

History, Injury and Blood Flow: The Keys to Detection of Venous Thromboembolism

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Disclosure of financial relationships

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Has disclosed relationships with entities producing, marketing, re-selling, or distributing health care goods or services consumed by, or used on, patients.

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Resolution of Potential Conflicts of Interest:

-All presented material is independent of industry produced content.
-Only material supported by published data and Evidence-based guidelines will be presented.

November 2009

If Women controlled medicine



The Manogram

“Statistics don’t tell the whole story . . .”

What is quality health care and where can I get some?

Top states	Rank	Bottom states	Rank
Vermont	1	Texas	46
Hawaii	2	Nevada	47
Iowa	2	Arkansas	48
Minnesota	4	Louisiana	49
Maine	5	Oklahoma	50
New Hampshire	5	Mississippi	51

QuickTime™ and a decompressor are needed to see this picture.

Commonwealth Fund 2009

QuickTime™ and a decompressor are needed to see this picture.

Commonwealth Fund 2009

“Real quality must be tied to improving important patient outcomes not just processes and provider behavior . . .”

-D. W. Harrington (slipped out at the end of a 4 hour dog and pony show for the governing body where binders of 'Quality' reports were presented and discussed)

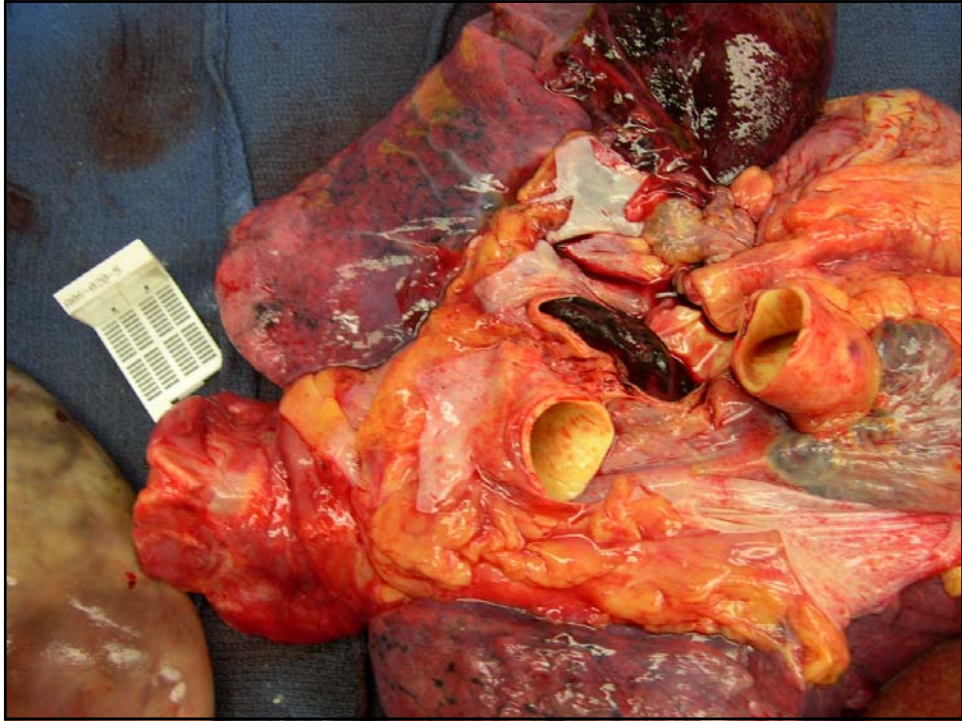
Learning Objectives

1. Recognize the high hospitalizations and mortality rates associated with VTE and the adverse costs to managed care.
2. Identify the main factors contributing to the onset of VTE
3. Emphasize the importance of early detection for those at risk, including teaching patients about preventative actions for decreasing their high risk.
4. Review the latest guidelines from the ACCP, particularly with regard to the development of a formal prevention strategy at all hospitals
5. Discuss methods for physicians and nurses to assess/recognize the potential risk in each patient

The Impact of VTE

VTE - Venous Thromboembolism
Pulmonary Embolism and Deep Vein
Thrombosis





VTE Incidence

Incidence:¹

- 900,000 PEs and DVTs in the USA in 2002
- Estimated 296,000 PE deaths
 - 7% treated unsuccessfully, 34% sudden and fatal, and 59% undetected
- Up to 10% of symptomatic DVT with severe Post-Thrombotic syndrome

Annual number at risk for VTE: US hospitals:²

- 7.7 million medical service inpatients
- 4.3 million surgical service inpatients
- 2/3 of VTE cases and deaths are hospital-acquired¹

1. Heit J, et al. *Blood*. 2005;106:Abstract 910.

2. Anderson FA Jr, et al. *Am J Hematol*. 2007;82:777-782.

Real Numbers in the Insured Population

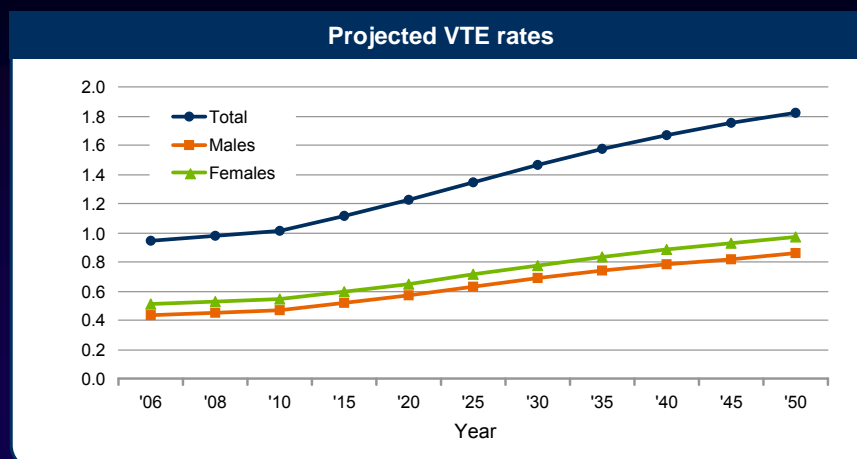
- Discharges from a PharMetrics database from Jan 2001 - Dec 2005 aged > 40 years hospitalized for cancer, CHF, severe infection, or lung disease.
- Outcome: VTE rate and type; time to event
- Results: Average VTE rate 5.6% (1.5%); highest for Cancer patients at 7.6%.
 - VTE occurred most frequently after discharge
 - Post discharge prophylaxis was provided to 13.1% of CHF patients and < 5% of the others.
 - Previous VTE and Cancer were independent predictors of post-discharge VTE

Spyropoulos AC et al. *Thrombosis and Haemostasis* 2009;102:951-7.

Important Lessons . . .

1. Most events occur in the “average hospitalized patient”
2. Most new symptomatic VTE events occur after hospital discharge
3. Most new events occur without warning with little opportunity to intervene
4. In 2009 this is still a very common and preventable disease. . .

Projected VTE rates, 2006–2050



Deitelzweig et al. Presented at: XXII Congress of the ISTH; July 11-16, 2009; Boston, MA.

