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DVT Pathophysiology and Prophylaxis in Medically Hospitalized Patients

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Overview

- Pathophysiology of DVT
- Epidemiology and risk factors for DVT in the community
- DVT prophylaxis in the acutely ill, hospitalized patient

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“Tis but a Scratch”

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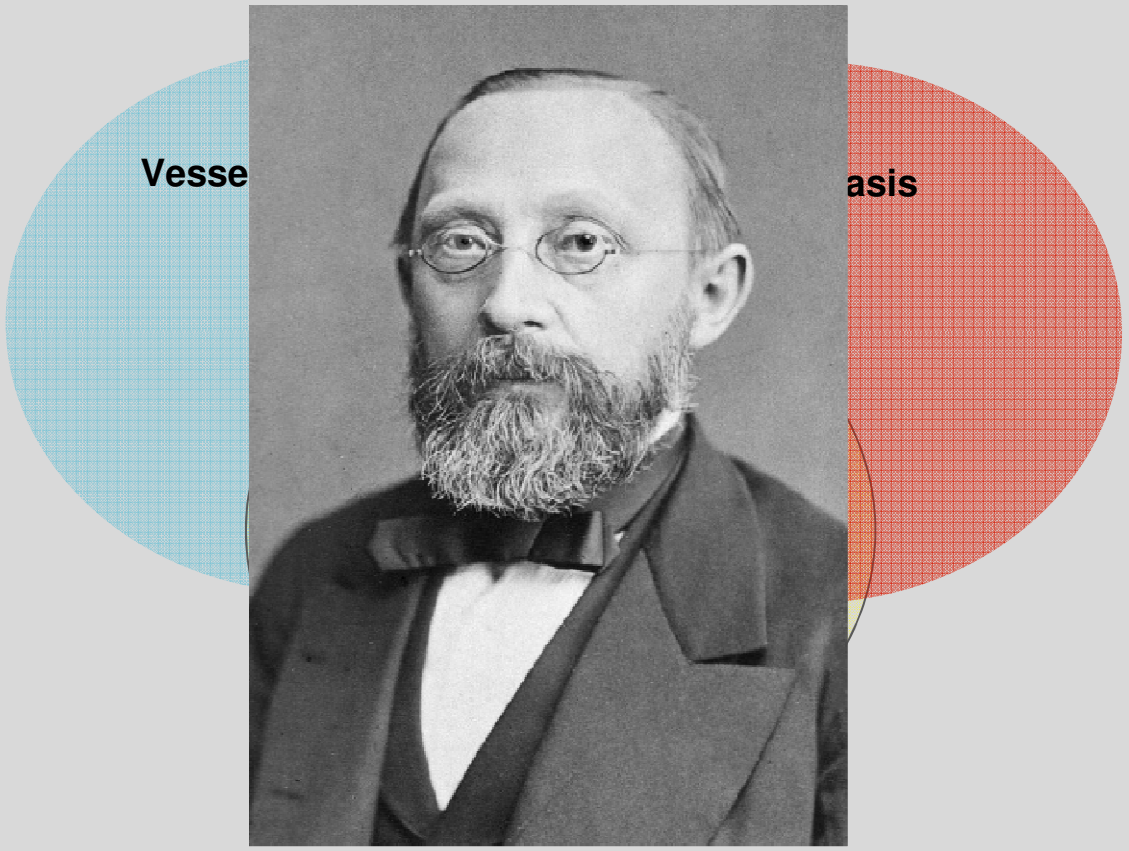
Virchow's Triad



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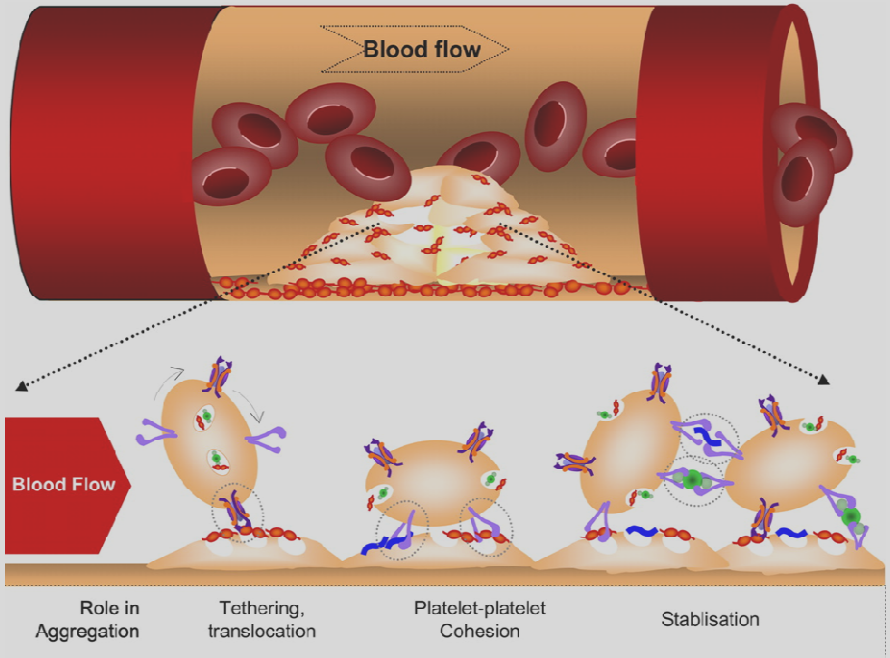
Clot Formation in the Artery

1. Vessel wall damage (plaque rupture, trauma)
2. Platelets bind the damaged endothelium
3. Thrombin binds platelets and fibrin clot forms



