

Thrombosis Risk-Assessment As A Guide To Thrombosis Prophylaxis In Surgical Patients

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Levels Of Thromboembolism Risk In Surgical Patients Without Prophylaxis

Level of risk	Calf DVT, %	Proximal DVT, %	Clinical PE, %	Fatal PE, %
Moderate	10–20	2–4	1–2	0.1–0.4
Low	2	0.4	0.2	< 0.01

Levels Of Thromboembolism Risk In Surgical Patients Without Prophylaxis

Level of risk	Calf DVT, %	Proximal DVT, %	Clinical PE, %	Fatal PE, %
Highest	40–80	10–20	4–10	0.2–5
High	20–40	4–8	2–4	0.4–1.0

“ACCP Guideline-Defined” Risk of Venous Thromboembolism in Y2002 (hospital discharges)

Highest risk surgery	744,465
High risk surgery	3,031,318
Moderate risk surgery	2,019,696
<u>Surgical total</u>	<u>5,795,479</u>

$13,392,124 / 37,804,021 = 35\%$ of all hospital discharges

VTE Incidence

Probability of Pulmonary Emboli (%)

	Without prophylaxis %	With prophylaxis %	Prophylaxis utilization %
Surgical			
Moderate risk	PE 5.2	PE 2.7	40
High risk	10.3	5.4	65
Highest risk	24.1	12.6	85

The majority (93%) of estimated VTE-related deaths in the US were due to sudden, fatal PE (34%) and 59% of these fatalities were in those with undiagnosed VTE (59%).

Given that effective VTE prophylaxis and expert consensus prophylaxis guidelines are widely available, these data suggest that universal safe and effective prophylaxis could significantly reduce US VTE incidence and related deaths.

Fatal Pulmonary Embolism

- o Randomized double-blind comparison of LMWH with UFH, involving 23,078 patients, 73.9% of whom underwent general surgery

	LMWH (N = 11,542)	UFH (N = 11,536)	p
	N (%)	N (%)	
PE (at autopsy)	22 (0.191)	22 (0.191)	
Fatal	17 (0.147)	18 (0.156)	0.87
Non-fatal	5 (0.043)	4 (0.035)	1

If Seventeen Plane Crashes Occurred For Every 11,542 Airline Flights, No One Would Fly

**It Takes 13 days at 900
departures/day to equal 11,700
flights which means 17 crashes
at Ohare every 13 days--- or
more than one daily**

Patient Intake Form

Physician Assessment



1. Personal History of DVT or PE
2. Family History of DVT or PE
3. Malignancy: Current or Previous
4. Personal History of Recent MI or stroke (\leq 1 month)
5. Recent Major Surgery (\leq 1 month)
6. Currently on BCP, HRT, or hormonal therapy for Breast or Prostate Cancer
7. Current or recent acute inflammatory or infectious process (\leq 1 month)
8. Currently immobile (unable to ambulate in the in-patient setting)
9. History of unexplained stillborn infant, recurrent spontaneous abortion, premature birth with preeclampsia or growth-restricted infant.
10. Swollen legs
11. Varicose Veins
12. Obesity (BMI \geq 30)
13. Age



Thrombosis Risk Factor Assessment

Patient's Name: _____ Age: ___ Sex: ___ Wgt: ___ lbs

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Choose All That Apply

Each Risk Factor Represents 1 Point

- Age 41-60 years
- Minor surgery planned
- History of prior major surgery ($<$ 1 month)
- Varicose veins
- History of inflammatory bowel disease
- Swollen legs (current)
- Obesity (BMI $>$ 25)
- Acute myocardial infarction
- Congestive heart failure ($<$ 1 month)
- Sepsis ($<$ 1 month)
- Serious lung disease incl. pneumonia ($<$ 1 month)
- Abnormal pulmonary function (COPD)
- Medical patient currently at bed rest
- Other risk factors _____

Each Risk Factor Represents 3 Points

- Age over 75 years
- History of DVT/PE
- Family history of thrombosis*
- Positive Factor V Leiden
- Positive Prothrombin 20210A
- Elevated serum homocysteine
- Positive Lupus anticoagulant
- Elevated anticardiolipin antibodies
- Heparin-induced thrombocytopenia (HIT)
- Other congenital or acquired thrombophilia