VTE in Hospitalized Patients

- 50%-70% of symptomatic VTEs occur in nonsurgical patients¹
- 70%-80% of fatal PEs occur in nonsurgical patients¹
- DVT was detected by ultrasound in 33% of medical patients in the ICU during an 8-month screening study²
- PE: most preventable cause of hospital death and the number one strategy to improve patient safety in hospitals¹

1. Geerts WH, et al. *Chest*. 2008;133:381S-453S.
2. Hirsch DR, et al. *JAMA*. 1995;274:335-337.

Long-term Consequences of VTE



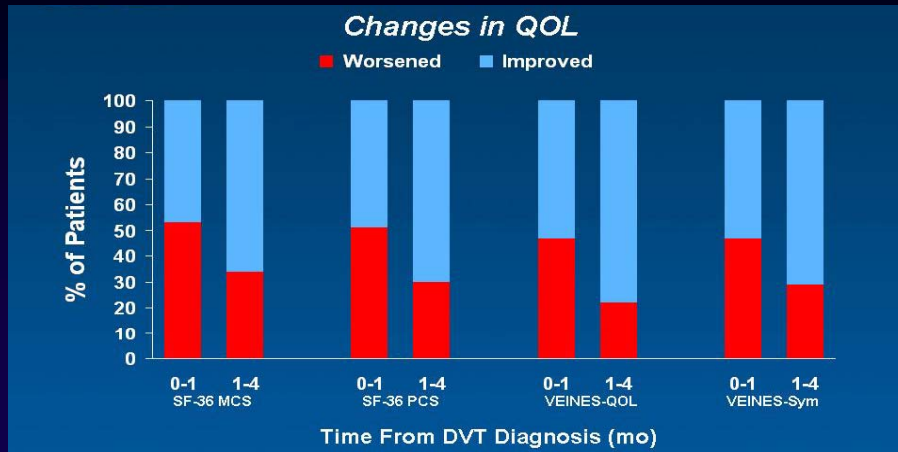
- Post-thrombotic syndrome
 - Overall frequency of post-thrombotic syndrome after symptomatic DVT ranges from 20% to 50%¹
 - Severe post-thrombotic syndrome occurs in 5% to 10% of patients with DVT¹



- Pulmonary Hypertension (PH)
 - Cumulative incidence of symptomatic PH in patients with acute PE is 3.8% at 2 years²

¹ Kahn S, Ginsberg J. *Arch Intern Med*. 2004;164:17-26.
² Pengo V, et al. *N Engl J Med*. 2004;350:2257-64.

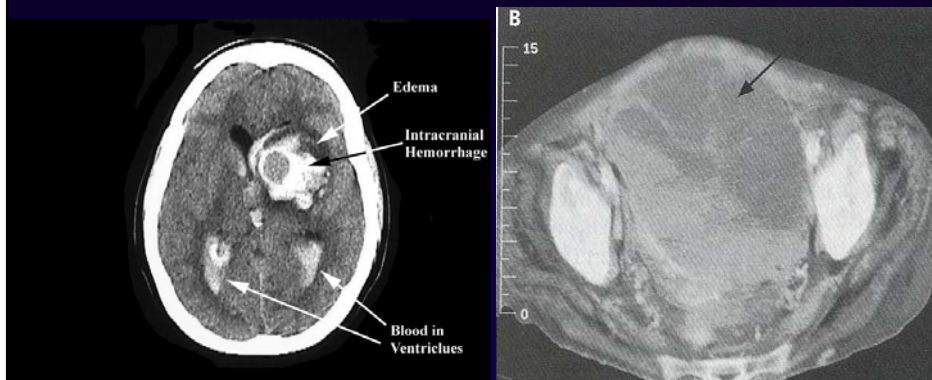
Quality of Life Following VTE



Kahn SR et al. Arch Intern Med 2005

VTE Carries Long-Term Consequences

Complications of VTE Treatment: Bleeding



VTE Carries Long-Term Consequences Cont'd

Complications of VTE Treatment: Heparin-Induced Thrombocytopenia (HIT)



Courtesy of A. Almahameed; 2002

Hospital-Acquired DVT/PE Increases Both Cost of Care and Length of Stay

- Data from discharge summaries and itemized bills at 220 US hospitals
 - Total of 67,293 patients who underwent total hip or total knee replacement
- Of these, 403 (0.6%) suffered hospital-acquired DVT, and 190 (0.3%) suffered PE

	Mean total costs of inpatient care	Mean LOS in the hospital
No VTE	\$9541	4.7 days
DVT only	\$13,300	8.3 days
PE	\$17,965	11 days

- Patients with DVT and PE had significantly higher costs and length of stay than those without ($P < 0.0001$)

DVT/PE=deep vein thrombosis/pulmonary embolism; LOS=length of stay; VTE=venous thromboembolism=DVT and/or PE.

Ollendorf et al. *Am J Health-Syst Pharm.* 2002;59(18):1750-1754.

“Never events don’t just live in Neverland . . .”

Hospital Acquired Conditions (HAC) -
Preventable complications that will not be
compensated by payors (ie. CMS)

VTE and its Complications Can be Prevented!

- Probability model to estimate the number of VTE events in the 2003 United States Healthcare Cost and Utilization Project.
- Inpatient sample of 8,077,919:
 - DVT - 122,235
 - PE - 32,654
 - Recurrent DVT's - 28,052; Recurrent PE's - 6,680
 - PTS - 140,156
- Total VTE events may be reduced by 60%

Fanikos et al. 2009 Thrombosis and Haemostasis

What are the principle factors contributing to this disease?

Rudolf Ludwig Karl Virchow 1821-1902

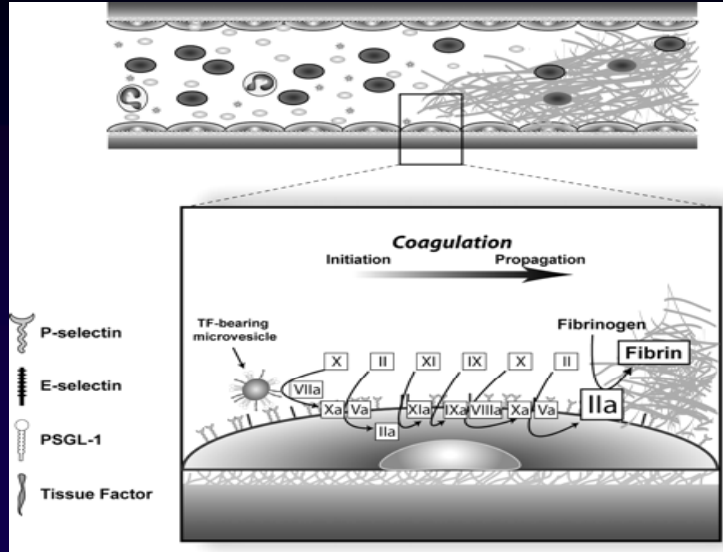
- “Changes in pattern of blood flow . . .”
- “Changes in vessel wall . . .”
- “Changes in constituents of blood . . .”

