recent retrospective single center study carried out by Hohaus and collaborators evaluated the occurrence of VTE and identified proposed lymphoma-specific risk factors. It was identified 3 specifics clinical risk factors: central nervous system (CNS) lesions, tumor bulk greater than 10 cm and reduced performance ECOG status. This group proposed that VTE risk factors in patients with lymphoma are not the same VTE risk factors described for patients with solid tumors (3).

As for study design, Borchmann et al. excluded patients over 60 years old and follow-up was limited to 1 year. We believe that future prospective trials involving patients with individual types of cancer, elderly and with longer follow-up periods would provide the definitive evidence about the clinical benefit associated with prophylaxis in out-of-

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Currently available VTE risk tools for cancer patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>Types of cancer*</td>
</tr>
<tr>
<td>Khorana et al. (4)</td>
<td>Breast, colorectal, lung, gynecologic, gastric, pancreatic and lymphoma</td>
</tr>
<tr>
<td>Pabinger et al. (7)</td>
<td>Breast, prostate, lung, colorectal, oesophagus, kidney, lymphoma, bladder or urothelial, uterus, cervical, ovarian, sarcoma, testicular germ-cell tumors, pancreas and stomach</td>
</tr>
<tr>
<td>Tic-ONCO(8)</td>
<td>Solid tumors (colon, pancreas, stomach, lung and oesophagus)</td>
</tr>
<tr>
<td>COMPASS-CAT (9)</td>
<td>Solid tumors (breast, colon, lung and ovarian cancer)</td>
</tr>
<tr>
<td>ONKOTEV (10)</td>
<td>Breast, gastroenteropancreatic genito/urinary tract, lung, kidney, neuroendocrine tumors, head and neck, sarcoma, GIST, hepatocellular carcinoma, skin, brain</td>
</tr>
<tr>
<td>PROTECHT (11)</td>
<td>Gastrointestinal, lung, breast, ovarian, pancreas, head and neck</td>
</tr>
<tr>
<td>VIENNA (12)</td>
<td>Breast, lung, stomach, colorectal, pancreas, kidney, prostate, brain (high-grade glioma) lymphoma, multiple myeloma</td>
</tr>
</tbody>
</table>

* population in the original publication. VTE, venous thromboembolism; GIST, gastrointestinal stromal tumors; BMI, body mass index.
hospital patients, particularly in patients suffering from non-solid tumors.

**Acknowledgments**

None.

**Footnote**

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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