

VTE Prevention Among Hospitalized
Patients: Computer Order Entry

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February 4, 2006

VTE PROPHYLAXIS: UNDERUSED

Implementation of VTE prophylaxis continues to be problematic, despite detailed North American and European consensus guidelines.

Trials of VTE Prophylaxis in Hospitalized Medical Patients

- ▶ MEDENOX (enoxaparin 40 mg)
 - Samama MM, et al. *New Engl J Med.* 1999;341:793-800.
- ▶ PREVENT (dalteparin 5000 IU)
 - Leizorovicz A, et al. *Circulation.* 2004;110:874-879.
- ▶ ARTEMIS (fondaparinux 2.5 mg)
 - Cohen AT, et al. *J Thromb Haemost.* 2003;1(Suppl 1):P2046.

Results: 3 Pharmacological Trials

Pharmacological prophylaxis in these 3 trials halved the risk of DVT/PE compared with placebo, without increasing major bleeding.

DVT FREE Registry

- ▶ N = 5451
- ▶ 183 sites in the USA
- ▶ Of the 2726 patients diagnosed with DVT while inpatients, 58% (mostly medical patients) had not received VTE prophylaxis

Goldhaber SZ, Tapson VF. *Am J Cardiol.* 2004;93:259-262.

ONGOING BWH EFFORTS

1. Frequent staff education on necessity for VTE prophylaxis
2. Order entry is programmed to suggest VTE prophylaxis if “bed rest” is ordered

BWH Audit

- ▶ Evaluate BWH patients who develop VTE while hospitalized for another reason.

(Goldhaber SZ, et al. CHEST 2000;118:1680)

VTE Patients Hospitalized for Other Conditions

Service	PE	DVT	PE/DVT	%
Medicine	34	139	35	54
General surgery	7	44	9	16
Orthopedics	4	29	0	9
Thoracic surgery	7	21	3	8
Cardiac surgery	0	21	1	6
Gynecology	9	10	2	6

▶ **11 of 13 deaths (3.4%) were medical patients.**

(Goldhaber SZ, et al. CHEST 2000:118:1680)

Changing Physicians' Behavior

- ▶ Guidelines alone do not suffice
- ▶ Strategies for change
 - Physician champions
 - Individual hospital protocols
 - Registries
 - Coalitions (eg, Coalition to Prevent DVT)
 - Litigation (eg, regarding reimbursement of costs)
 - **Electronic alerts**

Quality Improvement Initiative To Improve Clinical Practice

- ▶ Randomized controlled trial to issue or withhold electronic alerts to MDs whose high-risk patients were not receiving DVT prophylaxis

(Kucher N et al. NEJM 2005; 352: 969)

Computer Program

- ▶ We developed a computer program linked to the patient database that screened the system daily to identify high-risk patients.
- ▶ We included consecutive high-risk patients on medical and surgical services who were not receiving DVT prophylaxis.

(Kucher N et al. NEJM 2005; 352: 969)

Definition of “High Risk”

VTE risk score ≥ 4 points:

- ▶ Cancer 3 (ICD codes)
- ▶ Prior VTE 3 (ICD codes)
- ▶ Hypercoagulability 3 (Leiden, ACLA)
- ▶ Major surgery 2 (> 60 minutes)
- ▶ Bed rest 1 (“bed rest” order)
- ▶ Advanced age 1 (> 70 years)
- ▶ Obesity 1 (BMI > 29 kg/m²)
- ▶ HRT/OC 1 (order entry)

Computer Screening

Among patients with a VTE risk score ≥ 4 , the program searched for:

- ▶ GCS (“stockings”)
- ▶ IPC (“boots”)
- ▶ UFH
- ▶ LMWH
- ▶ Warfarin

DVT Prophylaxis at BWH

- ▶ There were 13,922 patients with a VTE risk score ≥ 4 from September 2000 to January 2004
- ▶ 11,416 (82%) patients received DVT prophylaxis
- ▶ 2506 (18%) patients did not receive DVT prophylaxis

(Kucher N, et al. NEJM 2005;352:969-977)

Randomization

VTE risk score ≥ 4
No prophylaxis
N = 2506

INTERVENTION
Single alert
n = 1255

CONTROL
No alert
n = 1251

(Kucher N, et al. NEJM 2005;352:969-977)

Computer alert

- ▶ The physician (identified by the computer using the command “Who is responsible for this patient?”) was forced to acknowledge the alert and could order DVT prophylaxis on the same computer screen.

