

# Public Health Importance of Venous Thromboembolism



Accessible version: <https://youtu.be/CZuknY8D2-A>

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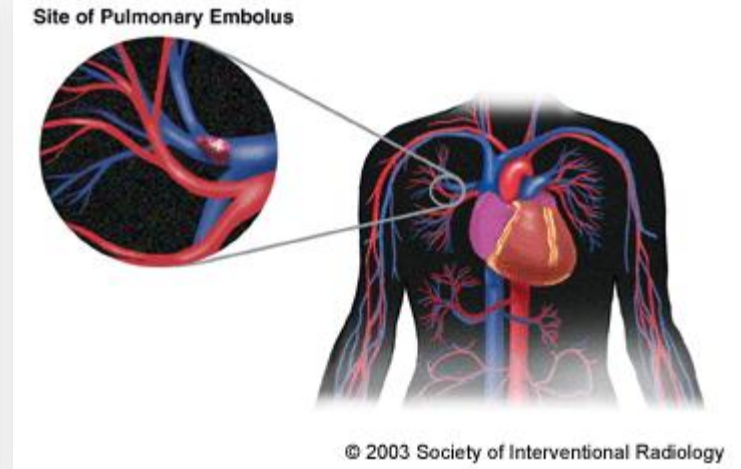
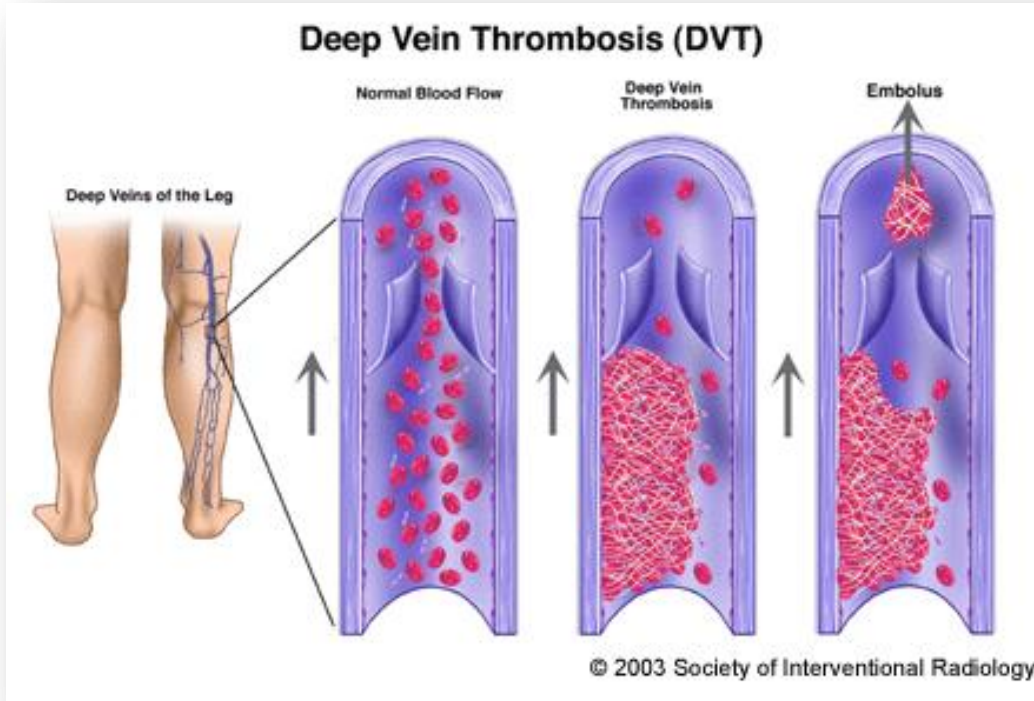
*National Center on Birth Defects and Developmental Disabilities*

