Sarcopenia is an established risk factor for oncologic treatments like surgical interventions and conventional chemotherapy. However, the impact of sarcopenia on treatment and immune-related adverse events (irAEs) of cancer patients treated with immune checkpoint inhibitors (ICIs) continues to be debated. Therefore, we performed a systematic review and meta-analysis of all published articles evaluating the effects of sarcopenia on survival outcomes and irAEs of patients undergoing ICI treatment.

Materials and Methods
In analogy to the Cochrane guidelines for systematic reviews, we performed a systematic literature search including all published articles in PubMed until February 2021 for the key terms 'sarcopenia' or 'sarcopenic obesity' in combination with several terms for ICI treatments, irrespective of cancer entity and ICI used. Further selection criteria for meta-analysis included defined cut-offs for sarcopenia. Reported outcomes included progression-free survival (PFS), overall survival (OS) and the frequency of irAEs. For the random effects meta-analysis, we used Hazard Ratios (HR) for OS and PFS and Odds Ratios (OR) for occurrence of irAEs with corresponding 95% confidence intervals (95%CI), respectively.

Results
A total of 15 studies with 1,428 patients were selected to be eligible for meta-analysis. To evaluate muscle mass, all studies used CT-derived body composition parameters at the third lumbar vertebrae level and defined sarcopenia by using skeletal muscle index (SMI), psoas muscle index (PMI) or skeletal muscle density (SMD). Sarcopenic patients showed an inferior survival compared to non-sarcopenic patients with a combined HR for PFS with 1.53 (95%CI 1.23-1.91, p = 0.0001) and for OS with 1.6 (95% CI 1.23-2.09, p = 0.0005). Frequency of irAEs did not differ between sarcopenic and non-sarcopenic patients regardless of irAE grade (irAEs of grade ≥ 3; OR 1.14, 95%CI 0.65-2.01, p = 0.64, irAEs of any grade: OR 0.96, 95%CI 0.65-1.42, p = 0.85).

Conclusions
This is the first meta-analysis that assessed sarcopenia in a mixed cohort of cancer patients. It revealed that sarcopenia is an adverse risk factor for survival of patients undergoing ICI treatment without affecting the risk of developing irAEs. Future studies may address sarcopenia as a patient-derived risk factor emphasizing the importance of nutrition and physical activity interventions.

Disclosure Information