(Kucher N, et al. NEJM 2005;352:969-977)

View PtLookup

Patient: XXXXXXXX,XXXXX 76M 00000000 Adm: 03/02/2005 Room: 8B-312
Time: 03:03 AM Mar 3, 2005 Alert #1881848 8B phone: x7725
Alert: Patient is at high risk for deep vein thrombosis, according to BWH
guidelines.
Reason: Total DVT risk assessment score is 6.
Patient does not have any active Anti-Embolism orders.
Patient is currently NOT on a drug from ANTICOAGULANTS drug family.

Relevant medications and lab results: <alert Details>

Act- [IA Order set: DVT Prophylaxis
ions:[IB Quick Ref: Prevention
[IC Exit to order entry

Covering M.D.: Bp#

<dOne>

<Not my patient>

<pAge M.D.>

<coMments>

< Logic >

Primary End Point

- ▶ Clinically diagnosed DVT or PE confirmed with imaging (eg, ultrasound, lung scan, chest CT) at 90 days.
- ▶ 2361 (94%) patients were followed up at 90 days.

(Kucher N, et al. NEJM 2005;352:969-977)

Baseline Characteristics

- ▶ Median age = 62.5 years
- ▶ Medical services: 83%
- ▶ Surgical services: 17%
- ▶ Comorbidities
 - Cancer: 80%
 - Hypertension: 34%
 - Infection: 30%
 - Prior VTE: 20%

(Kucher N, et al. NEJM 2005;352:969-977)

Orders for DVT Prophylaxis

	<u>Intervention</u>	<u>Control</u>	<u>P value</u>
	<u>n = 1255</u>	<u>n = 1251</u>	
Overall	421 (33.5)	182 (14.5)	< 0.001
Mechanical	125 (10.0)	19 (1.6)	< 0.001
GCS	52 (4.1)	7 (0.6)	< 0.001
IPC	73 (5.8)	12 (1.0)	< 0.001
Pharmacological	296 (23.6)	163 (13.0)	< 0.001
Heparin	213 (17.0)	81 (6.5)	< 0.001
Warfarin	28 (2.2)	41 (3.3)	0.11
Enoxaparin	55 (4.4)	41 (3.3)	0.18