*CDC*



**U.S. Department of  
Health and Human Services**  
Centers for Disease  
Control and Prevention

# What is Venous Thromboembolism (VTE)?



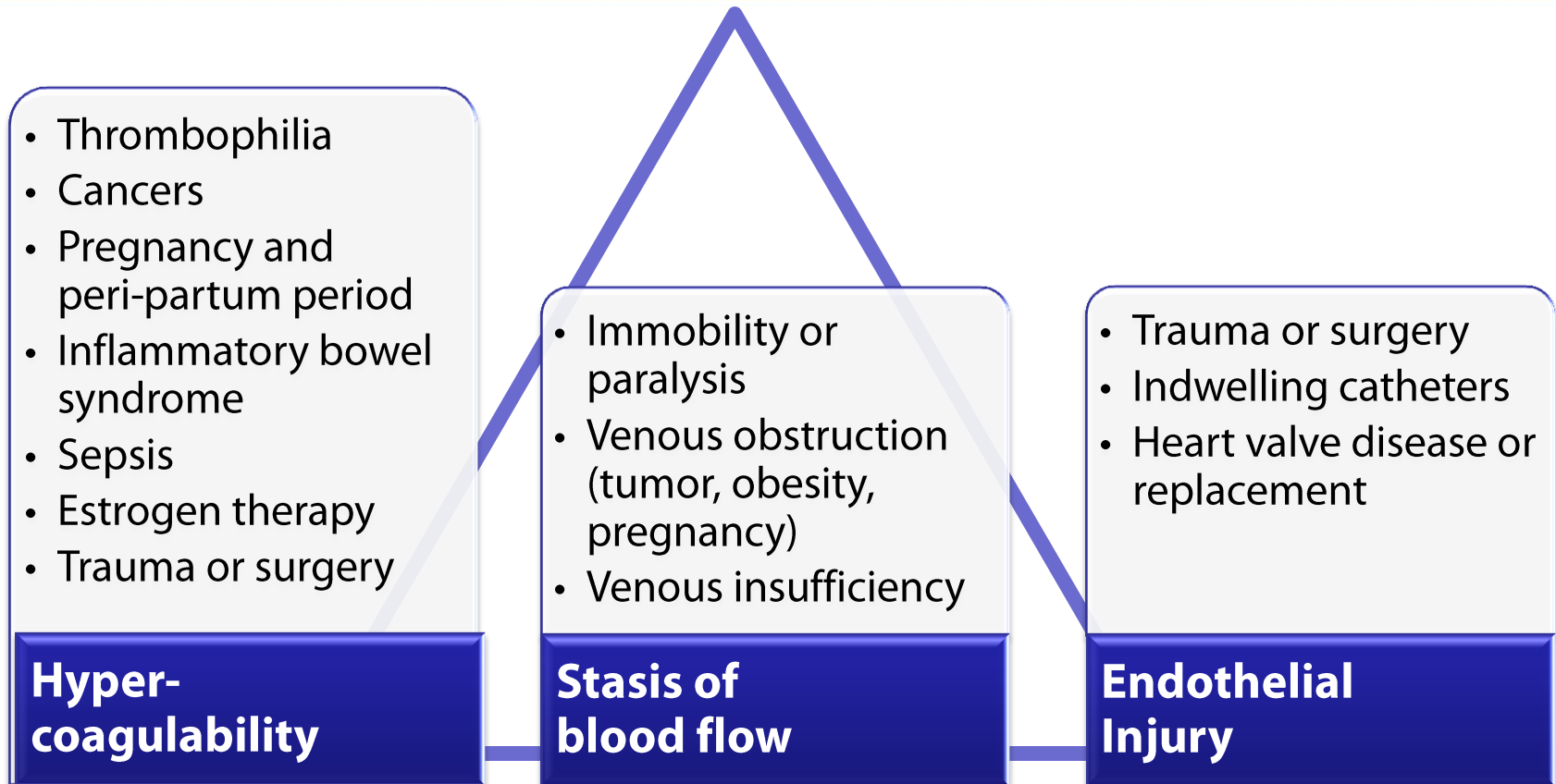
## ❑ DVT, Deep vein thrombosis

- Blood clot in a deep vein

## ❑ PE, Pulmonary embolism

- Blood clot that has traveled to and is blocking an artery supplying lung

# Virchow's Triangle: Causes of Venous Thromboembolism



# VTE in the United States in Numbers

## Incidence

➤ 100–120 per 100,000 adults/year

- 140 per 100,000 African Americans
- 100 per 100,000 non-Hispanic Whites
- 60 per 100,000 Hispanics
- 30 per 100,000 Asians

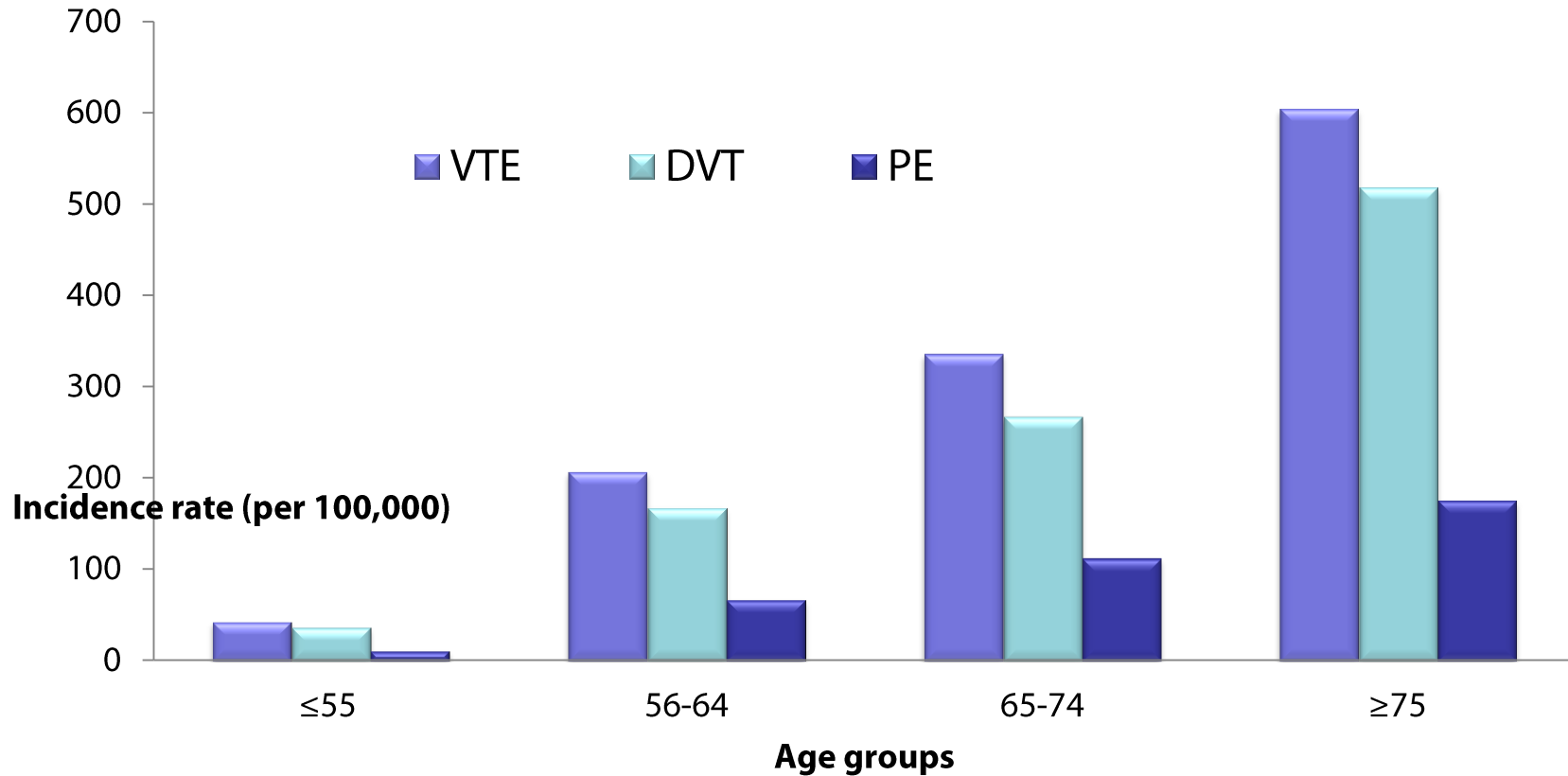
➤ Estimated 300,000–900,000 cases/year

- 2/3 DVT: 200,000–600,000 cases/year
- 1/3 PE: 100,000–300,000 cases/year

## Recurrence

➤ 10–30% of people with a new VTE develop another VTE within 5 years

# VTE Incidence Rates Increase with Age



# Health Consequences of VTE

## ❑ Mortality

- If not treated, 10-30% of PEs are fatal
  - 30,000-100,000 deaths per year
- If treated, 2-8% PEs are fatal
- Many deaths from PE are undiagnosed