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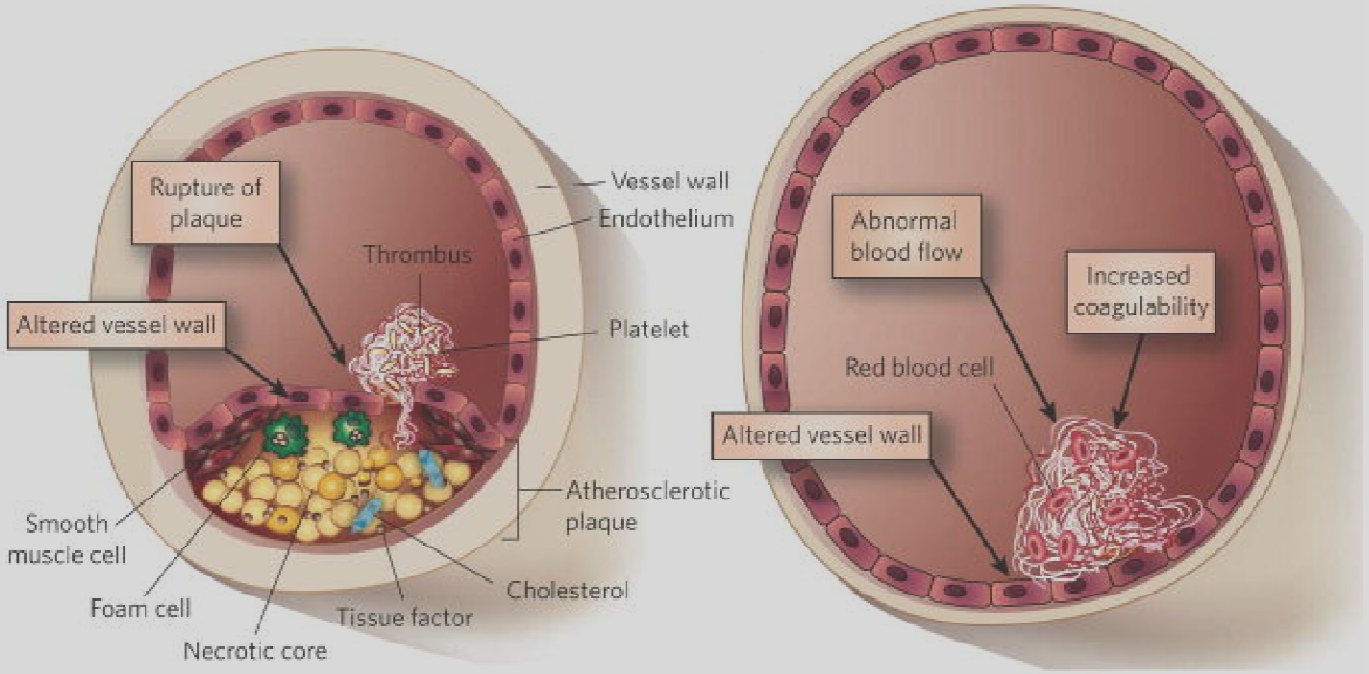
Arterial vs. Venous Thrombus



Nature 2008;451(7181):914

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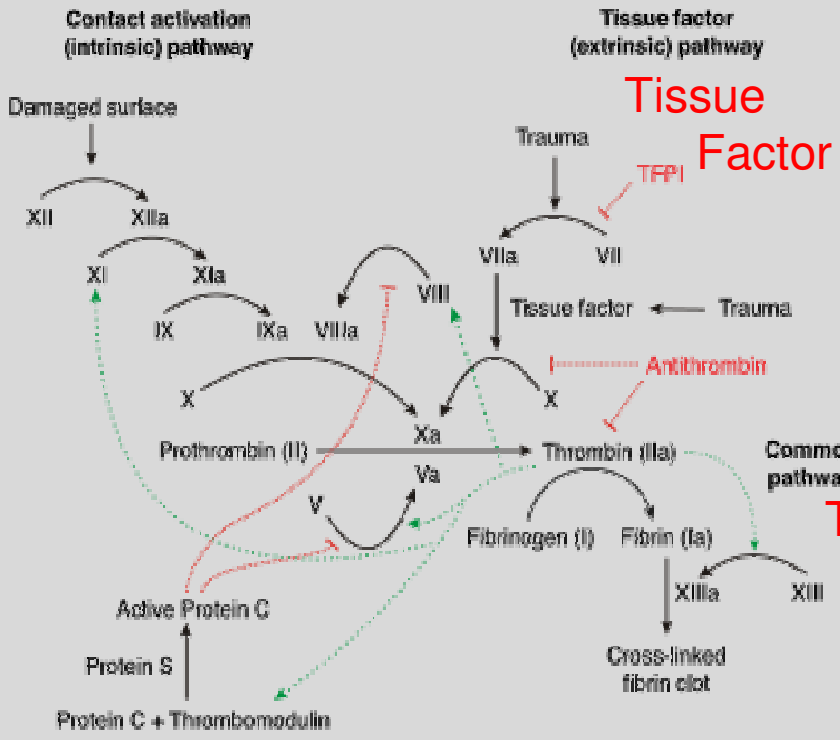
Coagulation Cascade

1. How does Tissue Factor get to the vein?

2. Why does Tissue Factor adhere to the intact endothelium?



Tissue Factor

Thrombin and Fibrin

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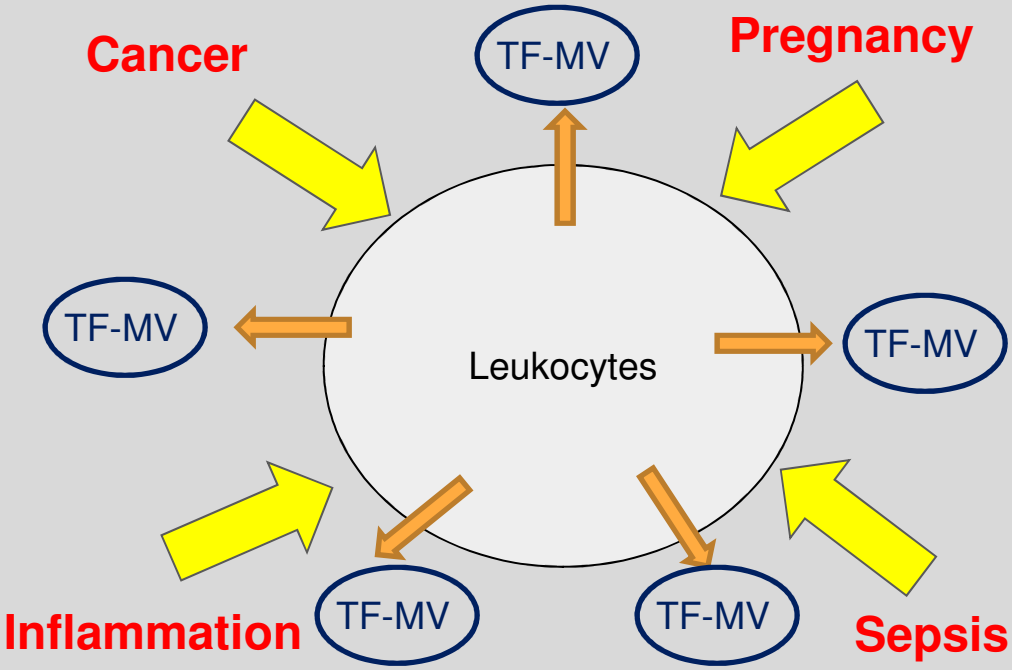
How Does Tissue Factor get into the Blood?