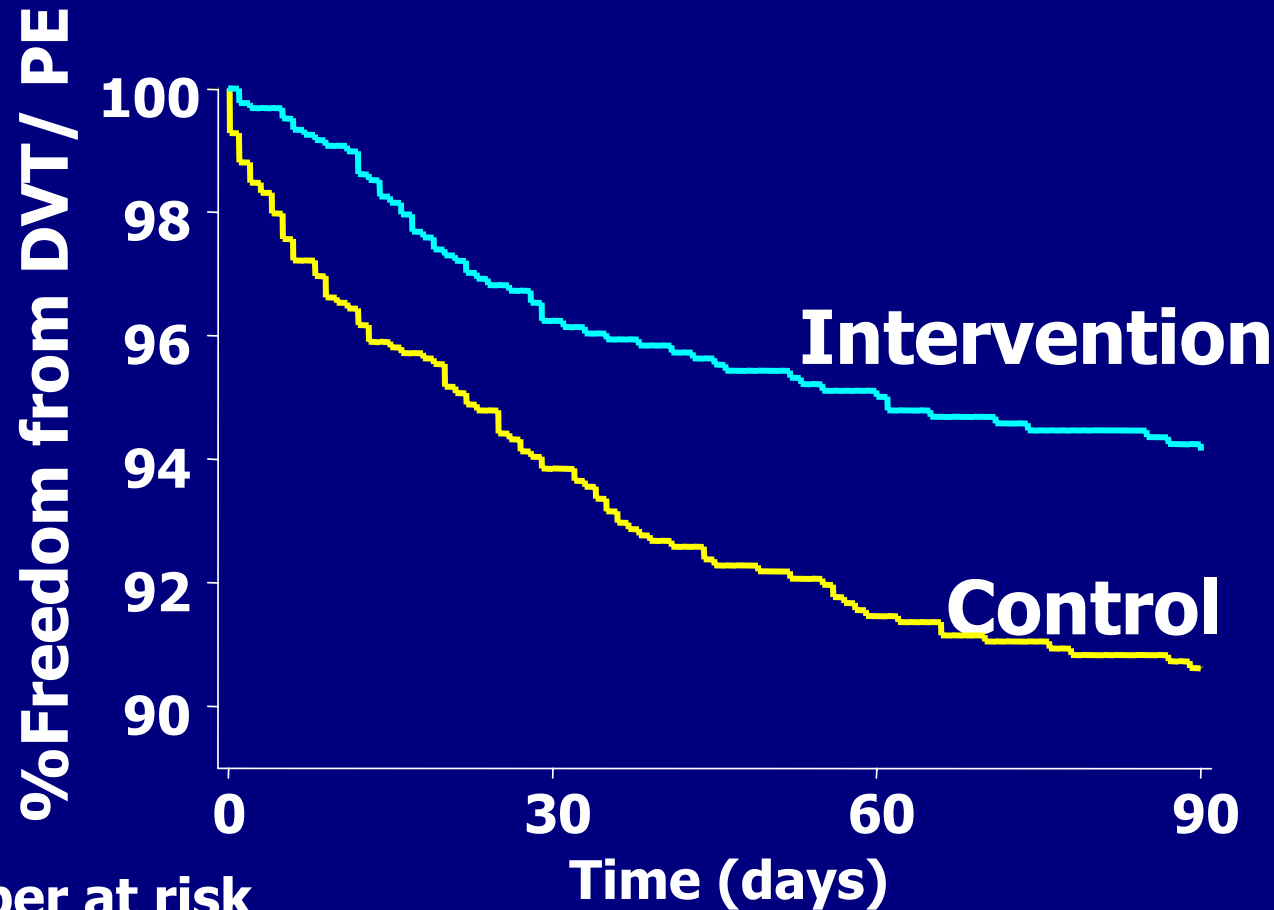
(Kucher N, et al. NEJM 2005;352:969-977)

Primary End Point at 90 Days

	<u>Intervention</u> (n = 1255)	<u>Control</u> (n = 1251)	<u>Hazard ratio</u> (95% CI)	<u>P</u>
Total VTE	61 (4.9)	103 (8.2)	0.59 (0.43–0.81)	0.001
Acute PE	14 (1.1)	35 (2.8)	0.40 (0.21–0.74)	0.004
Proximal DVT	10 (0.8)	23 (1.8)	0.47 (0.20–1.09)	0.08
Distal DVT	5 (0.4)	12 (1.0)	0.42 (0.15–1.18)	0.10
UE DVT	32 (2.5)	33 (2.6)	0.97 (0.60–1.58)	0.90

(Kucher N, et al. NEJM 2005;352:969-977)

Primary End Point



	Number at risk			
	0	30	60	90
— Intervention	1255	977	900	853
— Control	1251	976	893	839

(Kucher N, et al. NEJM 2005;352:969-977)

Safety

	<u>Intervention</u>	<u>Control</u>	<u>P value</u>
	<u>n = 1255</u>	<u>n = 1251</u>	
Mortality	282 (22.5)	279 (22.3)	0.74
Major hemorrhage	19 (1.5)	19 (1.5)	0.87
Minor hemorrhage	81 (6.5)	88 (7.0)	0.43

(Kucher N, et al. NEJM 2005;352:969-977)

Challenges

- ▶ Rate of DVT prophylaxis among intervention patients was low (33.5%).
- ▶ Many patients may have had contraindications to pharmacological prophylaxis.
- ▶ We have no obvious explanation for failure to order GCS or IPC.

(Kucher N, et al. NEJM 2005;352:969-977)

Conclusions

Electronic alerts:

1. Facilitated the detection of patients at high risk of DVT/PE
2. Increased the rate of DVT prophylaxis from 14.5% to 33.5%
3. Reduced the incidence of DVT/PE by 41%, without increasing bleeding

(Kucher N, et al. NEJM 2005;352:969-977)

Future Perspectives

- ▶ As part of a multipronged approach to improve thromboprophylaxis use and decrease rates of DVT and PE, hospitals can translate national and international guidelines into local protocols and guidelines, improve education, and make use of electronic alerts.