## ❑ Post thrombotic syndrome (PTS)

- 20-50% of people with DVT develop PTS
  - Swelling, pain, discoloration, and scaling in the affected limb
- PTS reduces quality of life and functioning and may cause disability

DVT, deep vein thrombosis

Heit JA. J Thromb Haemost 2005;3(8):1611-7

Goldhaber SZ, et al. for ICOPER. Lancet 1999;353:1386-9

Carson JL, et al: NEJM 1992;326(19):1240-5

# Risk Factors for VTE

<b>Strong risk factors</b>	<b>Moderate risk factors</b>	<b>Weak risk factors</b>
<b>Fracture (hip or leg)</b>	<b>Arthroscopic knee surgery</b>	<b>Prolonged bed rest</b>
<b>Hip or knee replacement</b>	<b>Central venous lines</b>	<b>Immobility</b>
<b>Major general surgery</b>	<b>Chemotherapy/Cancer</b>	<b>Age &gt;40 years</b>
<b>Major trauma</b>	<b>Congestive heart or respiratory failure</b>	<b>Laparoscopic surgery</b>
<b>Spinal cord injury</b>	<b>Estrogen</b>	<b>Obesity</b>
	<b>Age &gt;65 years</b>	<b>Pregnancy</b>
	<b>Paralytic stroke</b>	<b>Varicose veins</b>
	<b>Postpartum period</b>	
	<b>Previous VTE</b>	
	<b>Thrombophilia</b>	

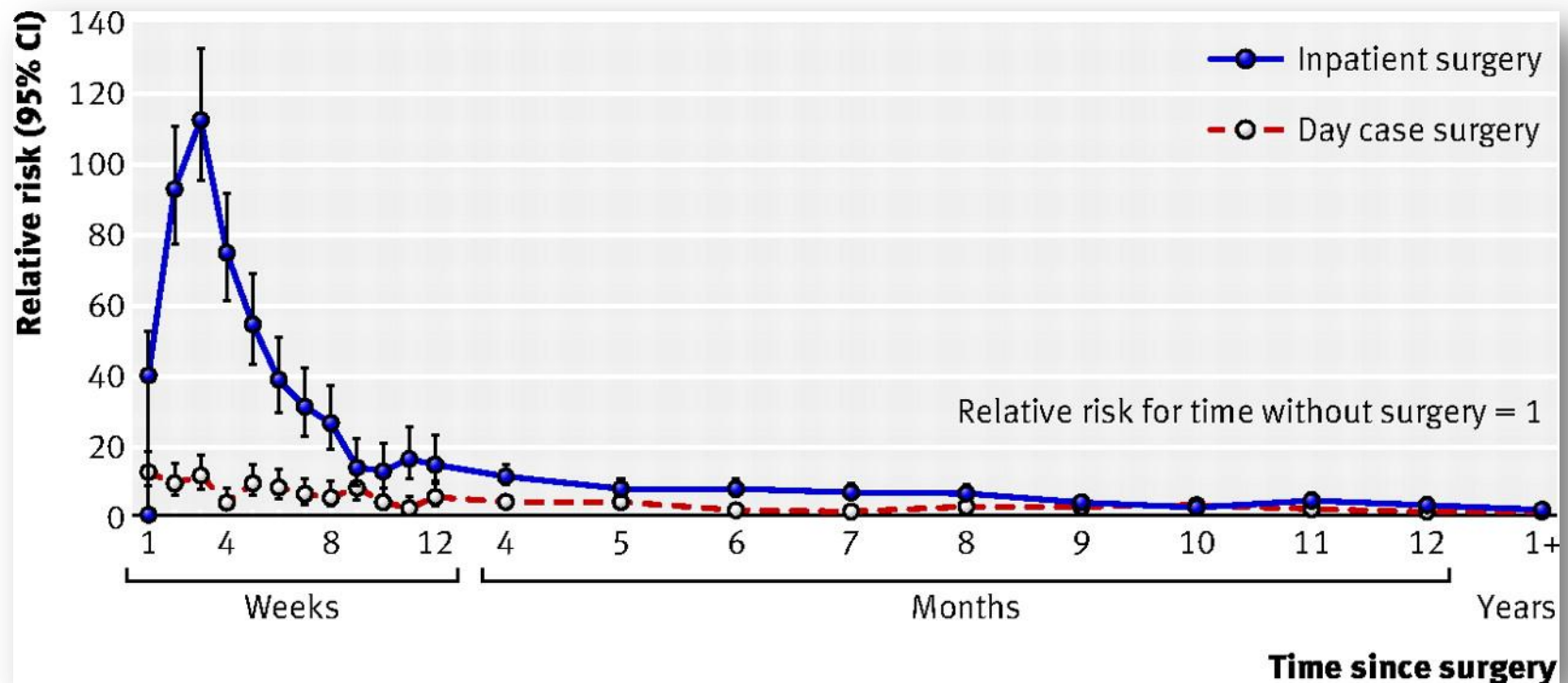
# Half of VTE Are Hospital-associated

- ❑ **46% of new VTE are recognized within 90 days of a hospital stay**
  - 24%: Hospitalization with surgery
  - 22%: Hospitalization without surgery
- ❑ **VTE is a preventable patient safety concern**
  - According to one study, VTE is the 4<sup>th</sup> most frequent cause of serious hospital patient harm, 1 of 8 preventable deaths
- ❑ **74% of VTE are identified outside of the hospital inpatient setting or during the first 24 hours after inpatient admission**



# Most HA-VTE Occur Within 3 Months of Hospital Encounter

## Relative risk of venous thromboembolism by time since inpatient surgery and since day case surgery



Sweetland S, et al. BMJ 2009;339:bmj.b4583

HA-VTE, Hospital-associated venous thromboembolism

# What Can Be Done to Prevent VTE?

- ❑ **There is knowledge and evidence available**
  - How to prevent and/or minimize the health impact of VTE especially among patients at elevated risk
- ❑ **The key to implementing successful prevention**
  - Identify and target these prevention efforts to people at elevated risk of VTE
- ❑ **A large proportion of VTEs are healthcare-associated**
  - There is a clear role that clinicians and hospitals can play in prevention of VTE