If yes:
 Type _____
 *most frequently missed risk factor

Each Risk Factor Represents 2 Points

- Age 60-74 years
- Arthroscopic surgery
- Malignancy (present or previous)
- Major surgery ($>$ 45 minutes)
- Laparoscopic surgery ($>$ 45 minutes)
- Patient confined to bed ($>$ 72 hours)
- Immobilizing plaster cast ($<$ 1 month)
- Central venous access

Each Risk Factor Represents 5 Points

- Elective major lower extremity arthroplasty
- Hip, pelvis or leg fracture ($<$ 1 month)
- Stroke ($<$ 1 month)
- Multiple trauma ($<$ 1 month)
- Acute spinal cord injury (paralysis) ($<$ 1 month)

For Women Only (Each Represents 1 Point)

- Oral contraceptives or hormone replacement therapy
- Pregnancy or postpartum ($<$ 1 month)
- History of unexplained stillborn infant, recurrent spontaneous abortion (\geq 3), premature birth with toxemia or growth-restricted infant

Total Risk Factor Score

SUBCUTANEOUS LOW-DOSE UNFRACTIONATED HEPARIN



<u>Investigator</u>	<u>Kakkar 1975</u>	<u>Kakkar 1975</u>	<u>Collins 1988</u>	<u>Collins 1988</u>
Group	Control	Heparin	Control	Heparin
DVT	29.60%	9.40%	27.40%	10.60%
Fatal PE	38 (1.7%)	20 (0.9%)	114 (3.4%)	67 (1.7%)
Bleeding	5.80%	8.80%	1.80%	3.10%
Patients	4,000	4,000	16,000	16,000
Centers	28	28	70	70



Efficacy and safety validated in 98 centers and 20,000 patients over a 13 year period when control groups and venographic confirmation were allowed

Kakkar Lancet, 1975; Collins NEJM, 1988

Comparison of 16 Clinical Trials

VTE Prophylaxis After Abdominal Surgery

- Data from 16 clinical trials conducted 1980-2003
 - Trials selected based on initial computerized literature search including PubMed, EMBASE
 - Compared LMWH vs UFH, placebo, or other LMWH
 - No formal statistical meta-analysis performed

Conclusions:

- Patients undergoing abdominal surgery should be stratified by risk for thromboembolism and managed accordingly
- LMWH is a recommended alternative to UFH in moderate- or high-risk patients
- In patients with cancer:
 - High-dose LMWH may offer increased benefits without increased bleeding
 - Extended 4-week period of prophylaxis appears beneficial

