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Title: Predictors of Venous Thromboembolism In Patients With Advanced Solid Tumors.

Specific Aims: Among patients with common, advanced-stage solid malignancies and no documented venous thromboembolism (VTE) prior to their cancer diagnosis:
1. To determine the incidence of VTE
2. To identify specific risk factors for VTE.
3. To describe which groups of patients are at greatest risk for VTE, thereby identifying a population that warrants further study for primary prophylaxis.

Hypothesis: Incidence rates for VTE vary depending on cancer type and time since cancer diagnosis. Groups of patients at very high risk for the development of VTE can be identified based on patient demographics, associated comorbid illnesses, and cancer characteristics.

Methods Used: We used the National Cancer Institute’s Surveillance, Epidemiology, and End Results (SEER) database linked to Medicare claims data to identify a cohort of patients 67 years old or older who were diagnosed with stage III or IV cancer of the breast, colon, lung, prostate, or pancreas from 1995 through 1999. Patients with ICD-9 diagnosis codes consistent with VTE prior to diagnosis of cancer were excluded from the cohort. We calculated the incidence of VTE for each of the first three years following the diagnosis of cancer. We then analyzed predictors of VTE in the first year after cancer diagnosis, performing bivariate analyses of patient and cancer characteristics along with various comorbidities versus development of VTE. We entered the significant variables into a multivariable Cox survival analysis to develop a hazards model. We also used recursive partitioning analysis (RPA), splitting the cohort on cancer type and stage, to separate patients into clinically distinct groups with varying rates of VTE.

Results: Overall incidence rates for VTE (per 100 person-years) were 5.32, 0.97, and 0.36 for years one, two and three after cancer diagnosis respectively. There was substantial variability across cancer types in the risk of VTE during the first year after cancer diagnosis. Compared to prostate cancer on multivariate analysis, all gender-cancer groups had increased hazard ratios (HR) for development of VTE in the first year after cancer diagnosis ranging from 3.7 for male-colon (95% CI 2.1 – 6.6) to 21.6 for female-pancreas (12.2 – 38.1). VTE was also associated with advanced cancer stage (HR for Stage 4 vs. Stage 3: 1.8 (1.4 – 2.1) and the use of chemotherapy (HR of 1.3 (1.0 - 1.6). RPA was then used to divide the group into five VTE-risk strata (per 100 person-years (95% CI): prostate 1.4 (0.8 – 2.1); stage 3 breast and colon 4.0 (3.1 – 4.9); stage 3 lung 5.2 (4.2 – 6.2); stage 4 lung, breast, and colon 7.2 (6.0 – 8.3); and pancreas 17.4 (12.5 – 22.3).

Conclusions: Cancer type, stage, and the use of chemotherapy were the major characteristics associated with development of VTE within the first year of cancer diagnosis. Our use of RPA allowed for identification of VTE risk strata, categorizing patients into clinically relevant cancer type and stage groups.