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The Influence of Anemia on Clinical Outcomes in Venous Thromboembolism: Results from GARFIELD-VTE

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BACKGROUND

- Venous thromboembolism (VTE) is associated with long-term risk of recurrent VTE and major bleeding
- Extended anticoagulation reduces the risk of recurrence at the expense of an increased risk of bleeding
- The impact of concurrent anemia upon global anticoagulation management and clinical outcomes has not been conclusively investigated[1]
- GARFIELD-VTE is a non-interventional prospective observational study of VTE outcomes and therapy[2]

Aim: compare the baseline characteristics, treatment patterns, and 24-month clinical outcomes of VTE patients with and without anemia in GARFIELD-VTE.

METHODS

- Eligible patients (≥18 years) required confirmed diagnosis of primary or recurrent VTE within 30 days of enrolment, and haemoglobin (Hb) values measured within 30 days following entry
- The study was approved by the individual ethics committees of each participating site. All patients provided written informed consent

ANEMIA CHARACTERISATION

- Anemia was characterized as Hb <12g/dL (women) and <13g/dL (men)
- Severe anemia was characterized as Hb <10 g/dL for both men and women

RESULTS

Study design and patient demographics

- Between May 2014 and January 2017, 10,870 patients from 415 sites in 28 countries were eligible for enrolment into GARFIELD-VTE.
- A total of 7,704 were eligible for analysis (Figure 1)
- Patients with anemia were slightly older, had a lower BMI and were more often female
- Patient demographics and clinical characteristics are summarized in table 1

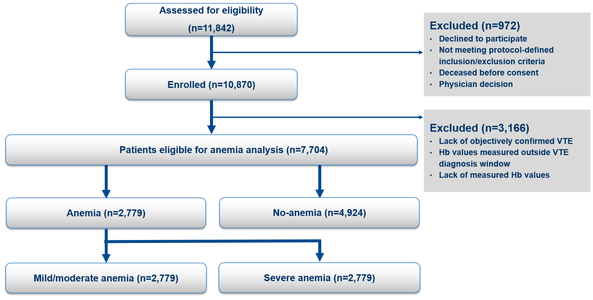


Figure 1. Study population

Table 1. Baseline demographics

Variable	Anemia (n = 2,779)	No-anemia (n = 4,924)
Male, n (%)	1182 (42.5)	2762 (56.1)
Age, median (IQR)	62.6 (47.0 to 74.0)	58.9 (46.0 to 69.9)
BMI, kg/m², median (IQR)	26.4 (22.9 to 30.8)	28.0 (24.9 to 32.1)
Missing	199	480
VTE type, n (%)		
DVT	1,698 (61.1)	2,755 (56.0)
PE ± DVT	1,081 (38.9)	2,169 (44)
Site of DVT, n (%)		
Upper limb	130 (6.2)	174 (4.7)
Lower limb	1,925 (91.3)	3,429 (93.5)
Caval vein	53 (2.5)	63 (1.7)
Missing	681	1,285
Site of PE (pulmonary arterial branch, n (%)		
Main	303 (28.2)	692 (32.1)
Lobar	309 (28.7)	656 (30.5)
Segmental	359 (33.4)	615 (28.6)
Sub-segmental	104 (9.7)	190 (8.8)
Region, n (%)		
Africa and Middle East	309 (11.1)	305 (6.2)
Asia	754 (27.1)	541 (11.0)
Europe	1,218 (43.8)	3,146 (63.9)
Latin America	87 (3.1)	132 (2.7)
North America/ Australia	411 (14.8)	800 (16.2)
Hb categories [g/dL], n (%)		
Low (males: <13.0; females: <12.0)	2,779 (100.0)	0 (0)

BMI: Body Mass Index. DVT: Deep vein thrombosis. Hb: hemoglobin. PE: pulmonary embolism

24-months anticoagulation patterns

- The number of patients commencing anticoagulation at baseline was comparable, however choice of anticoagulation differed in patients with and without anemia (Figure 2)
- DOAC usage, with or without parenteral therapy was lower in patients with anemia
- VKA usage was comparable between groups

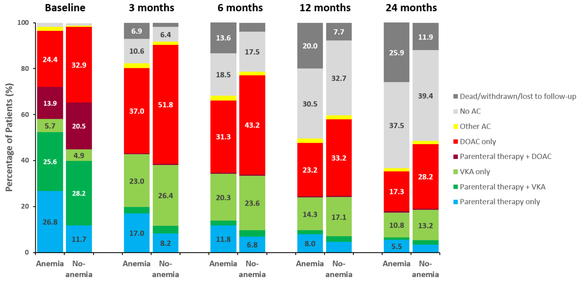


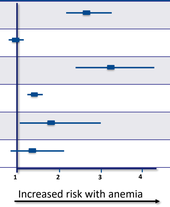
Figure 2. Anticoagulation Patterns

24-Month Clinical Outcomes

- Over 24-months follow-up, incidences of all-cause mortality, major bleeding, and any bleeding were higher in patients with anemia (p<0.0001) (Table 2).
- Recurrent VTE was comparable (*p*=0.6486) (Table 2)

Table 2. Adjusted hazard ratios for 24-months follow up of patients with anemia vs. no-anemia

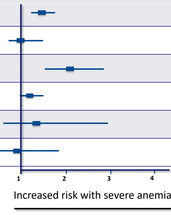
Event	HR/sHR
All-cause mortality	2.62 [2.12-3.25]
Recurrent VTE	0.93 [0.77-1.13]
Major bleed	3.21 [2.42-4.26]
Any bleed	1.43 [1.25-1.64]
MI/ACS	1.76 [1.06-2.93]
Stroke/TIA	1.35 [0.85-2.12]



- All-cause mortality, major bleeding, and any bleeding events increased with severity of anemia (Table 3)

Table 3. Adjusted hazard ratios for 24-months follow up of patients with severe vs. mild/moderate anemia

Event	HR/sHR
All-cause mortality	1.43 [1.22-1.77]
Recurrent VTE	1.06 [0.73-1.55]
Major bleed	2.08 [1.52-2.86]
Any bleed	1.24 [1.01-1.54]
MI/ACS	1.37 [0.64-2.95]
Stroke/TIA	0.89 [0.42-1.89]



HR: Hazard ratio. MI: Myocardial infarction. ACS: Acute coronary syndrome. TIA: Transient ischemic attack. Hazard ratios were adjusted for cancer status, age, ethnicity, and body mass index.

CONCLUSIONS

- Real-world anticoagulation strategies differ between patients with or without anemia
- Anemia patients were more likely to have an increased risk of major bleeding and mortality.
- Increasing severity of anemia is associated with enhanced long-term bleeding and mortality risks

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REFERENCES

[1]Chi, G., *et al.*, Am J Med, 2018. **131**(8): p. 972 e1-972 e7

[2]Weitz, JI *et al.* Thromb Haemost, 2016. **16**(6): p. 1172-1179.

DECLARATION OF INTEREST

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TRI Thrombosis Research Institute

www.garfieldregistry.org

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VTE Garfield global anticoagulant registry in the field