Venous Thromboembolism Prophylaxis Following Orthopedic Procedures



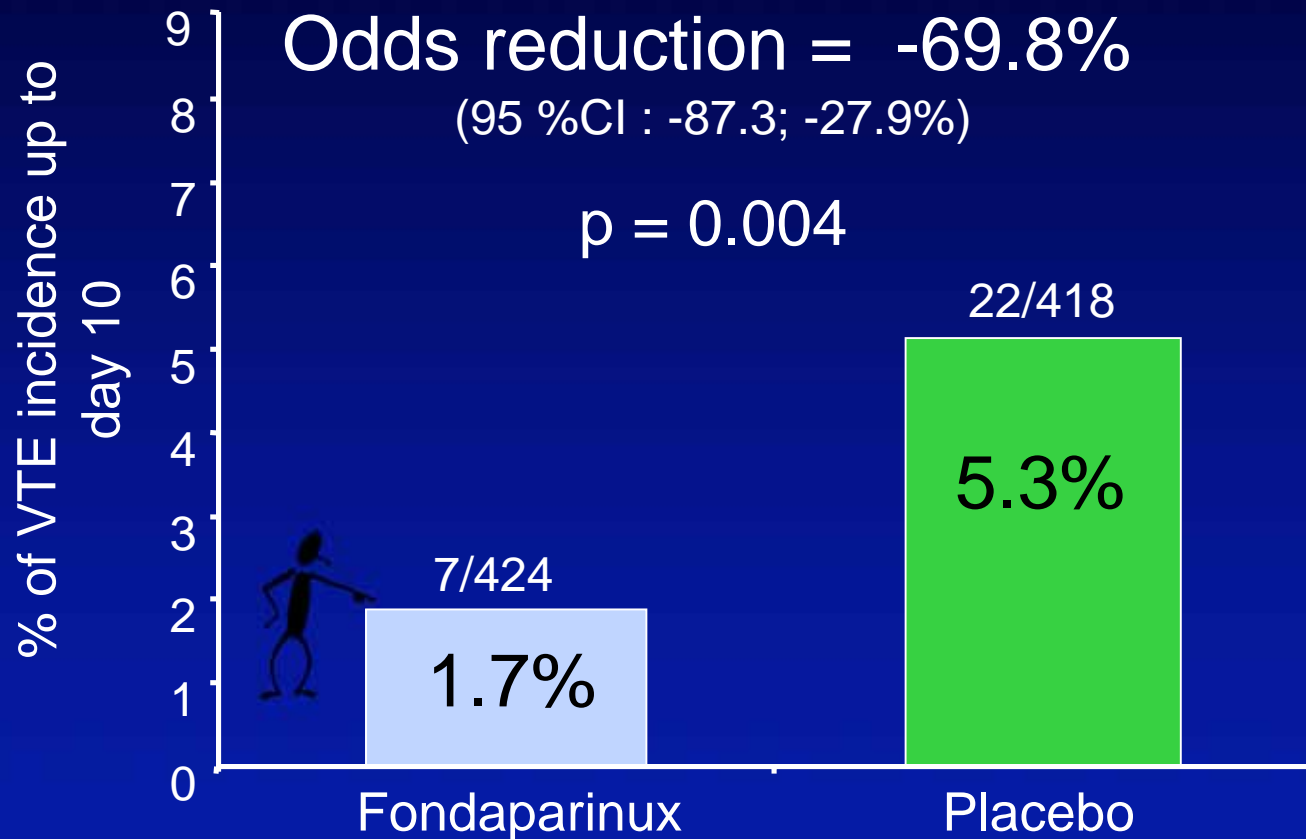
<u>Type Of Procedure</u>	<u>Patients</u>	<u>Pentasaccharide</u>	<u>LMWH</u>
Total Hip Replacement Europe, etc. (22 countries)	1723	4.1%*	9.2%
Total Hip Replacement North America	2257	6.1%	8.3%
Total Knee Replacement	1034	12.5%*	27.8%
Hip Fracture Repair	1711	8.3%*	19.1%
Extended Hip Fracture Repair Venogram=30 day	426	7 days Fondaparinux 35%	30 Days Fondaparinux 1.4%*