“Phlebitis dominates all of pathology” - 1856

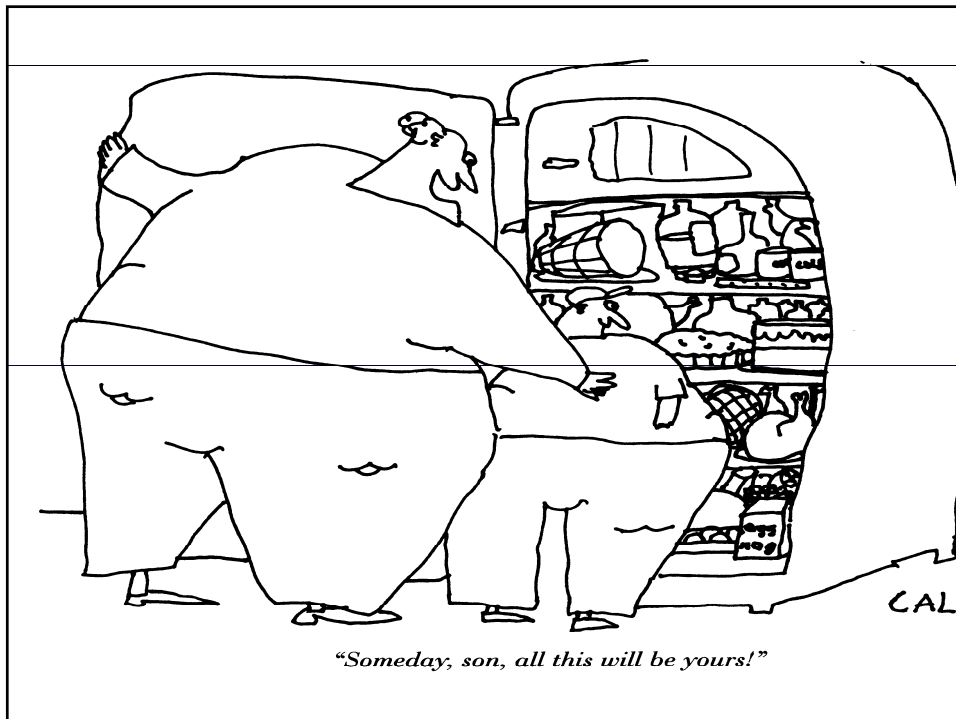


Virchow RLK (translated by: Matzdorff, et al. Thrombose und Embolie. Canton, MA: Science History Publications; 1998

Model for Venous Thrombosis



Lopez JA et al. Hematology Jan 2004:439-456



Acquired Risk Factors for VTE

ACCP¹

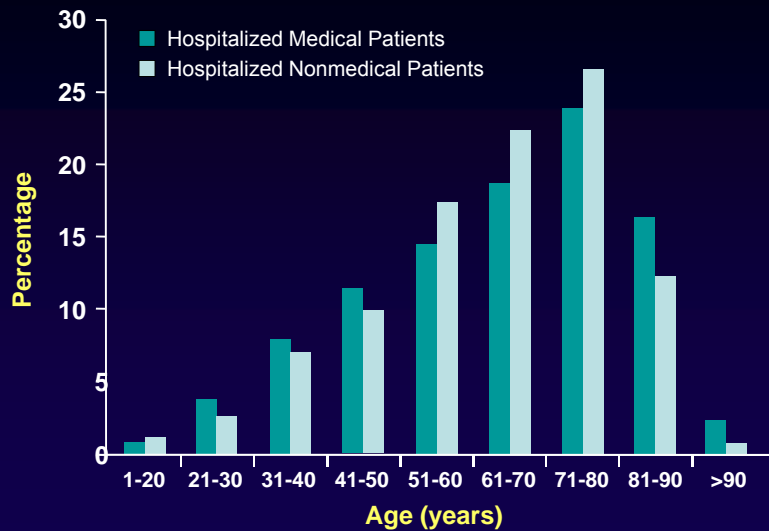
- Increasing age
- Immobility, paresis
- Previous VTE
- Cancer and/or its treatment
- Surgery
- Trauma (major or lower limbs)
- Obesity
- Central venous catheters
- Inflammatory bowel disease
- Nephrotic syndrome
- Pregnancy and postpartum
- Estrogen therapy or estrogen-containing oral contraceptives
- Acute medical illness

THRIFT²

- Increasing age
- Immobility (>4d), limb paralysis
- Previous VTE
- Malignancy
- Surgery
- Trauma (pelvis, hips, legs)
- Obesity
- Varicose veins
- Heart failure
- Recent myocardial infarction
- Inflammatory bowel disease
- Nephrotic syndrome
- Pregnancy
- High-dose estrogen therapy
- Infection

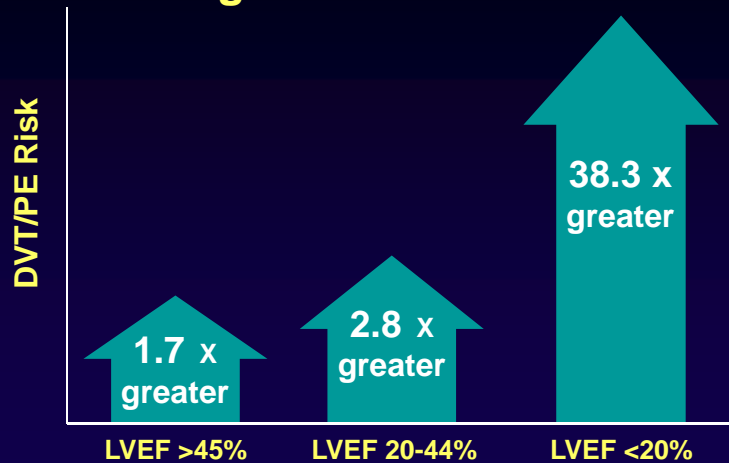
1. Geerts WH, et al. *Chest*. 2008;133:381S-453S.
2. THRIFT Consensus Group. *BMJ*. 1992;305:567-574.

Distribution of Patients With DVT by Age



Reprinted with permission from Piazza G, et al. *Chest*. 2007;132:554-561.

The Importance of DVT Prophylaxis in Congestive Heart Failure



LVEF = left ventricular ejection fraction.

Howell MD, et al. *J Clin Epidemiol.* 2001;54:810-816.

Risk of VTE Varies by Ethnic Group

- California claims database

Ethnic Group	Incidence per	RR (95% CI)
Caucasian	230	Reference
Black	293	1.27 (1.07 -1.51)
Hispanic	139	0.60 (0.54-0.67)
Asian/Pacific	60	0.26 (0.22-0.30)

White RH *Ann Intern Med* 1998

Independent Risk Factors for First Lifetime Definite VTE Within Olmsted County

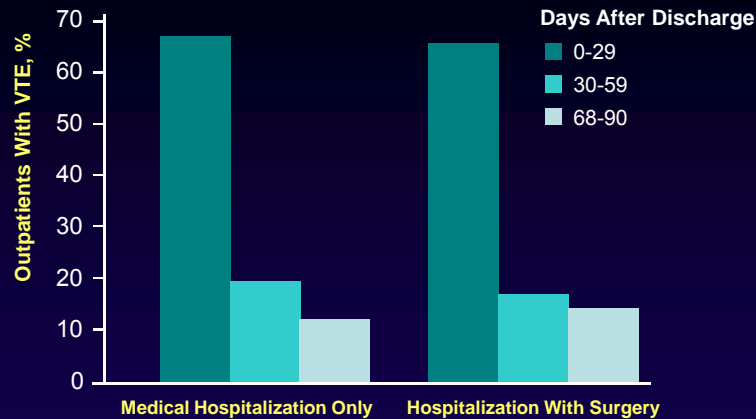
RISK FACTOR ^a	AR ^b	95% CI
Hospitalization or nursing home	58.8	53.4-64.2
Hospitalization with surgery	23.8	20.3-27.3
Hospitalization without surgery	21.5	17.3-25.6
Nursing home	13.3	9.9-16.8
Active malignant neoplasm	18.0	13.4-22.6
Trauma	12.0	9.0-14.9
Congestive heart failure	9.5	3.3-15.8
Prior central venous catheter or pacemaker	9.1	5.7-12.6
Neurological disease with extremity paresis	6.9	3.5-10.2
Prior superficial vein thrombosis	5.4	3.0-7.7

^aAll 8 risk factors together accounted for 74% of all observed VTE cases.