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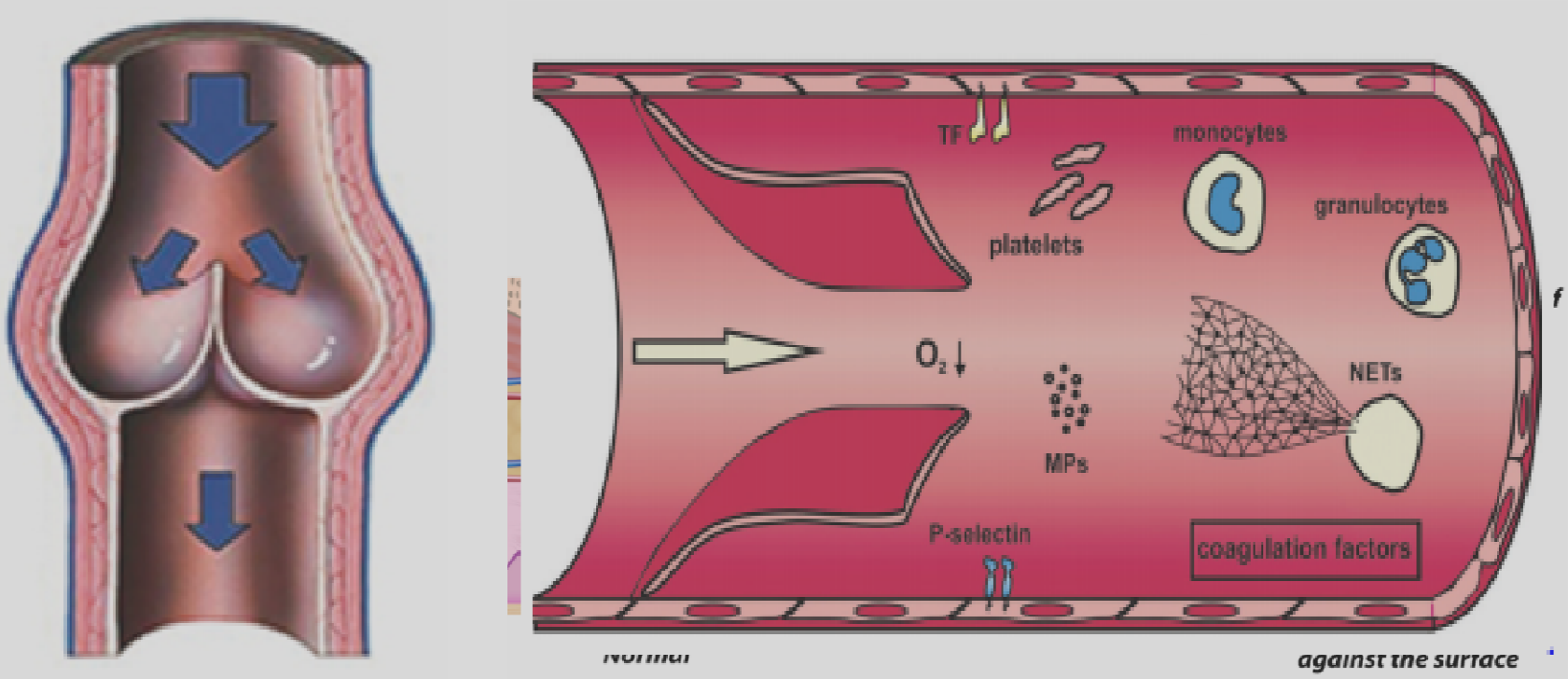
Why Does Tissue Factor Adhere to the Vein?



Ann Royal Coll Surg 1984;66:416
Arterioscler Thromb Vasc Biol 2012;32:563

Venous Thrombosis

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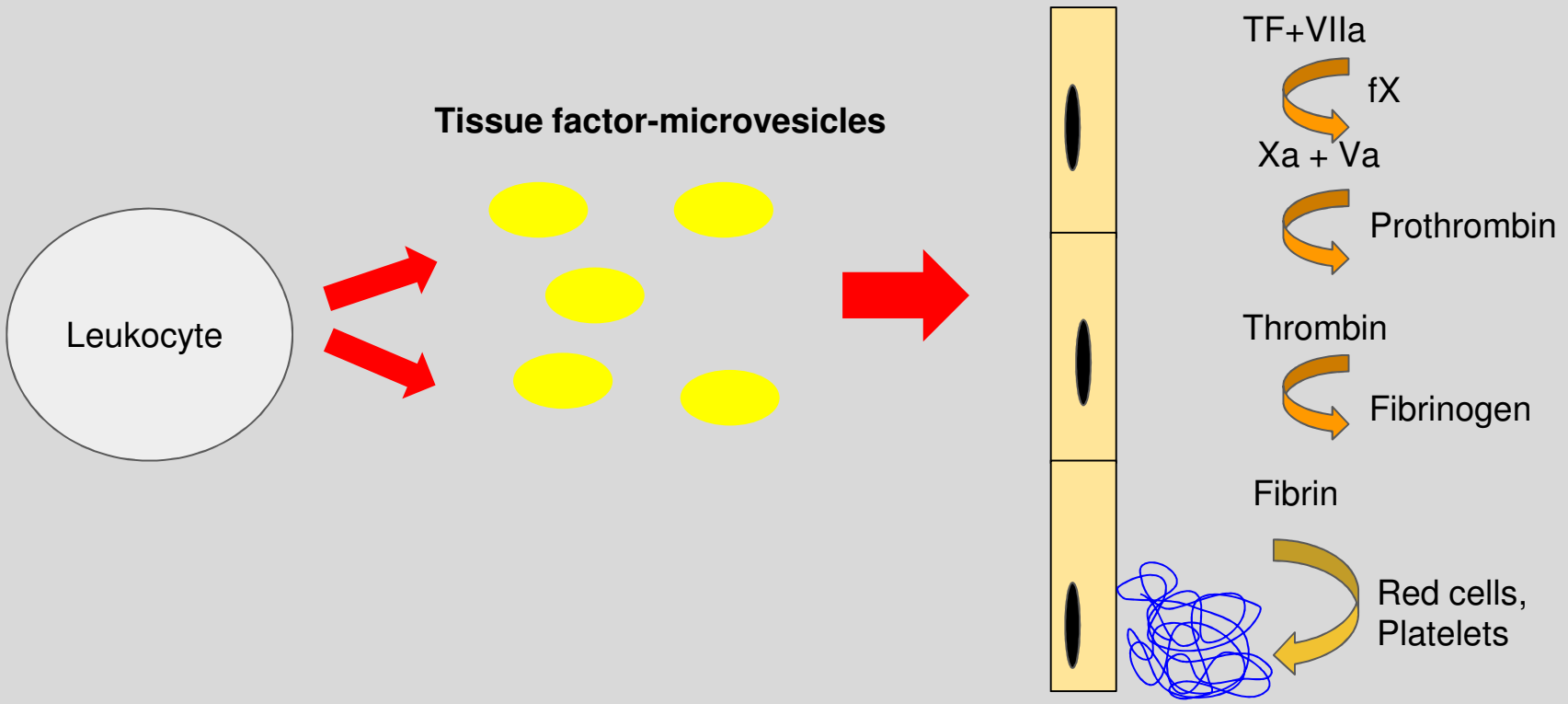