# Role of CDC and Public Health

- 1. Support and conduct epidemiologic and health services research on the causes, prevention, and treatment of VTE**
- 2. Clarify and promote use of evidence-based practices for screening, preventing, diagnosing, and treating VTE**
- 3. Increase public and provider knowledge and awareness**
- 4. Implement surveillance to track VTE rates and monitor use and effectiveness of interventions over time**

# 1. Support Epidemiologic and Health Services Research

## □ CDC-supported projects

- Thrombosis and Hemostasis Centers Research and Prevention Network
- Genetic Attributes and Thrombosis Epidemiology Study

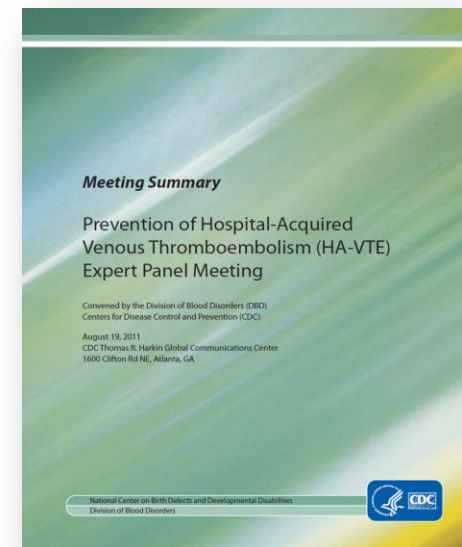
## □ Key findings

- Sickle cell trait is an important risk factor for VTE in African Americans
- Traditional risk factors, presentation, and morbidity may differ among races, ages, and sexes
- Thrombophilia is not only a risk factor for VTE but also a risk factor for adverse pregnancy outcomes

## 2. Promote Evidence-based Prevention Practices

- ❑ **Goal: Develop recommendations to improve HA-VTE prevention**
- ❑ **Outcome: Identified opportunities to improve prevention of HA-VTE**
  - Strategies to address VTE prophylaxis underutilization among medical populations
  - Adherence to clinician-prescribed VTE prophylaxis among hospitalized patients
  - Track burden through identification of medical patients at risk for VTE after discharge
- ❑ **Next steps**
  - Summarize existing hospital prevention guidelines and risk assessment models and evaluate risk-stratified prevention protocols

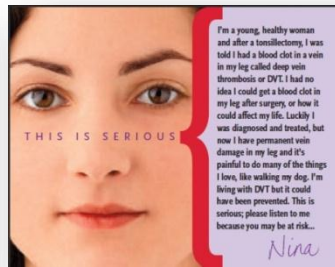
August 2011  
Expert Panel Meeting



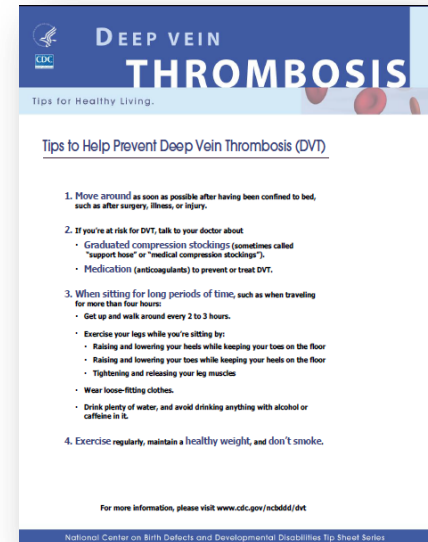
# 3. Increase Knowledge and Awareness

## □ Funding organizations to develop health promotion initiatives and provider training

### Vascular Disease Foundation (VDF)



### CDC fact sheets and videos



### National Blood Clot Alliance (NBCA)



[http://www.cdc.gov/ncbddd/dvt/documents/DVT-panel-card\\_Final1210.pdf](http://www.cdc.gov/ncbddd/dvt/documents/DVT-panel-card_Final1210.pdf)  
<http://stoptheclot.org>

# 4. Implement Surveillance to Track VTE Rates and Monitor Use and Effectiveness of Interventions

- ❑ **Currently, there is no population-based surveillance of VTE in the United States**
- ❑ **VTE surveillance challenges**
  - Identifying those at risk
  - Distinguishing new vs. recurrent VTE
  - Collecting the data



# VTE Surveillance Challenges

## ❑ Identifying those at risk

- Risk factors: Genetic or acquired
  - A trigger: Hospitalization, surgery, injury, immobility, cancer, etc.
  - Unknown: Spontaneous
  - Multiple risk factors

## ❑ Distinguishing new vs. recurrent VTE

## ❑ Collecting the data

- From diverse populations
  - Events occur at all stages of the lifespan, all races/ethnicities, both sexes
- From multiple sources
  - Patients are diagnosed and treated in multiple settings
  - Events can result in sudden death



# CDC Is Developing Population-based Surveillance Systems

## □ 2012: Funded 2 pilot programs

- Durham County, NC and Oklahoma County, OK
- Goals
  - Establish population-based estimates of VTE burden and characteristics by age, race, and sex
  - Monitor and describe associated morbidity and mortality
  - Monitor trends over time and evaluate outcomes, recurrence, and the effect of prevention measures

## □ 2014: Funding pilot projects

- Goals
  - Monitor rates of hospital-associated VTE
  - Monitor VTE prevention practices in hospitals

# Prevention of Venous Thromboembolism (VTE) The Johns Hopkins Medical Institutions (JHMI) VTE Collaborative



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Johns Hopkins Medical Institutions

**DISCLOSURE:** Dr. Streiff serves as a consultant and a CME lecturer for Eisai and Sanofi-aventis



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# Prevention of Venous Thromboembolism

## □ Antithrombotic prophylaxis

- Heparin
- Low molecular weight heparin
- Fondaparinux
- Warfarin
- New oral anticoagulants
- Aspirin

## □ Mechanical prophylaxis

- Graduated compression (TED) stockings
- Intermittent pneumatic compression devices

# American College of Chest Physicians (ACCP) Guidelines for VTE Prophylaxis

- ❑ **VTE guidelines recommend prevention strategies based on balance of predicted risk of clotting and bleeding**
- ❑ **Most hospital prevention protocols use qualitative risk stratification approaches based on the 2004 and 2008 ACCP guidelines**
- ❑ **The 2012 ACCP guidelines, unlike the 2004 and 2008 ACCP guidelines**
  - Endorse quantitative risk stratification models
  - Suggest pharmacological prophylaxis may not be appropriate for all patients