^bAll values are given as percentages. AR = attributable risk. Adjusted for age, sex, year, and terms in final model.

Heit JA, et al. *Arch Intern Med.* 2002;162:1245-1248.

Outpatient and Inpatient VTE Are Linked



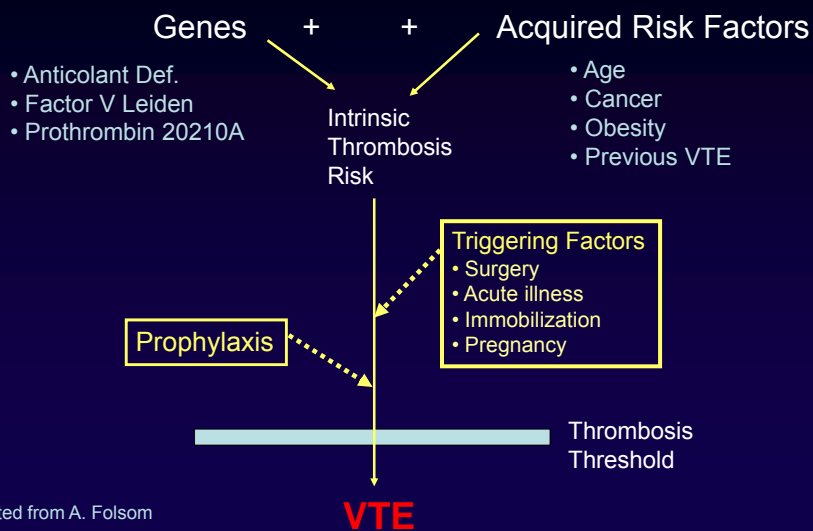
- 74% of VTEs present in outpatients
- 23% of outpatient VTE patients have had recent surgery; 37% recently hospitalized
- Only 43% had received VTE prophylaxis

Spencer FA, et al. *Arch Intern Med.* 2007;167:1471-1475.

Two-thirds of VTE Cases are Hospital Acquired . . .

Acute illness/major surgery leading to hospitalization is the most important risk factor for VTE.

VTE Risk Factor Model



Adopted from A. Folsom

Early Detection of VTE

... It's like waiting for the sleeping giant to awaken.

...or parking an ambulance at the bottom of the Grand Canyon during an attempt to cross by Evel Knievil [Kenevil].

DVT FREE

Signs and Symptoms of DVT

Sign/Symptom	Outpatient (n=2725)	Inpatient (n=2726)
None	41 (2%)	289 (11%)
<i>Edema</i>	<i>2241 (82%)</i>	<i>1610 (59%)</i>
<i>Extremity discomfort</i>	<i>1902 (70%)</i>	<i>1000 (37%)</i>
Dyspnea	363 (13%)	649 (24%)
Erythema	450 (17%)	224 (8%)
Difficulty walking	359 (13%)	174 (6%)
Chest pain	170 (6%)	230 (8%)
Cough	85 (3%)	132 (5%)
Syncope	23 (1%)	65 (2%)
Hemoptysis	16 (1%)	33 (1%)
Other	208 (8%)	253 (9%)

Goldhaber SZ and Tapson VF. Am J Cardiol 2004;93:259-62.

Clinical features of Pulmonary Embolism:

Frequency of Symptoms:

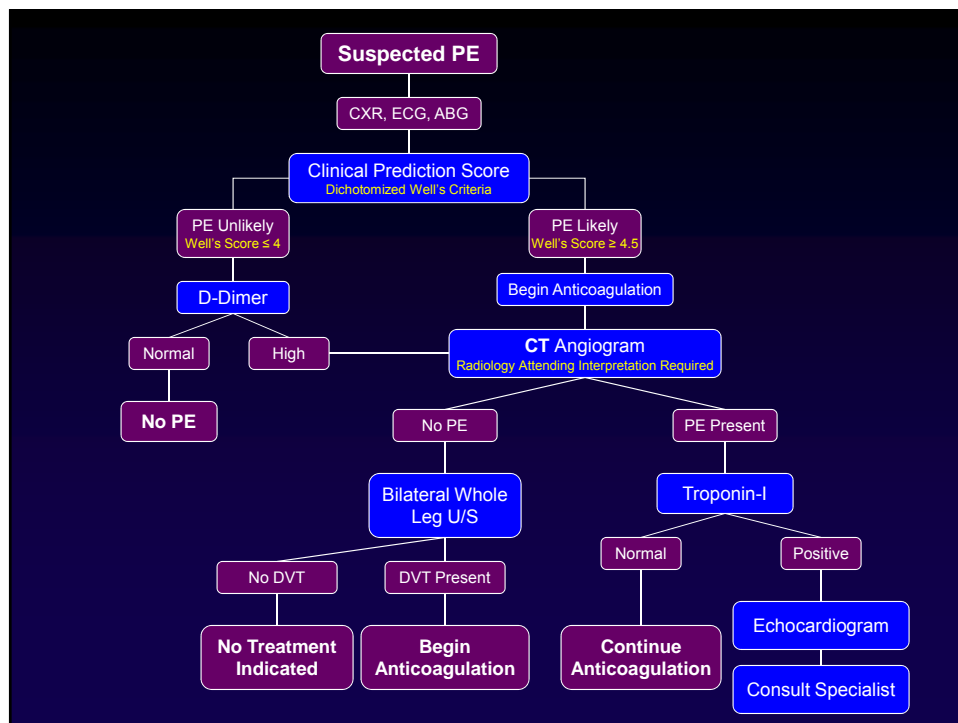
- SOB (76%)
- Pleuritic chest pain (76%)
- Cough (44%)
- Calf pain (26%)

Frequency of Signs:

- Haemoptysis (6%)
- \uparrow RR >20 /min (52%)
- Crackles (21%)
- Calf swelling > 1 cm (36%)
- \uparrow pulse rate >100 /min (20%)
- RV S₄ or \uparrow P₂ (24%)



PIOPED II: Stein, PD., NEJM 2006;354:2317-27



Diagnostic Management and Outcomes of Suspected PE

Table 3. Patient Outcomes at 3 Months after Exclusion of Pulmonary Embolism*

Diagnostic Work-up	Patients Receiving Appropriate Management (n = 418)	Patients Receiving Inappropriate Management (n = 506)	P Value
Total thromboembolic events, n (%)	5 (1.2)	39 (7.7)	<0.001
Nonfatal thromboembolic event, n	2	10	0.045
Unexplained sudden death, n	3	29	<0.001

* Patients who received anticoagulation for reasons other than thromboembolic disease were excluded from follow-up analysis.

Ann Intern Med. 2006;144:157-164

How Can We Educate Patients?

- Inform/make aware of risk of VTE in the setting of acute illness and convalescence
- Compliance with preventive strategies
- Recognition of signs and symptoms of VTE (unfortunately often vague)
- Patients may also receive information from alternative sources - public media, internet, journals etc. . .