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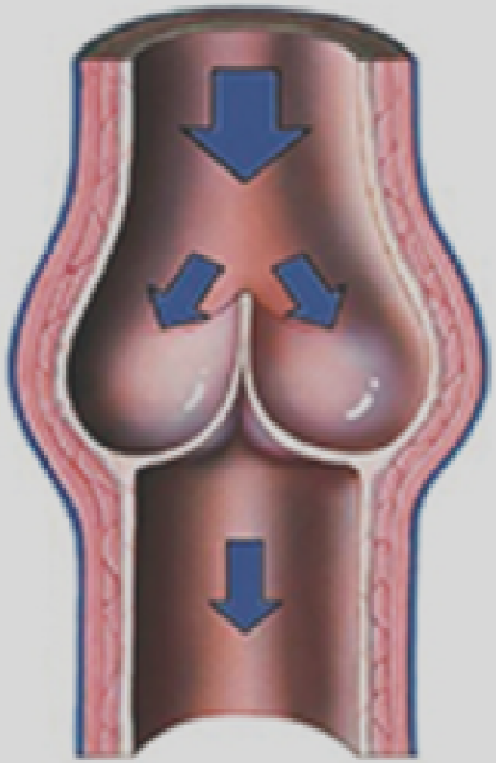
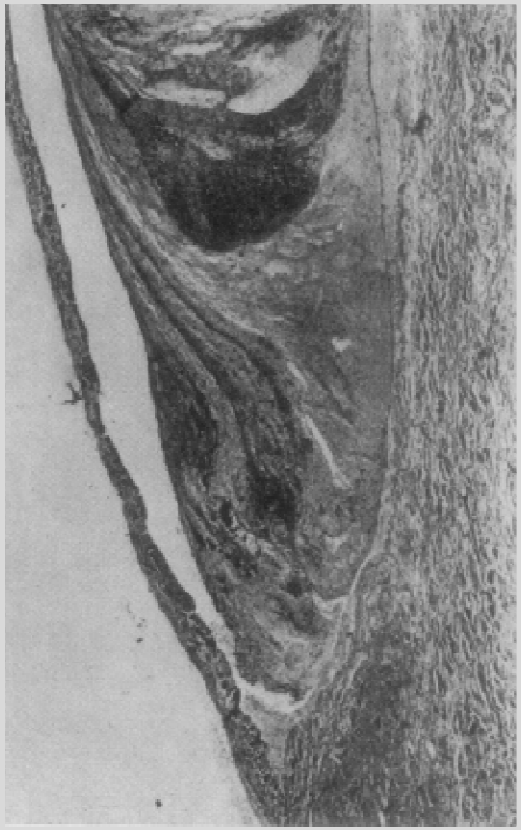
Valve Cusp Thrombus





J Clin Path 1972;27:517-528

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Hypercoagulable Conditions

Genetic

- Increased coagulants
  - Prothrombin mutation: 8%
- Decreased anticoagulants
  - AT deficiency: 1%
  - Protein C: 2-5%
  - Protein S: 2%
  - Factor V Leiden: 20-25%

Acquired

- Malignancy
- Hyperhomocysteinemia
- OCT's
- Pregnancy
- Nephrotic syndrome
- Antiphospholipid antibodies

Chest 2002;1222:1440-1456

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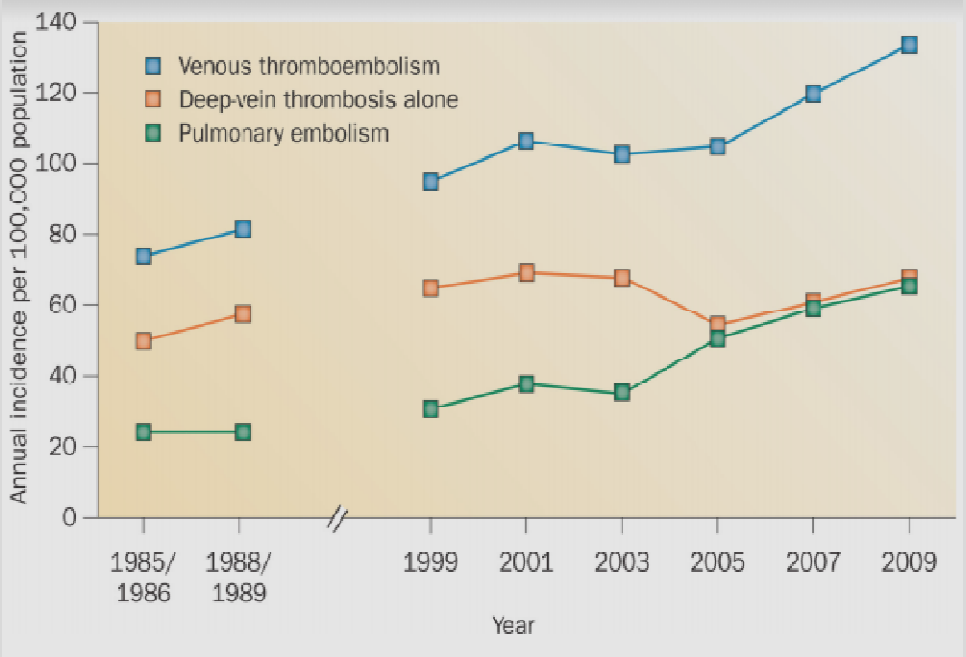
DVT Epidemiology

- 548,000 annual admissions for VTE
- Contributes to 100,000 deaths annually in the US
- Accounts for up to 15% of unexpected hospital deaths
- Costs > $10 billion annually



Nat Rev Cardiol 2015;12(8):464

J. Hosp. Med 2012;9;706-708

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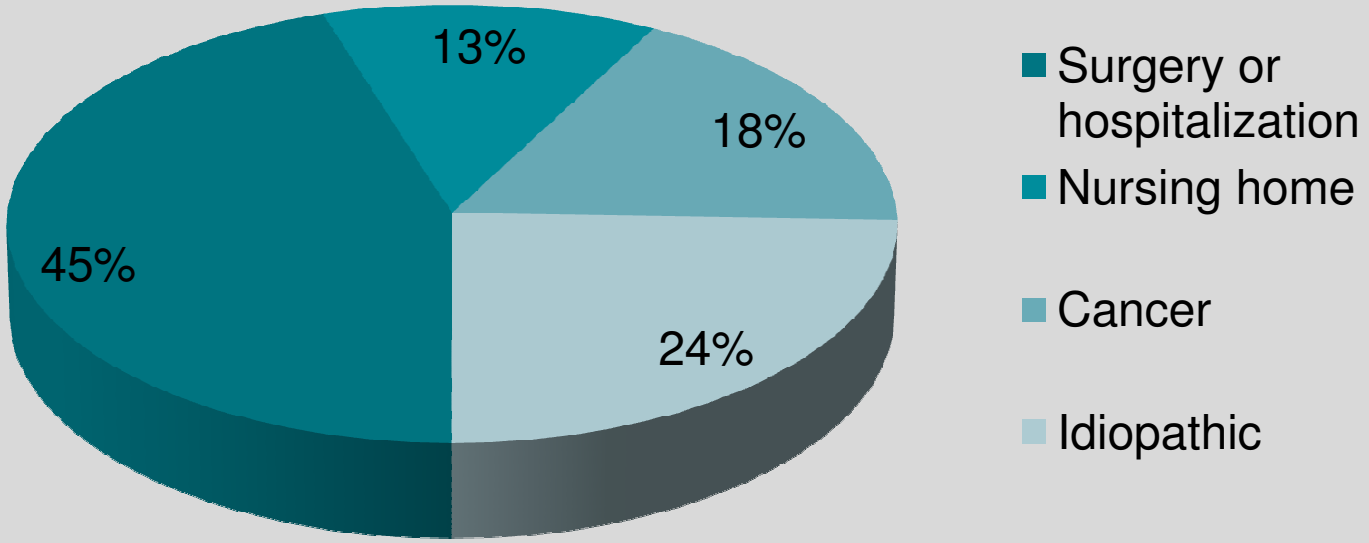
Who Gets VTE in the Community?