# Risk Stratification Models

## □ VTE risk assessment

- Identify patients at high or low risk for VTE
- VTE risk stratification models
  - Padua Prediction Score
  - Caprini Risk Assessment
- VTE risk factors include previous VTE, cancer, surgery, and age

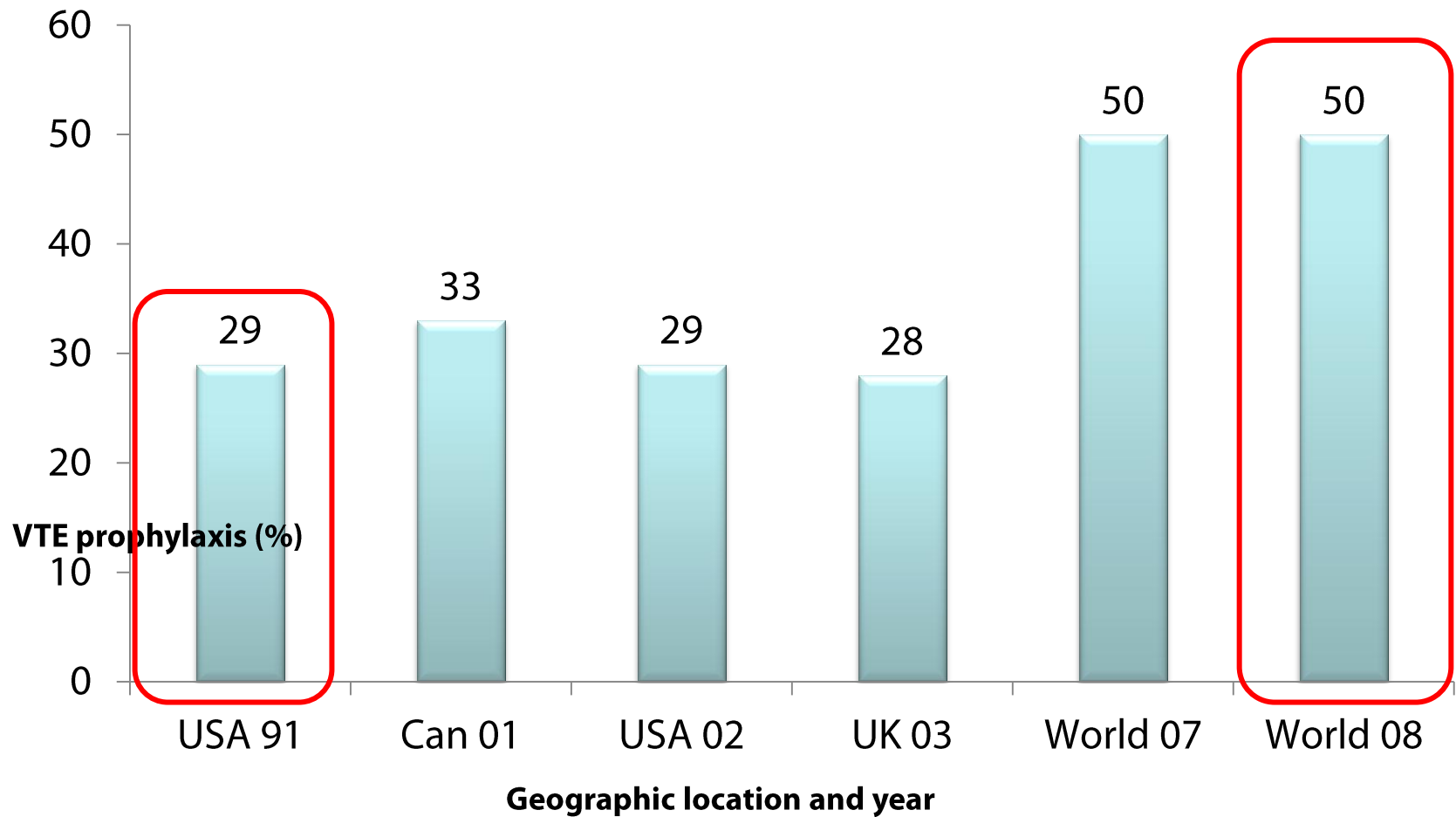
## □ Bleeding risk assessment

- Identify patients at high or low risk for bleeding
- Bleeding risk assessment model
  - IMPROVE Bleeding Score
- Bleeding risk factors include recent bleed, and low platelets

## □ Limitations of current models: Incomplete validation and limited evidence of improved outcomes

# VTE Prevention

## We Have Been Failing Our Patients!

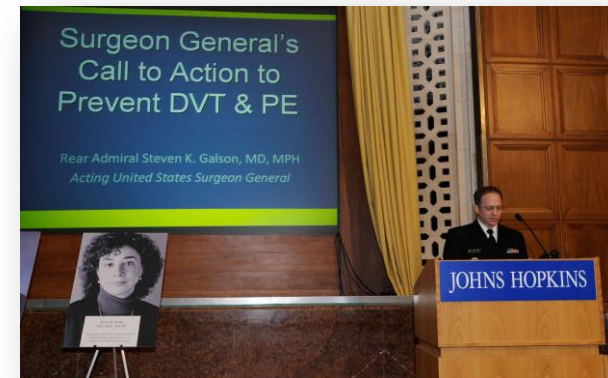


Anderson FA, et al. *Ann Intern Med.* 1991;115:591–5  
Goldhaber SZ, et al. *Am J Cardiol.* 2004;93:259–62  
Rahim SA, et al. *Thromb Res.* 2003;111:215–9

Rashid J. *Royal Soc Med* 2005;98:507–12  
Tapson VF, et al. *Chest* 2007;132:936–45  
Cohen AT, et al. *Lancet* 2008;371:387–94