*p<.0001

VTE Prophylaxis In General Surgery

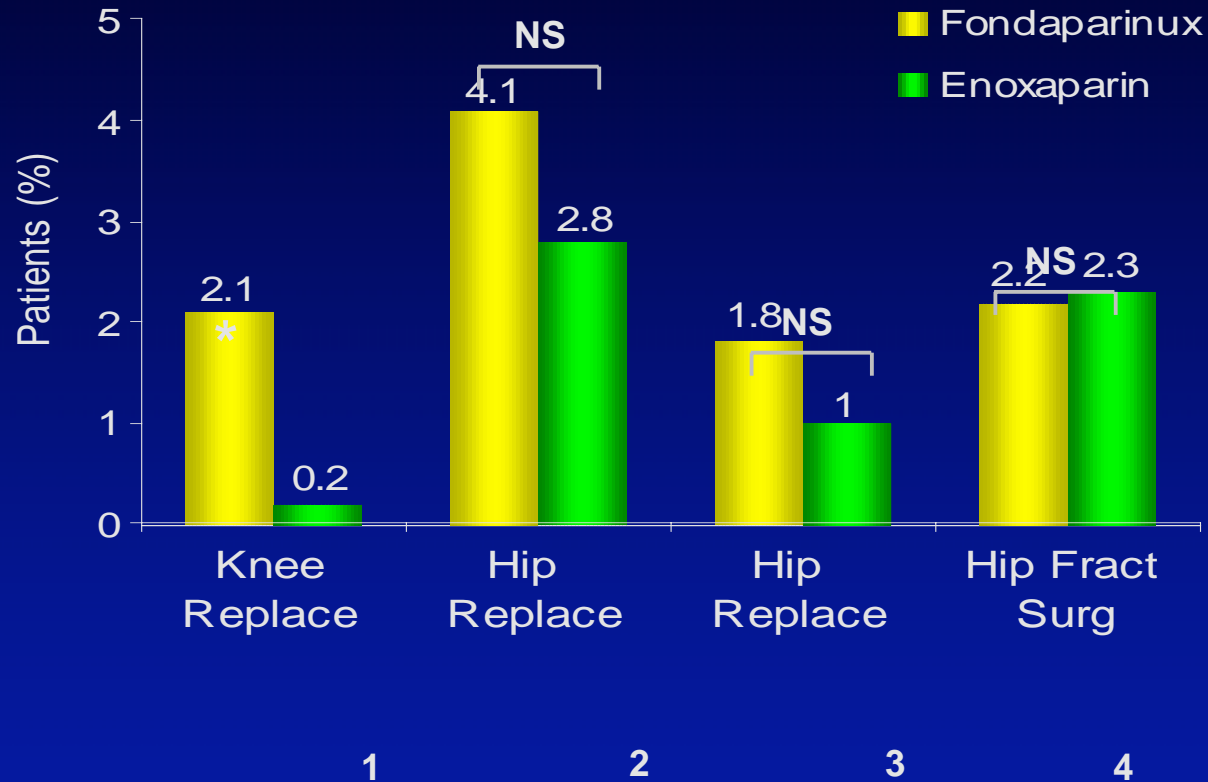
Combined Modalities



- Lowest venographic DVT rate ever seen in general surgery

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Fondaparinux: Major Bleeding Up to Day 11 By Study



*P=0.006 for Fondaparinux vs enoxaparin for major bleeding up to 11 days after major knee surgery; major bleeding included bleeding that was fatal, retroperitoneal, intracranial, intraspinal, in a critical organ, led to reoperation, or had a bleeding index ≥ 2 .

1. Bauer KA et al. *N Engl J Med.* 2001;345:1305-1310.
2. Lassen MR et al. *Lancet.* 2002;359:1715-1720.
3. Turpie AGG et al. *Lancet.* 2002;359:1721-1726.
4. Eriksson BI et al. *N Engl J Med.* 2001;345:1298-1304.

***Bleeding With a Positive BI Largely Accounts for Higher Bleeding Incidence**

Intermittent Pneumatic Compression And Deep Vein Thrombosis Prevention

Combined Modalities

A meta-analysis in postoperative patients

- A total of 2,270 patients were included in 15 eligible studies: 1,125 in the IPC group and 1,145 in the no prophylaxis group.
- IPC devices reduced the risk of DVT by 60% (relative risk 0.40, 95% CI 0.29 – 0.56; $p < 0.001$)
- The authors suggest that further randomized trials are warranted to test the utility of IPC in hospitalized medical patients as well as combination pharmacological-IPC prophylaxis in both medical and surgical patients.

When to Think About Pneumatic Compression

- Patients with 2-3 risk factors
- Patients with >4 risk factors in combination with anticoagulant prophylaxis
- Patients with hemostatic defects like hemophilia, Von Willebrand's disease, platelet functional defects, heparin induced thrombocytopenia, etc
- Patients with bleeding disorders, bleeding ulcers, bleeding from colitis or ileitis, acute hemorrhagic stroke.
- Patient needing craniotomy or spinal cord surgery.
- Patients requiring complex cancer operations associated with large blood loss such as a pancreatoduodenectomy, major hepatic resection, or extensive pelvic resection, etc.
- Patients with closed head injuries, pelvic hematomas, and/or other complex trauma situations.

Conclusions

- Individual risk assessment key to appropriate prophylaxis
- **IPC is very effective for those who have 2-4 risk factors**
- Combined physical and pharmacologic methods appropriate for the highest-risk individuals
- UFH is effective but relatively high incidence of HIT, poor anticancer effects, and difficult outpatient use are problems
- LMWH offers greater effectiveness, lower HIT incidence, good anticancer effects, and excellent 30 day postoperative efficacy
- Fondaparinux offers excellent efficacy, no worry about HIT, the lowest reported incidence of DVT in hip, knee, and hip fracture patients. Early data show the lowest DVT rates in abdominal surgery cancer patients especially when combined with IPC.