Arch Inter Med 2002;162:1245

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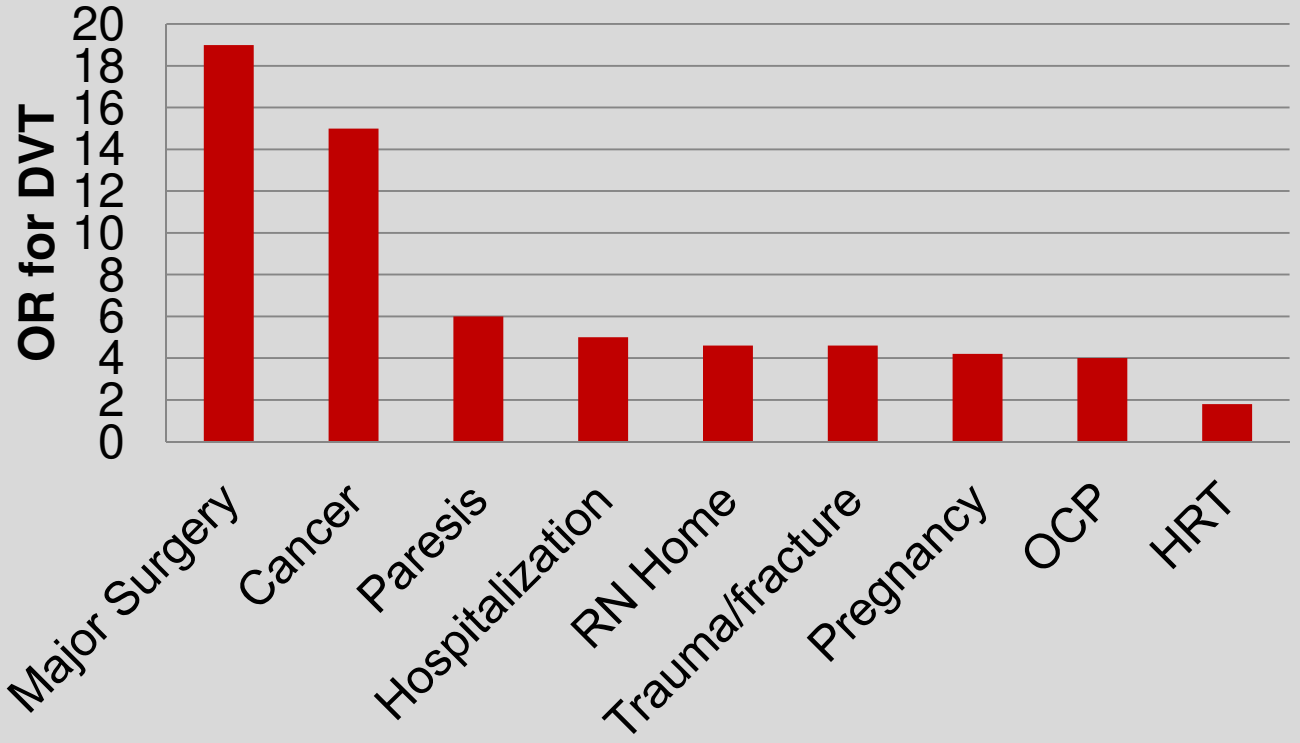
VTE Risk Factors



Nat Rev Cardiol 2015;12(8):464

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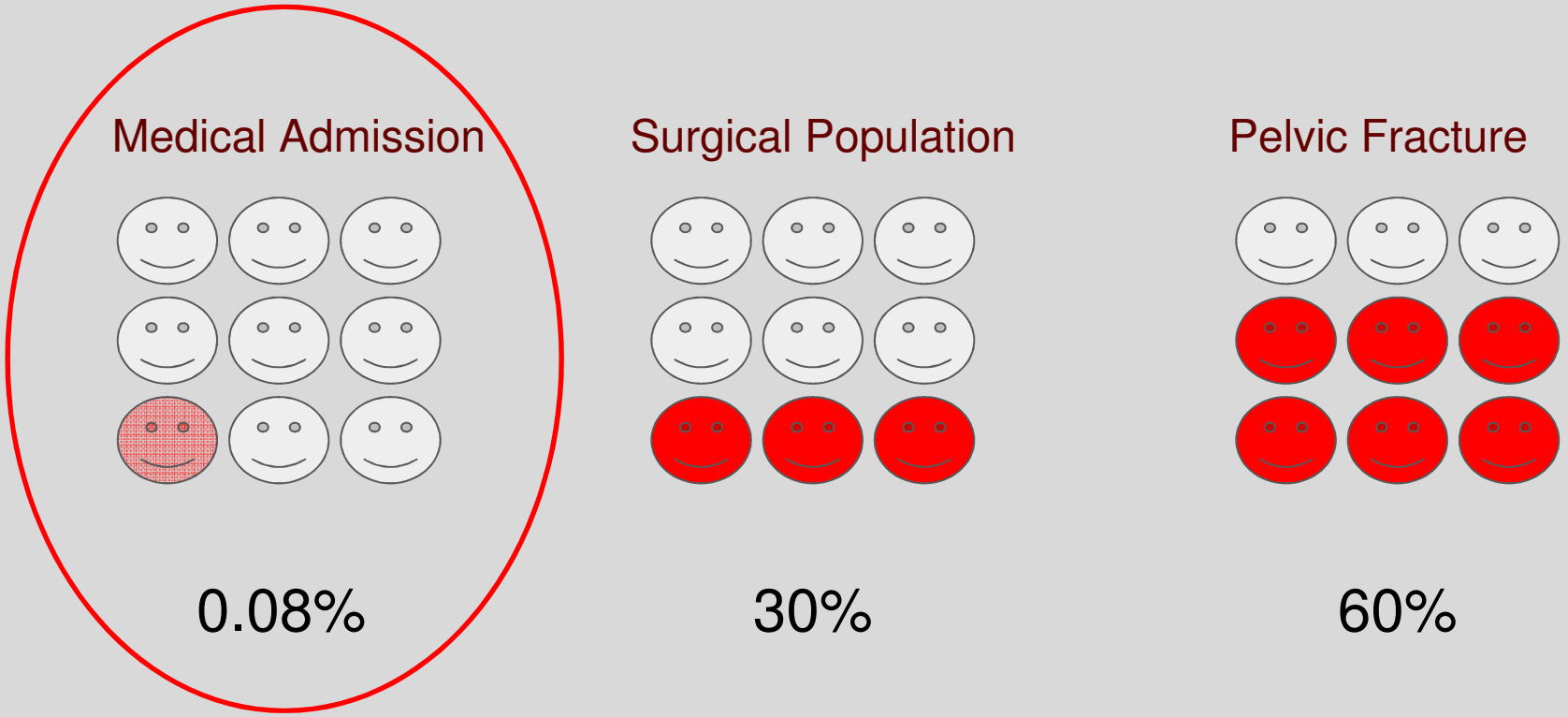
DVT in the Hospital