Public Reporting and Consumer Choice: Outcomes Available on Websites



Hospital Compare (Medicare)
<http://www.hospitalcompare.hhs.gov>

Quality Check
(Joint Commission)
www.qualitycheck.org

The Leapfrog Group
<http://www.leapfroggroup.org/cp>

- Data on hospital outcomes publicly available to all¹⁻³
- Consumer choice is reinforced by higher patient copays for poorly performing hospitals in programs administered by such groups as:
 - Blue Shield of California⁴
 - PacifiCare⁵
 - Tufts Health Plan⁵
 - General Motors⁶

1. CMS. *Hospital Quality Initiative: Overview*. December 2005. Available at: <http://www.cms.hhs.gov/HospitalQualityInits/downloads/HospitalOverview200512.pdf>. Accessed December 21, 2006.
 2. Joint Commission. *Facts About Quality Check® and Quality Reports*. Available at: http://www.jointcommission.org/qualitycheck/04_faqs_facts.htm. Accessed January 23, 2007.
 3. The Leapfrog Group. *Welcome to the Leapfrog Hospital Quality and Safety Survey Results*. Available at: <http://www.leapfroggroup.org/cp>. Accessed September 22, 2006.
 4. Blue Cross Blue Shield Association Press Release. June 4, 2003. Available at: <https://www.blueshieldca.com/bso/newsroom/pr/terprogram.jhtml?sessionId=SAZY1YJNJPPNP3YSSGLNFSXDCEITT>. Accessed June 25, 2007.
 5. The Leapfrog Group. *Incentive and Reward Compendium Results*. Available at: <http://lr.leapfroggroup.org/compendium/compendiumresult.cfm>. Accessed February 23, 2007.
 6. The Leapfrog Group. *Profiles of Organizations Using Quality Incentives: Executive Summary*. Available at: <http://www.leapfroggroup.org/RewardingResults/pdf/profiles.pdf>. Accessed September 25, 2006.

Journal of USAT

Study warns of deep-vein thrombosis 'crisis'

By Robert Davis
USATODAY



Airlines routinely warn about the risk of deep-vein thrombosis, the so-called economy-class syndrome, but a new study says doctors are not doing enough on the ground to prevent DVT cases.

In particular, people in the hospital, who may have risk factors such as obesity, surgery and prolonged immobility, do not always get simple, preventive care. And, the study found 71% of all sufferers had not received preventive care.

Treatments such as stockings to improve leg circulation and drugs have been

shown to prevent blood clots and cut the DVT rate by two-thirds.

"This is a public health crisis," says Samuel Goldhaber, a DVT expert at Boston's Brigham and Women's Hospital, an author of the study in this week's *American Journal of Cardiology*.

Doctors today will try to rally support from other medical experts at a Washington meeting of the Coalition to Prevent Deep-Vein Thrombosis, a group, along with the American Medical Association, that hopes to raise awareness in medicine.

The condition begins when clots form in the large veins in the legs, especially after periods of immobility. It may cause leg

cramps, but of the estimated 2 million people a year who have DVT, as many as half have no symptoms.

When a clot shears, fragments can land in the lungs and cause a pulmonary embolism (PE), leading to an estimated 200,000 U.S. deaths a year.

The public has learned more about DVT as the risks associated with airline travel have made news. But other factors such as hypertension or obesity don't always raise the DVT flag in the medical community.

For the study, paid for in part by Aventis Pharmaceuticals, Goldhaber and his team surveyed 5,451 people with DVT at 183 locations over six months. Two-thirds

were overweight or obese, which increases the chances of developing PE.

Other characteristics:
 ▶ 50% suffered hypertension.
 ▶ 38% had surgery within three months before the clot was found.
 ▶ 34% were immobile within 30 days of diagnosis of DVT.

▶ 32% had cancer.
 Of the 2,726 patients who were hospitalized when diagnosed, only 42% had preventive care.

"This offers us opportunities to improve care," says the American Hospital Association's Nancy Foster. She says the best steps include "getting patients up and moving."

USA Today – Wednesday January 21, 2004

**“We are responsible for keeping
are patients safe while the are
diagnosed and treated for acute
illness!”**

Quality Organizations Driving VTE Prevention and Treatment Measures

- Agency for Healthcare Research and Quality (AHRQ)
- Centers for Medicare and Medicaid Services (CMS)*
- Institute of Medicine (IOM)
- The Joint Commission (TJC)*
- The Leapfrog Group*
- National Institute of Clinical Excellence (NICE)
- National Quality Forum (NQF)*
- Medicare Modernization Act (MMA)

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decompressor
are needed to see this picture.

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are needed to see this picture.

- **1.2 VTE Prophylaxis Policy**

1.2.1 We recommend that **every general hospital** develop a **formal, active strategy** that addresses the prevention of VTE [Grade 1A].

What is the Evidence?

- Hundreds of randomized trials:
 - Thromboprophylaxis reduces DVT, PE, Mortality and costs
- Thromboprophylaxis is the **number 1 ranked patient safety strategy** in hospitalized patients
- More than 25 published **evidence-based guidelines** since 1986 showing clear evidence of benefit and safety

Levels of Thromboembolism Risk and ACCP Recommendations for Prophylaxis in Hospital Patients^a

Levels of Risk	Approximate DVT Risk Without Thromboprophylaxis % ^b	Suggested Thromboprophylaxis Options
Low risk		
Minor surgery in mobile patients Medical patients who are fully mobile	< 10	No specific thromboprophylaxis Early, "aggressive" ambulation
Moderate risk		
Most general, open gynecologic, or urology surgery patients Medical patients, bed rest or sick Moderate VTE risk plus high bleeding risk	10-40	LMWH (at recommended doses), LDUH bid or tid, fondaparinux "OR → IF" Mechanical thromboprophylaxis
High risk		
Hip or knee arthroplasty, HFS Major trauma, SCI High VTE risk plus high bleeding risk	40-80	LMWH (at recommended doses), fondaparinux, oral vitamin K antagonist (INR 2-3) Mechanical thromboprophylaxis ^c

^aDescriptive terms purposely left undefined to allow individual clinician interpretation. ^bRates based on objective diagnostic screening for asymptomatic DVT in patients not receiving thromboprophylaxis. ^cMechanical thromboprophylaxis includes IPC or VFP and/or GCS; consider switch to anticoagulant thromboprophylaxis when high bleeding risk decreases.

HFS = hip fracture surgery; IPC = intermittent pneumatic compression; GCS = graduated compression stockings; LDUH = low-dose unfractionated heparin; LMWH = low-molecular-weight heparin; SCI = spinal cord injury; VFP = venous foot pump.

Reprinted with permission from Geerts WH, et al. *Chest*. 2008;133:381S-453S.



The Rationale Against Mechanical Devices

- No established standards for size, pressure, or physiologic features.
- No data to demonstrate reduction in mortality from VTE.
- Studies for mechanical devices were often unblinded and subject to significant bias.
- Compliance from both patients and staff is poor - may inhibit walking.
- Head-to-head less effective than pharmacologic strategies in high risk patients.
- Significant cost associated with purchase, storage, as well as ensuring optimal compliance.

The reality of mechanical devices . . .

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Current ACCP Recommendations *Mechanical Methods & Aspirin*

- We recommend that mechanical methods of prophylaxis be used primarily in patients who are at high risk of bleeding (Grade 1C+)
- We recommend that aspirin not be used for VTE prophylaxis in any patient group (1A)



Geerts WH, et al. Chest 2008;133:381S-453S.

Guidelines for Prophylaxis in Orthopedic Patients

	ACCP ¹	IUA ²	AAOS ³
Total hip replacement	LMWH, fondaparinux, warfarin	LMWH, fondaparinux, warfarin, IPC or FIT	Aspirin, LMWH, fondaparinux, warfarin
Total knee replacement	LMWH, fondaparinux, warfarin	LMWH or warfarin	Aspirin, LMWH, fondaparinux, warfarin
Arthroscopic knee surgery	LMWH for higher-risk patients	LMWH or IPC if contraindications to LMWH	
Multiple trauma	LMWH or IPC	LMWH or IPC if contraindications to LMWH	

FIT = foot impulse technology.