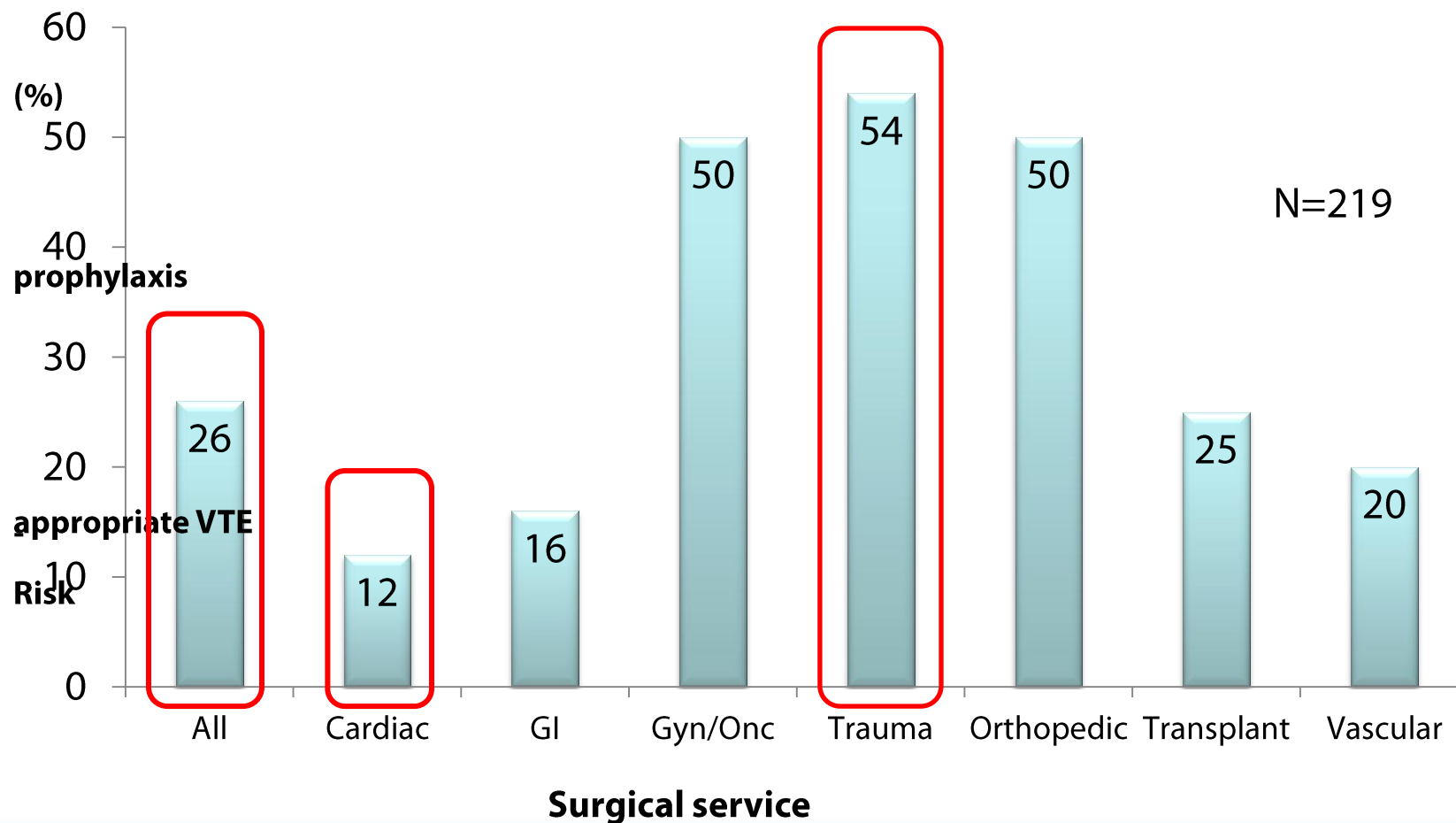
# JHMI VTE Collaborative's Strategy for Achieving Optimal VTE Prophylaxis

- ❑ **Established in 2004 and led by the Center for Innovation in Patient Safety and Quality Care**
- ❑ **Key components**
  - Multidisciplinary VTE prevention team
  - Education of providers
  - Collaboration to develop risk-appropriate VTE prophylaxis
  - Assessment of performance
    - Measure baseline performance
    - Monitor performance
    - Review performance with staff
    - Adapt to improve performance



# JHMI Surgical Services

## VTE Prophylaxis: Baseline Performance, 2005





# Essential Features of Optimal VTE Prevention Strategy

- ❑ Use of risk order sets for VTE prevention must be mandatory
- ❑ Identify VTE risk factors on admission
- ❑ Identify contraindications to prophylaxis
- ❑ Order **risk-appropriate** VTE prophylaxis
- ❑ Reassess VTE risk factors and contraindications during hospital stay
- ❑ Save patient and provider data
- ❑ Monitor hospital-acquired VTE and bleeding
- ❑ Measure performance regularly to promote continuous improvement