Lancet 2005;365:1163

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DVT Prevention

Pharmacoprophylaxis

- Heparin
- LMWH
- Dabigatran/Argatroban
- Apixiban/Rivaroxaban

Mechanical Prophylaxis

- Graduated compression stockings
- Intermittent pneumatic compression devices (ICP)
- Venous foot pumps

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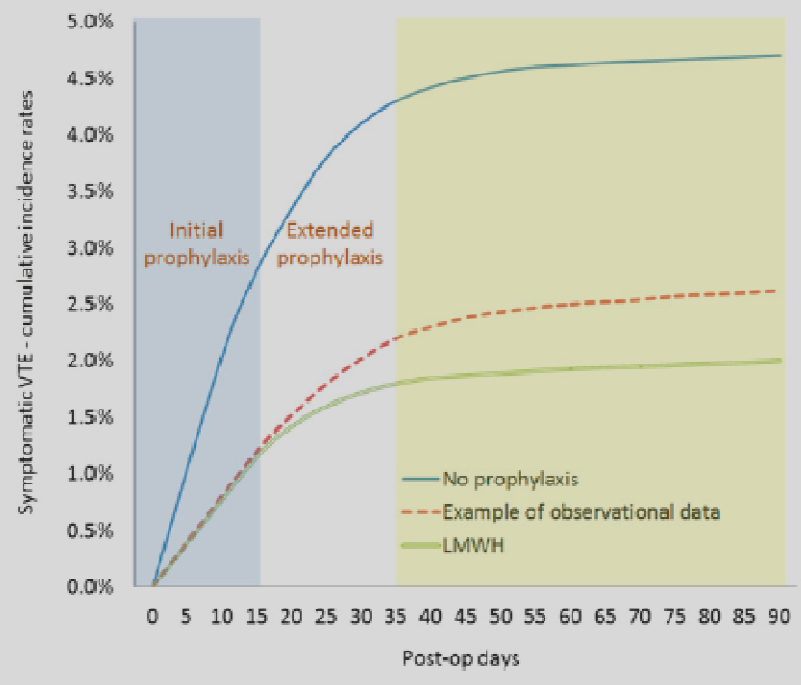
Any Anticoagulant vs. None to Prevent VTE

- Nearly 50% reduction in Symptomatic DVT in all orthopedic surgery patients



Chest 2012;141(2):e278s

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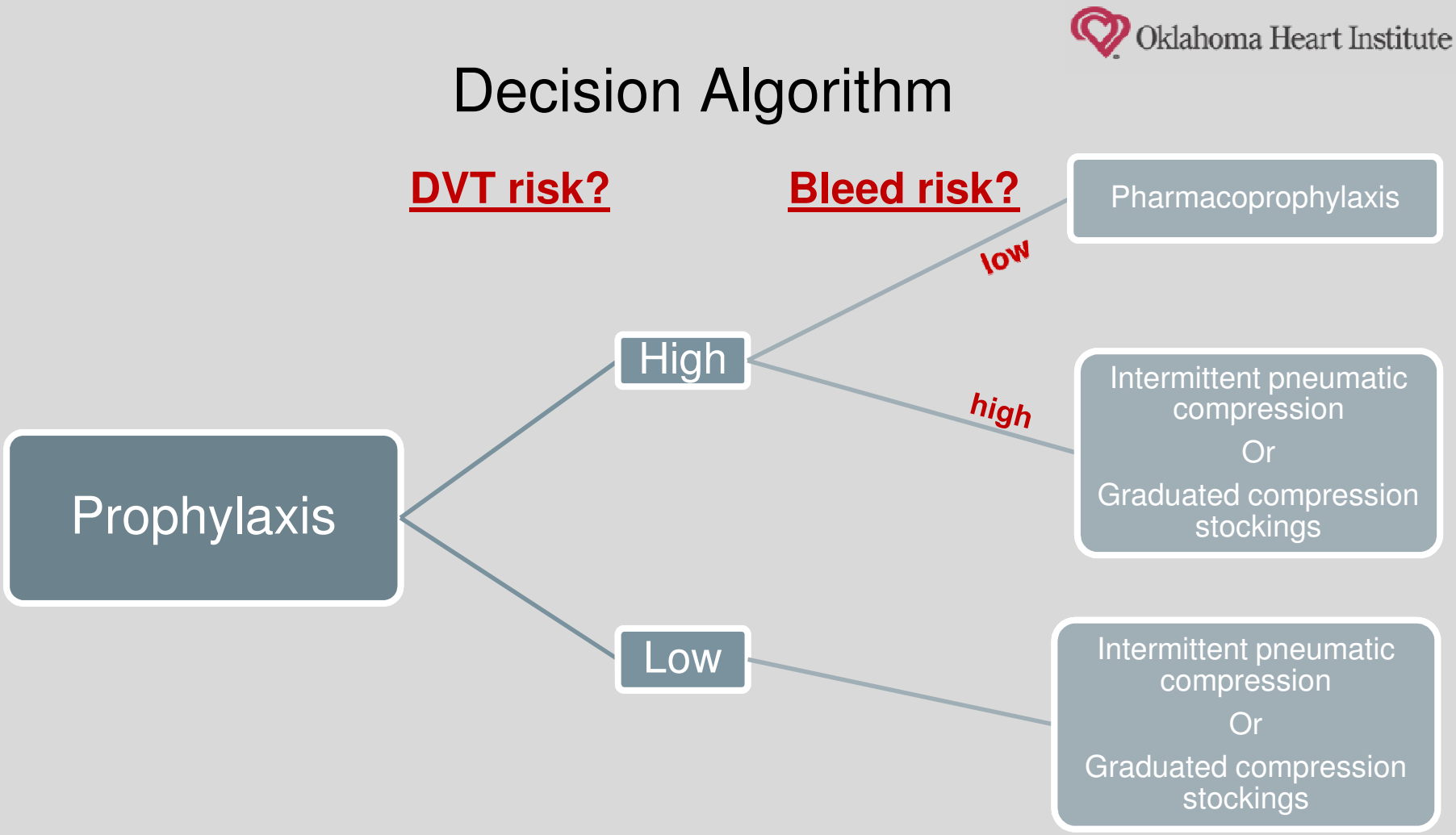
Decision Algorithm