1. Geerts WH, et al. *Chest*. 2008;133:381S-453S.
2. International Union of Angiology. *Int Angiol*. 2006;25:101-161.
3. American Academy of Orthopaedic Surgeons Clinical Guideline, 2007. Available at: <http://www.aaos.org/research/guidelines/guide.asp>. Accessed July 29, 2008.

Recommendations for Prophylaxis in Medical Patients

ACCP 2008 and IUA 2006 Guidelines

- In acutely ill medical patients who have been admitted to the hospital with:^{1,2}
 - Congestive heart failure or severe respiratory disease
 - Or who are confined to bed and have ≥1 additional risk factors, including active cancer, previous VTE, sepsis, acute neurologic disease, or inflammatory bowel disease
 - LMWH (Grade 1A; IUA: enoxaparin 40 mg qday or dalteparin 5000 qday)
 - Low-dose UFH (Grade 1A; IUA: 5000 IU tid)
 - Fondaparinux 2.5 mg q day(Grade 1A)*

* Fondaparinux is not approved by the FDA for prophylaxis in medical patients.

- International Consensus Statement. *Int Angiol*. 2006;25:101-161.
- 1. Geerts WH, et al. *Chest*. 2008;133:381S-453S.

Definitions of Immobility Or “Bed Rest”

Study

Definition

MEDENOX	Autonomous walking distance of <10 m ¹
THE-PRINCE	Confined to bed for >2/3 of the day ²
PRIME	Expected immobilization for >1/2 day ³

MEDENOX=Prophylaxis in MEDical Patients with ENOXaparin; THE-PRINCE=THromboEmbolism-PREvention IN Cardiac or Respiratory Disease with Enoxaparin; PRIME=THromboEmbolism PRophylaxis in Internal Medicine with Enoxaparin

1. Alikahn et al. *Blood Coagul Fibrinolysis*. 2003;14(4):341-346.
2. Kleber et al. *Am Heart J*. 2003;145:614-621.
3. Lechler et al. *Haemostasis*. 1996;26(suppl 2):49-56.

Current ACCP Recommendations

How should agents be used?

- For each of the anti-thrombotic agents, “Clinicians should follow the manufacturer-suggested dosing guidelines” (Grade 1C)
 - How long were agents given in RCTs that led to FDA approval?



Geerts WH, et al. *Chest* 2008;133:381S-453S.

Transitioning from Inpatient to Outpatient

- At risk hospital patients are discharged with continued risk and immobility
- Specific groups have proven benefit from extended prophylaxis - supported by Evidence-based guidelines (ACCP)
 - Trauma and high-risk orthopedic patients
 - Patients undergoing cancer surgery
 - At-risk medical patients with continued decreased mobility.
- All patients should be reassessed for the need for appropriate ongoing prophylaxis.
- Evidence-based therapy for PX is at least 6 - 11 days regardless of setting.
 - “Complete the course” vs. “Extended prophylaxis”

Hospital Stays Are Often Shorter Than Approved Prophylaxis Duration

Thrombosis prophylaxis indications	Average length of hospital stay	FDA Approved length of prophylaxis for LMWH
Medical illness (acute)	2-8 days	6-11 days
Abdominal surgery	2-7 days	7-10 days
Total hip-replacement surgery	2-6 days	7-10 days or 3 weeks (extended therapy)
Total knee-replacement surgery	2-5 days	7-10 days

Why do gaps persists?

- Has not reached an appropriate “threshold” to make it a priority
- Poor understanding of the natural history of VTE risk
- Perception of bleeding risk in the acutely ill patient
- Systems do not support automation of assessment and administration of prophylaxis
- Cost of prophylaxis
- Disagreement among guidelines

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Despite Evidence – Hospitalized Patients at Risk Remain Unprotected

ENDORSE¹

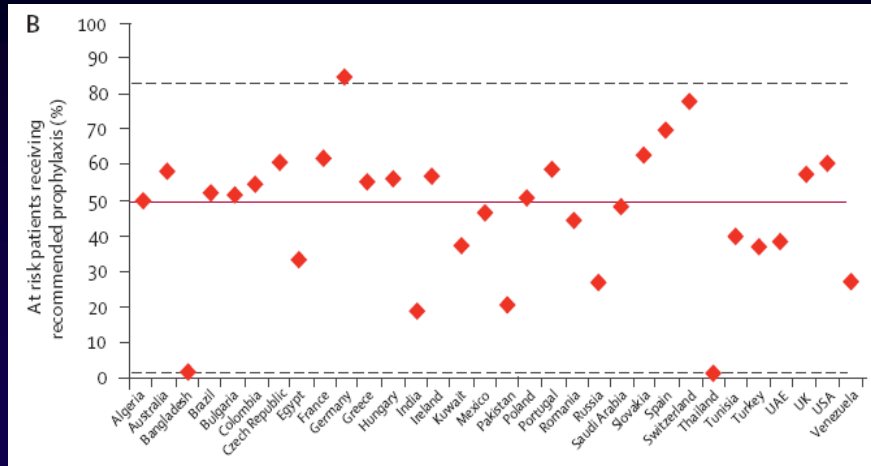
	Medical	Surgical
No. of patients	37,356	30,827
At risk for VTE	42%	64%
Receiving ACCP Tx	40%	59%

IMPROVE²

	United States	Other Countries
No. of patients	3,410	11,746
VTE prophylaxis	1852 (54%)	5788 (49%)
LMWH	476 (14%)	4657 (40%)
UFH	717 (21%)	1014 (9%)

1. Cohen AT, et al. Presented at: ISTH, July 8-11, 2007; Geneva, Switzerland.
2. Tapson VF, et al. *Chest*. 2007;132:936-945.

At-risk Patients receiving Prophylaxis (Endorse)

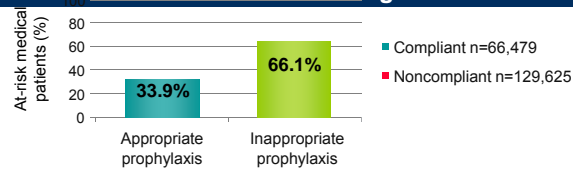


Cohen et al. *Lancet* 2008; 371:387

Low rates of appropriate thromboprophylaxis in US acute care hospitals

- Amin et al conducted a review of hospital discharge information from the Premier Perspective™ inpatient database from January 2002 to September 2005
- A total of 196,104 discharges from 227 hospitals were included
- 61.8% of all at-risk medical discharges received some form of prophylaxis, but only 33.9% received appropriate prophylaxis with respect to type, dose, and duration of therapy

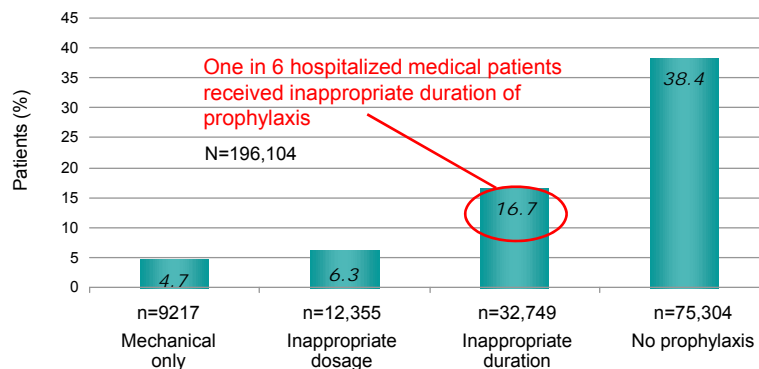
Hospitalized medical patients receiving prophylaxis in accordance with ACCP guidelines



ACCP—American College of Chest Physicians.
Amin et al. *J Thromb Haemost.* 2007;5(8):1610-1616.