# JHMI VTE Prophylaxis: Strategy 1.0

Paper order sets

Advantage

➤ Easy to create

Challenges

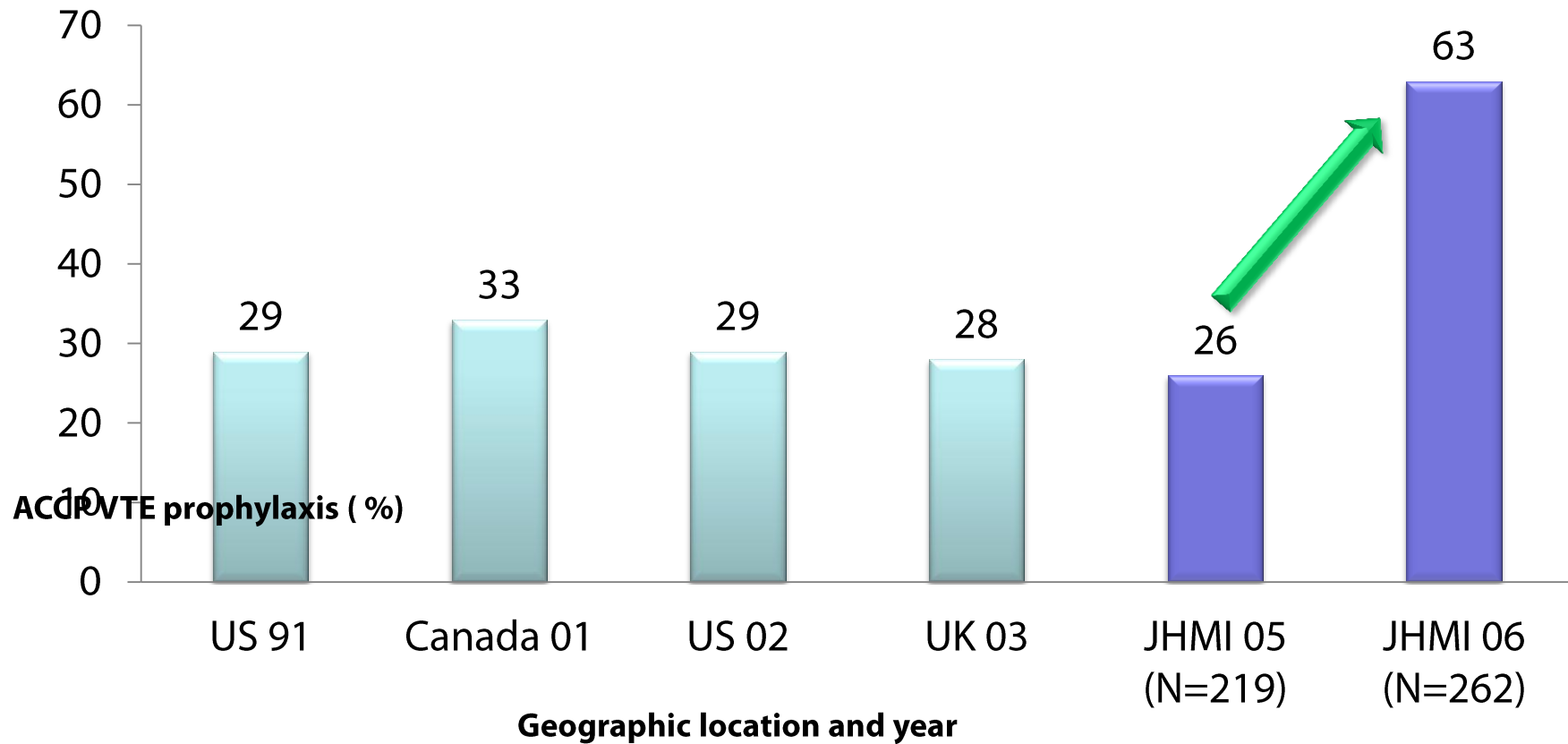
➤ Complex

➤ Labor-intensive data collect

➤ Labor-intensive performance monitoring

Prevention of Venous Thromboembolism (VTE) Adult Order Form – GENERAL SURGERY, SURGICAL ONCOLOGY, UROLOGIC, OR VASCULAR SURGERY		Patient Identification		
PILOT WORKSHEET		Weight: Kg	Serum Creatinine <sup>4</sup> :	
<b>INDICATE RISK FACTORS</b> (Check all that apply)				
<b>Serious Risk Factors</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Current, active cancer<sup>2</sup></li> <li><input type="checkbox"/> Previous DVT and/or PE<sup>2</sup></li> <li><input type="checkbox"/> Stroke within the past 3 months (non-hemorrhagic)</li> <li><input type="checkbox"/> Trauma (major or lower extremity)</li> <li><input type="checkbox"/> Heart or respiratory failure undergoing acute treatment</li> <li><input type="checkbox"/> Pregnancy and post-partum (&lt; 1 month)</li> <li><input type="checkbox"/> Inherited or acquired thrombophilia</li> </ul>		<b>Other Risk Factors</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Immobility (bedrest/sitting ≥ 3 days) or paralysis</li> <li><input type="checkbox"/> Central venous catheterizations</li> <li><input type="checkbox"/> Acute medical illness or sepsis</li> <li><input type="checkbox"/> Myeloproliferative disorder</li> <li><input type="checkbox"/> Inflammatory bowel disease</li> <li><input type="checkbox"/> Nephrotic syndrome</li> <li><input type="checkbox"/> Obesity (BMI &gt; 30 kg/M<sup>2</sup>)<sup>3</sup></li> <li><input type="checkbox"/> Smoking (active, not history)</li> <li><input type="checkbox"/> Estrogen use (OC or HRT)</li> <li><input type="checkbox"/> Selective estrogen receptor modulators (SERMs)</li> <li><input type="checkbox"/> Varicose veins</li> </ul>		
<b>RISK CATEGORIES</b>				
<b>Low Risk</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Minor surgery (&lt; 30 min), Age &lt; 40 years, with NO additional risk factors</li> <li><b>OR</b></li> <li><input type="checkbox"/> Vascular surgery with NO additional risk factors</li> <li><b>OR</b></li> <li><input type="checkbox"/> Laparoscopic procedures with NO additional risk factors</li> <li><b>OR</b></li> <li><input type="checkbox"/> Low risk urologic procedures (TURP, etc.)</li> </ul>	<b>Moderate Risk<sup>1</sup></b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Minor surgery (&lt; 30 min), age &lt; 40 years, WITH any additional risk factors (one or more)</li> <li><b>OR</b></li> <li><input type="checkbox"/> Minor surgery (&lt; 30 min), age 40-60 years, with NO additional risk factors</li> <li><b>OR</b></li> <li><input type="checkbox"/> Major surgery (&gt; 30 min), age &lt; 40 years with NO additional risk factors</li> <li><b>OR</b></li> <li><input type="checkbox"/> Laparoscopic surgery WITH any additional risk factors (one or more)</li> </ul>	<b>High Risk<sup>1</sup></b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Any surgery age &gt; 60 years WITHOUT any additional risk factors</li> <li><b>OR</b></li> <li><input type="checkbox"/> Minor surgery (&lt; 30 min), age 40-60 years WITH any additional risk factors (one or more)</li> <li><b>OR</b></li> <li><input type="checkbox"/> Major surgery (&gt; 30 min), age &lt; 40 years WITH any additional risk factors (one or more); <b>OR</b> age 40-60 years WITH or WITHOUT any additional risk factors (one or more)</li> <li><b>OR</b></li> <li><input type="checkbox"/> Major vascular surgery (&gt; 30 min) WITH any additional risk factors (one or more)</li> </ul>	<b>Very High Risk<sup>1,2</sup></b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Major surgery (&gt; 30 min) at any age WITH any <b>SERIOUS RISK FACTORS</b></li> <li><b>OR</b></li> <li><input type="checkbox"/> Major surgery (&gt; 30 min), age &gt; 60 years WITH any additional risk factors (one or more)</li> </ul>	
<b>ORDERS</b>				
<b>Low Risk</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> No pharmacologic prophylaxis is indicated; Early and persistent mobilization recommended; Please specify ambulation plan</li> </ul>	<b>Moderate Risk</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Heparin 5,000 Units SC Q12 hours<sup>3</sup></li> <li style="text-align: center;"><i>With the option to add</i></li> <li><input type="checkbox"/> TED<sup>5</sup></li> <li><input type="checkbox"/> SCD<sup>5</sup></li> </ul>	<b>High Risk</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Heparin 5,000 Units SC Q8 hours<sup>3</sup></li> <li style="text-align: center;"><i>With the option to add</i></li> <li><input type="checkbox"/> TED<sup>5</sup></li> <li><input type="checkbox"/> SCD<sup>5</sup></li> </ul>	<b>Very High Risk</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Heparin 5,000 Units SC Q8 hours<sup>3</sup></li> <li style="text-align: center;"><b>OR</b></li> <li><input type="checkbox"/> Enoxaparin 40 mg SC QDay<sup>3,4,5</sup> (Trade-off: fewer PE with more bleeds)</li> <li style="text-align: center;"><b>AND</b></li> <li><input type="checkbox"/> TED<sup>5</sup> and <input type="checkbox"/> SCD<sup>5</sup></li> </ul>	
<b>CONTRAINDICATIONS<sup>1</sup></b>				
<ul style="list-style-type: none"> <li><input type="checkbox"/> Active, uncontrolled bleeding or high risk of bleeding</li> <li><input type="checkbox"/> Systemic anticoagulation</li> <li><input type="checkbox"/> Active aneurysm (cerebral or aortic dissecting)</li> <li><input type="checkbox"/> Bacterial endocarditis or pericarditis</li> <li><input type="checkbox"/> Active peptic ulcer disease, ulcerative GI lesions</li> <li><input type="checkbox"/> Malignant hypertension</li> <li><input type="checkbox"/> Severe head trauma</li> <li><input type="checkbox"/> INR or aPTT ratio &gt; 1.5 (unless antiphospholipid antibodies)</li> </ul>		<ul style="list-style-type: none"> <li><input type="checkbox"/> Threatened abortion</li> <li><input type="checkbox"/> Severe thrombocytopenia (platelet count &lt; 30,000)</li> <li><input type="checkbox"/> Recent TURP</li> <li><input type="checkbox"/> Eye, brain, or spinal cord injury within the past 48 hrs.</li> <li><input type="checkbox"/> For Heparin or Enoxaparin: history of HIT</li> <li><input type="checkbox"/> For <b>Enoxaparin</b>: Epidural catheter removal or spinal tap &lt; 2 hours prior to dose; weight &lt; 45kg; hemodialysis<sup>3</sup></li> <li><input type="checkbox"/> For <b>SCD</b>: open wounds or extremity with known DVT</li> </ul>		
<b>ORDERS<sup>1</sup></b>				
<b>If contraindication present: (Check one or more)</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Discontinue orders above</li> <li><input type="checkbox"/> Early and persistent mobilization</li> <li><b>Please specify ambulation plan</b></li> <li><input type="checkbox"/> TED/SCD<sup>5</sup></li> </ul>				
<sup>2</sup> Patients undergoing major cancer surgery who are > 60 years, or patients with previous DVT/PE, post-discharge prophylaxis for 2 to 4 weeks is recommended. <sup>3</sup> Manipulation of epidural catheter should be undertaken at the nadir (trough) of anticoagulant effect. With enoxaparin remove the catheter at least 10-12 hours after the dose and wait 2 hours to redose. If catheter is to remain in place, heparin use is strongly recommended, with redose > 1 hour after removal. If blood is present with catheter manipulation or multiple punctures employed, wait 24 hours to re-start any pharmacologic thromboprophylaxis. <sup>4</sup> Patients with CrCL (< 30) mL/min, heparin is strongly recommended over enoxaparin. If enoxaparin is used, the manufacturer recommends 30mg SC QDay. <sup>5</sup> For morbidly obese patients (BMI > 40 kg/M <sup>2</sup> ) following bariatric surgery, enoxaparin 40mg SC Q12 hours was more effective than 30mg SC Q12 hours in an open trial. <sup>6</sup> TED and SCD are most effective when properly applied to the patient and are operating for > 23 hours per day.				
Date	Time	MD Signature	MD Name (printed)	MD ID Number