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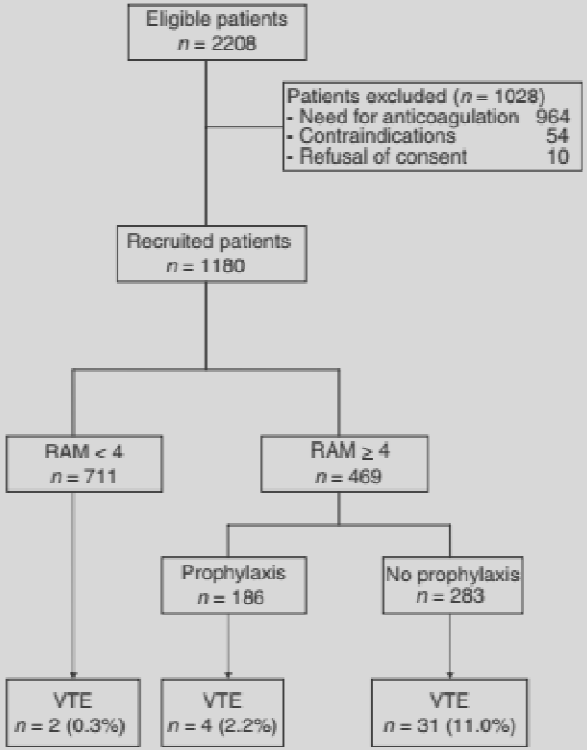
Padua Study-who is high risk?

- Padua Prediction Score-derived from a prospective observational study of all medical admission to a hospital.
- All patients without a need for anticoagulation were characterized prospectively as high or low risk based on a risk prediction model.
- Patients were followed for 3 months
- Primary outcome was symptomatic VTE within 3 months of hospitalization



J Thromb Haemost 2010;8:2450

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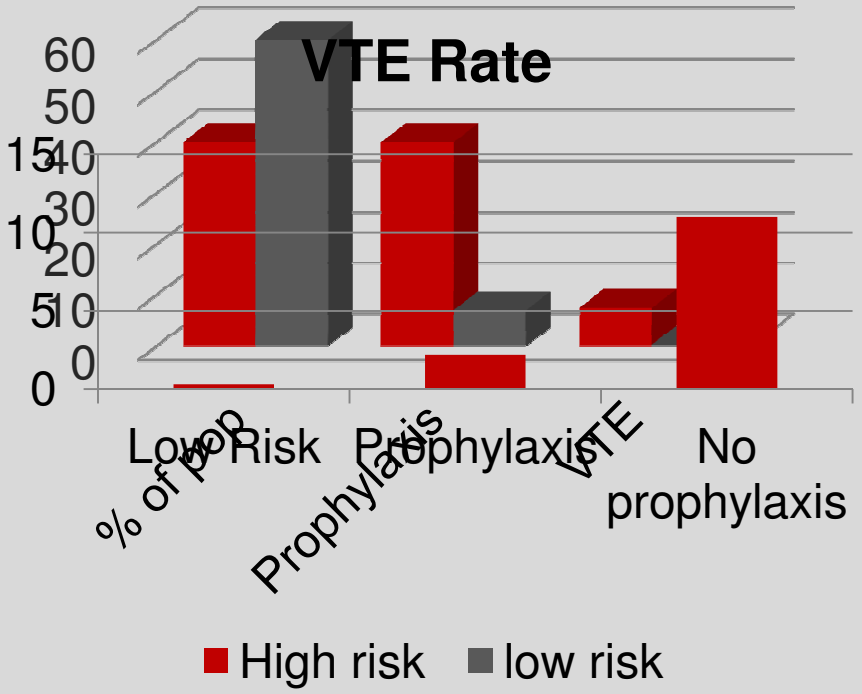
High vs. Low Risk?

Risk Factor	Points
Active cancer[a]	3
Previous VTE (with the exclusion of superficial vein thrombosis)	3
Reduced mobility[b]	3
Already known thrombophilic condition[c]	3
Recent (≤ 1 mo) trauma and/or surgery	2
Elderly age (≥ 70 y)	1
Heart and/or respiratory failure	1
Acute myocardial infarction or ischemic stroke	1
Acute infection and/or rheumatologic disorder	1
Obesity (BMI ≥ 30)	1
Ongoing hormonal treatment	1

High risk is > 4



J Thromb Haemost 2010;8:2450

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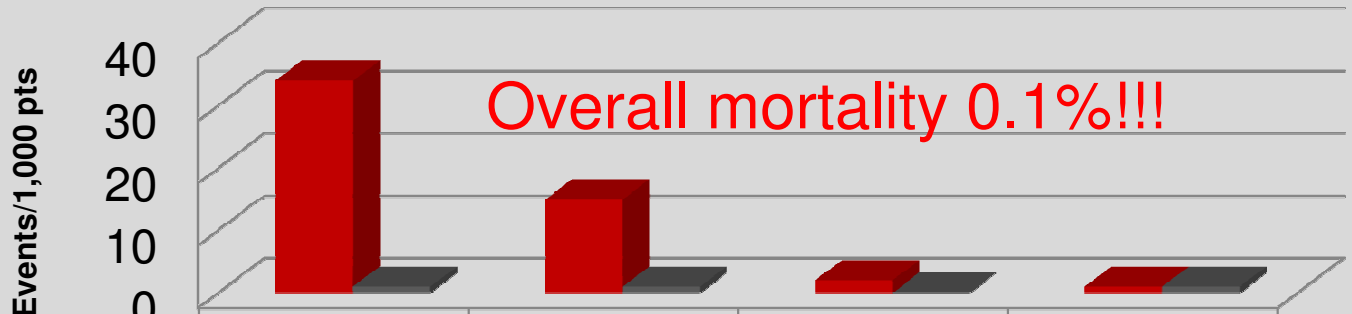
CHEST Physicians: “Anticipated Absolute Effect”



	Symptomatic DVT	Non-fatal PE	Fatal PE	Major Bleeding
High Risk	34	15	2	1
Low Risk	1	1	0	1

Chest 2012;141(2):e195s

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CHEST Guidelines

- For hospitalized patients at increased risk of thrombosis, anticoagulation is recommended (IB)
- For hospitalized patients at low risk of thrombosis, we recommend against the use of anticoagulation (IB)
- For acutely ill hospitalized medical patients at increased risk of thrombosis, we recommend anticoagulant thromboprophylaxis with LMWH, low dose unfractionated heparin BID or TID, or fondaparinux (IB)