Low rates of appropriate thromboprophylaxis in US acute care hospitals (continued)

Reasons for inappropriate prophylaxis



Amin et al. *J Thromb Haemost.* 2007;5(8):1610-1616.

What is meant by “Appropriate Prophylaxis”?

It means:

- The *right* **A**gent/modality . . .
- The *right* **D**ose/way . . .
- The *right* **D**uration . . .
- **U**sed In the *right* **P**atient!

- *This decision must be made while considering the balance of risk and benefit to the individual patient - It must “Add Up”*

**How should providers assess risk
of VTE in each patient?**

Strategies to increase prophylaxis rates: how well do they work?

- Passive strategy
 - Passive dissemination
 - Adherence to guidelines poor; not effective alone
- Active strategies: better improvements in prophylaxis practices
 - Documentation aids, quality assurance activities, audit and feedback
 - Appropriate prophylaxis rates approximately 80%
 - Computer-based decision aids
 - Most effective, appropriate prophylaxis rates approach 100%

Tooher et al. *Ann Surg.* 2005;241(3):397-415.

I. RISK FACTOR ASSESSMENT			
Risk Factor (One point each unless otherwise noted)		Risk Factor (One point each unless otherwise noted)	
<input type="checkbox"/> Documented history of DVT or PE (3 points) <input type="checkbox"/> Hypercoagulable states (3 points) <input type="checkbox"/> Visceral malignancy (3 points) <input type="checkbox"/> Age > 40 years <input type="checkbox"/> Obesity (BMI ≥ 27) <input type="checkbox"/> History of, or anticipated bed confinement/immobilization > 12 hours <input type="checkbox"/> Confining air/ground travel > 4 hours within 1 week of admission <input type="checkbox"/> Leg swelling, ulcers, stasis, varicose veins <input type="checkbox"/> History of pelvic or long bone fracture <input type="checkbox"/> Lower extremity arthroscopy in patient > 50 years <input type="checkbox"/> Spinal cord injury with paralysis <input type="checkbox"/> Stroke with paralysis <input type="checkbox"/> Pneumonia <input type="checkbox"/> Acute exacerbation of COPD		<input type="checkbox"/> Mechanical ventilation <input type="checkbox"/> MI/CHF (class III and IV) <input type="checkbox"/> Non-hemorrhagic myeloproliferative disorders including polycythemia vera <input type="checkbox"/> Severe systemic infection or sepsis <input type="checkbox"/> Estrogen hormone replacement or use of contraceptives <input type="checkbox"/> Major surgery (general anesthesia time > 2 hours) <input type="checkbox"/> Pregnancy or postpartum < 1 month <input type="checkbox"/> Multiple trauma (major or lower extremity) <input type="checkbox"/> Acute inflammatory disorders <input type="checkbox"/> Nephrotic syndrome <input type="checkbox"/> Indwelling central venous catheter	
		TOTAL RISK FACTOR SCORE:	
III. RISK ASSESSMENT CATEGORY AND SUGGESTED REGIMEN FOR DVT PROPHYLAXIS			
Low Risk	Moderate Risk	High Risk	Very High Risk
<input type="checkbox"/> Score of 1 or less OR: <input type="checkbox"/> Minor surgery in patients < 40 years and no additional risk factors	<input type="checkbox"/> Score of 2 OR: <input type="checkbox"/> Major surgery in patients < 40 years with no additional risk factors <input type="checkbox"/> Minor procedures with additional risk factor <input type="checkbox"/> Non-major surgery in patients 40-60 years with no additional risk factors	<input type="checkbox"/> Score of 3 OR: <input type="checkbox"/> Non-major surgery in patients > 60 years or with additional risk factors <input type="checkbox"/> Major surgery in patients > 40 years or with additional risk factors	<input type="checkbox"/> Score of 4 or greater OR: <input type="checkbox"/> Major surgery in patients > 40 years with any of the following: 1. History of venous thromboembolism 2. Hip fracture (ORIF) total joint, procedure of the leg* 3. Spinal cord injury 4. Visceral malignancy 5. Hypercoagulable states 6. Additional risk factors

A Popular Risk Assessment Tool

The Caprini Score

•The Caprini Score

- Originally published in 1991

- Developed in a surgical patient group and adapted to other groups

- No prospective validation of tool.

Caprini JA, et al. Semin Thromb Hemost. 1991;(suppl 3)17:304-12

Choose All That Apply

Each Risk Factor Represents 1 Point	Each Risk Factor Represents 2 Points
<input type="checkbox"/> Age 41-60 years <input type="checkbox"/> Minor surgery planned <input type="checkbox"/> History of prior major surgery <input type="checkbox"/> Varicose veins <input type="checkbox"/> History of inflammatory bowel disease <input type="checkbox"/> Swollen legs (current) <input type="checkbox"/> Obesity (BMI >30) <input type="checkbox"/> Acute myocardial infarction (< 1 month) <input type="checkbox"/> Congestive heart failure (< 1 month) <input type="checkbox"/> Sepsis (< 1 month) <input type="checkbox"/> Serious lung disease incl. pneumonia (< 1 month) <input type="checkbox"/> Abnormal pulmonary function (COPD) <input type="checkbox"/> Medical patient currently at bed rest <input type="checkbox"/> Leg plaster cast or brace <input type="checkbox"/> Other risk factors	<input type="checkbox"/> Age 60-74 years <input type="checkbox"/> Major surgery (> 60 minutes) <input type="checkbox"/> Arthroscopic surgery (> 60 minutes) <input type="checkbox"/> Laparoscopic surgery (> 60 minutes) <input type="checkbox"/> Previous malignancy <input type="checkbox"/> Central venous access <input type="checkbox"/> Morbid obesity (BMI >40)
Each Risk Factor Represents 3 Points	Each Risk Factor Represents 1 Point
<input type="checkbox"/> Age over 75 years <input type="checkbox"/> Major surgery lasting 2-3 hours <input type="checkbox"/> BMI > 50 (venous stasis syndrome) <input type="checkbox"/> History of SVT, DVT/PE <input type="checkbox"/> Family history of DVT/PE <input type="checkbox"/> Present cancer or chemotherapy <input type="checkbox"/> Positive Factor V Leiden <input type="checkbox"/> Positive Prothrombin 20210A <input type="checkbox"/> Elevated serum homocysteine <input type="checkbox"/> Positive Lupus anticoagulant <input type="checkbox"/> Elevated anticardiolipin antibodies <input type="checkbox"/> Heparin-induced thrombocytopenia (HIT) <input type="checkbox"/> Other thrombophilia Type: _____	<input type="checkbox"/> Elective major lower extremity arthroplasty <input type="checkbox"/> Hip, pelvis or leg fracture (< 1 month) <input type="checkbox"/> Stroke (< 1 month) <input type="checkbox"/> Multiple trauma (< 1 month) <input type="checkbox"/> Acute spinal cord injury (paralysis < 1 month) <input type="checkbox"/> Major surgery lasting over 3 hours
	For Women Only (Each Represents 1 Point)
	<input type="checkbox"/> Oral contraceptives or hormone replacement therapy <input type="checkbox"/> Pregnancy or postpartum (< 1 month) <input type="checkbox"/> History of unexplained stillborn infant, recurrent spontaneous abortion (≥ 3), premature birth with toxemia or growth restricted infant
Total Risk Factor Score <input type="text"/>	

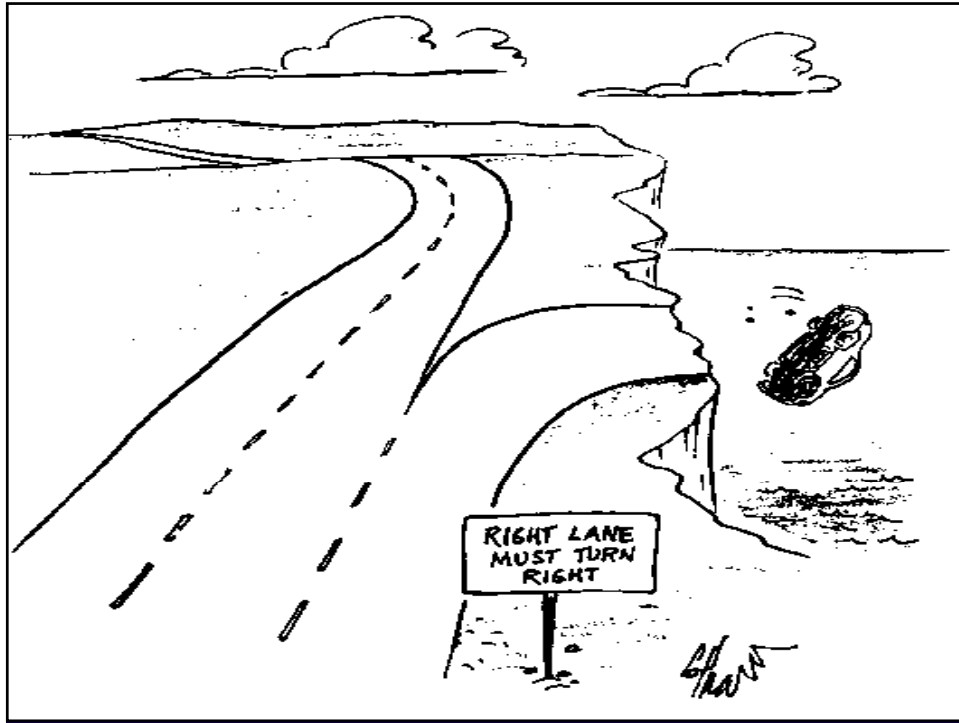
Please see Following Page for Prophylaxis Safety Considerations Revised November 4, 2005

VTE Risk Assessment (≥ 4 pts)

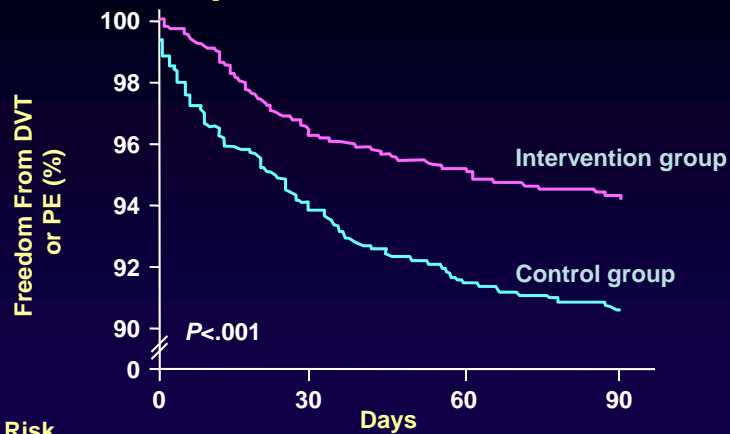
A Quantitative Tool

<u>VARIABLE</u>	<u>POINTS</u>
Major:	
• Malignancy	3
• Previous DVT or PE	3
• Hypercoagulability	3
Intermediate:	
• Major surgery (duration >1 hour)	2
Minor:	
• Advanced age (>70)	1
• Obesity (BMI >29)	1
• Bed rest (ordered)	1
• HRT or oral contraceptives	1

Kucher N, wet al. N Engl J Med. 2005;352(10):969-77.



Electronic Alerts to Prevent VTE in Hospitalized Patients



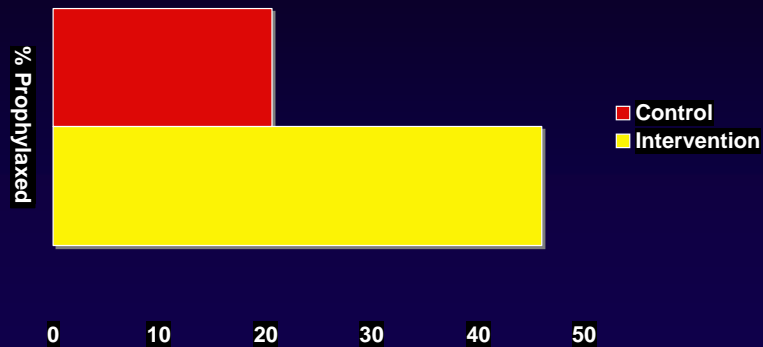
No. at Risk

	0	30	60	90
Intervention group	1255	977	900	853
Control group	1251	976	893	839

$P < .001$ by the log-rank test for the comparison of the outcome between groups at 90 days.

Kucher N, et al. *N Engl J Med.* 2005;352:969-977.

The Human Alert Trial



$P < .0001$ by the log-rank test for the comparison of the outcome between groups at 90 days.

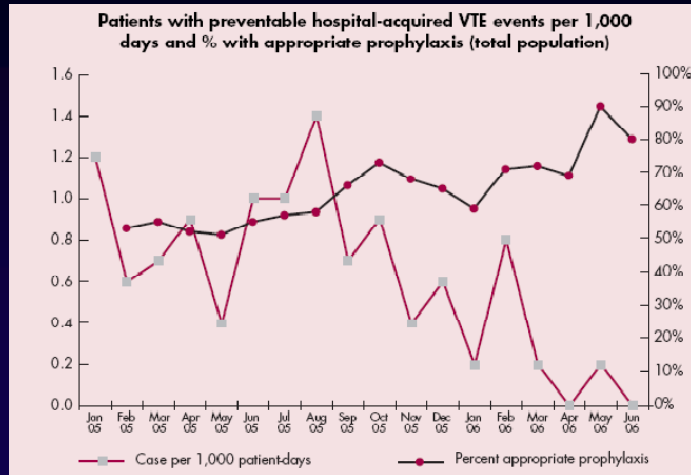
Kucher N, et al. *N Engl J Med.* 2005;352:969-977.

Unless ‘quality’ occurs each and every time for each patient we might as well put slot machines in the lobby and call it “Chance Care.”

Successful strategies are Hardwired!

What A Successful Program Can Achieve

Comparison of Tabular Data and Run Chart From the University fo California, San Diego Medical Center



Maynard GA, et al. J Hosp Medicine 2009



"That must be the new miracle drug!"

The “O” Effect of Quality

- Ownership
- Objective
- Operational
- Obligation
- Outcomes

Learning Objectives

1. Recognize the high hospitalizations and mortality rates associated with VTE and the adverse costs to managed care.
2. Identify the main factors contributing to the onset of VTE
3. Emphasize the importance of early detection for those at risk, including teaching patients about preventative actions for decreasing their high risk.
4. Review the latest guidelines from the ACCP, particularly with regard to the development of a formal prevention strategy at all hospitals
5. Discuss methods for physicians and nurses to assess/recognize the potential risk in each patient