Chest 2012;141(2):e195s

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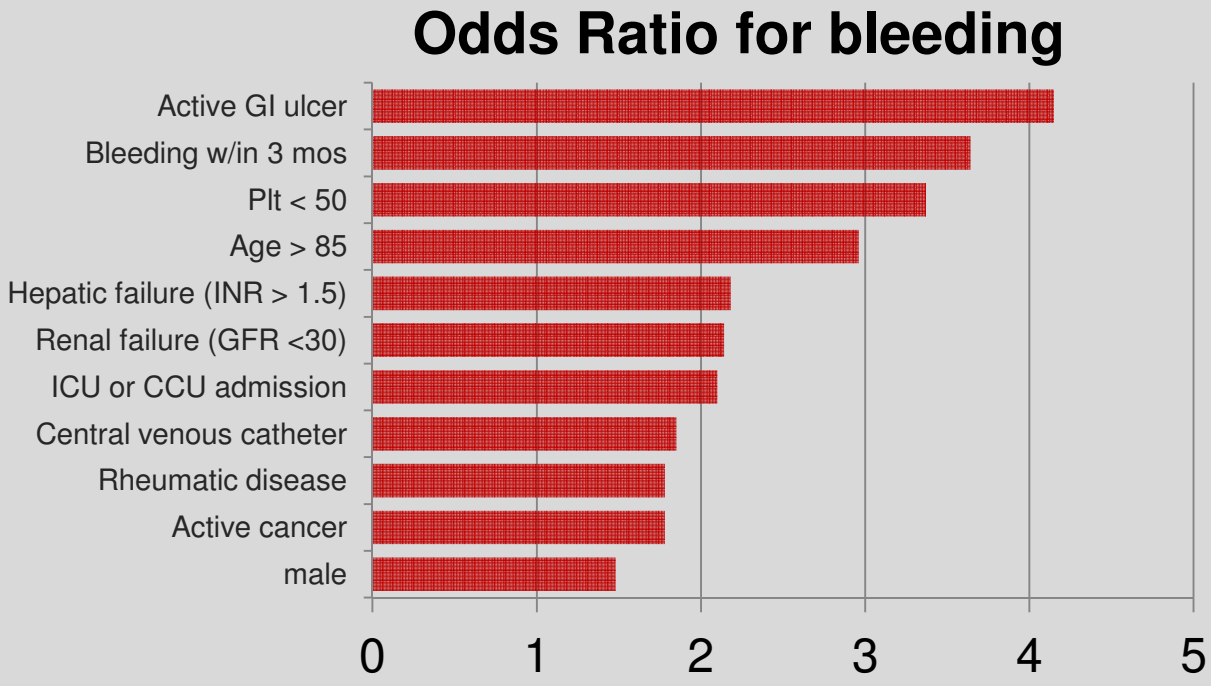
What About People who are Bleeding?

- Bleeding occurs in < 1% of patients due to prophylaxis
- 10% of acutely ill hospitalized patients are at high risk for bleeding
- Over half of all bleeds occur in patients at high risk for bleeding



Chest 2012;141(2):e195s

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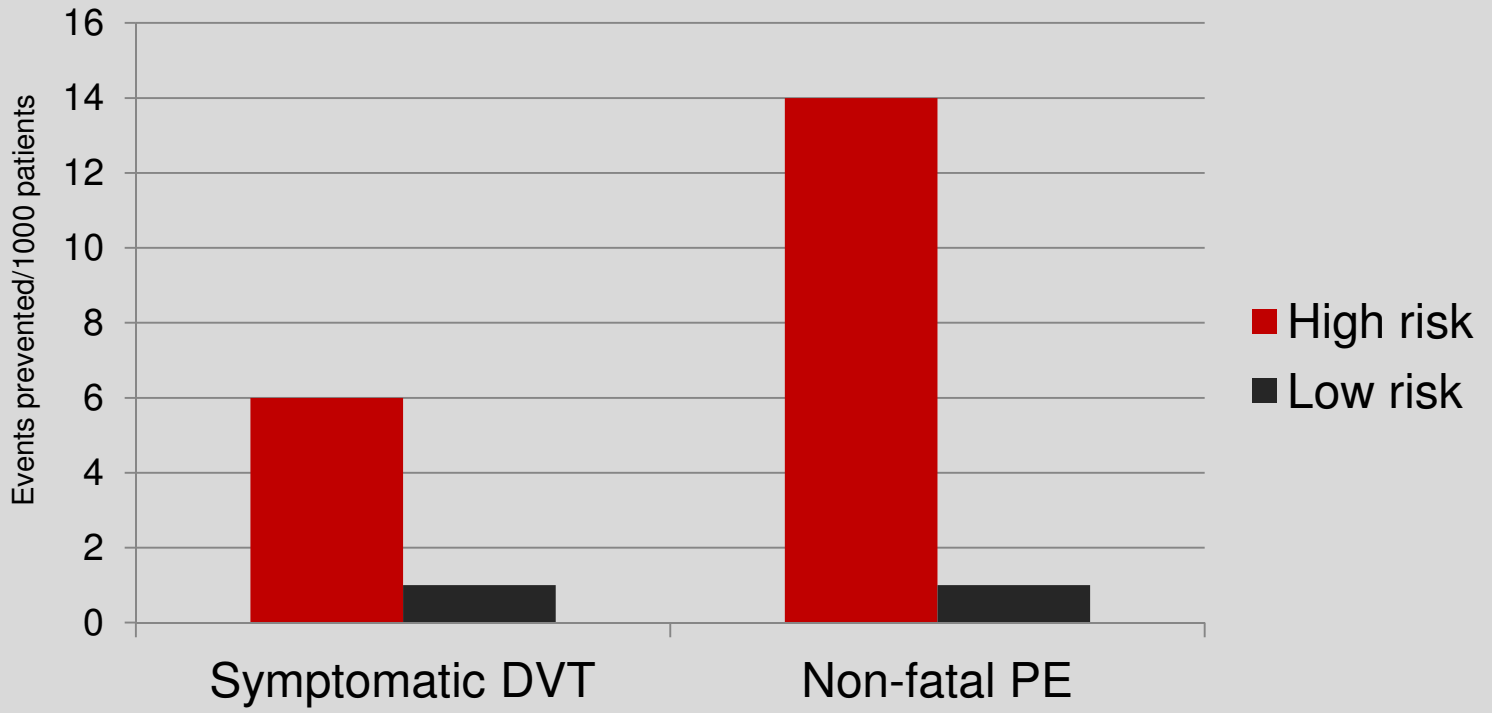
Graduated Compression Stockings



Chest 2012;141(2):e195s

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Intermittent Pneumatic Compression

- Used in 22% of US patients vs. 0.2% in other countries
- Not studied in medical admission patients
- No proven reduction in PE or mortality
- Does prevent symptomatic DVT in surgical patients (RR 0.43)

Chest 2012;141(2):e195s

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CHEST Guidelines

- For patients at high risk of bleeding or actively bleeding, don't use anticoagulation prophylaxis (IB)
- For patients at high risk of bleeding or actively bleeding, optimal use of graduated compression stockings or intermittent pneumatic compression is recommended (IIC)
- Weigh risks and benefits in patients at risk for skin complications

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Decision Algorithm