# JHMI VTE Prevention Performance Evaluation in 2006 Was Better, but Not Optimal



Order Set:

Order Items

<input checked="" type="checkbox"/>	<b>DOM Admission Orders</b>			
<input checked="" type="checkbox"/>	<b>DOM Lab Orders</b>			
<input type="checkbox"/>	<b>DOM Fever Workup</b>			
<input checked="" type="checkbox"/>	<b>VTE Prophylaxis: Internal Medicine</b>			
<input type="checkbox"/>	<b>Peripheral IV Catheter Insert Orderset</b>			
<b>IV Therapy</b>				
<input type="checkbox"/>	.Peripheral IV Catheter, Insert VAT -	Order Update: Ordered	T	Routine
<b>Second IV (Conditional Order)</b>				
<input checked="" type="checkbox"/>	Peripheral IV Catheter, Insert 2nd VAT -	Order Update: Ordered	T	Routine
	Nurse will activate order to support medication/fluid administration <Avail. Activations=1>			
<b>Maintain IV</b>				
<input checked="" type="checkbox"/>	.Peripheral IV Catheter, Maintain NUR - VAD Protocol MUST be implemented and followed! <Continuous>		T	Routine
<b>Pharmacy</b>				
<input checked="" type="checkbox"/>	Normal Saline Flush Inj - 2 ml IV q5min; PRN for VAD protocol. Flush each IV after each use or at least q8h when not in continuous use. (Peripheral IV)			Routine

**Patient order set**

Relevant Info Select All Deselect All Edit... Change Date...

OK Cancel Help

<input checked="" type="checkbox"/>		<b>DOM Admission Orders</b>			
<input checked="" type="checkbox"/>		<b>DOM Lab Orders</b>			
<input type="checkbox"/>		<b>DOM Fever Workup</b>			
<input checked="" type="checkbox"/>		<b>VTE Prophylaxis: Internal Medicine</b>			
<input type="checkbox"/>		<b>Peripheral IV Catheter Insert Order Set</b>			
		<b>IV Therapy</b>			
<input type="checkbox"/>		.Peripheral IV Catheter, Insert VAT -	Order Update: Ordered		
		<b>Second IV (Conditional Order)</b>			
<input checked="" type="checkbox"/>		Peripheral IV Catheter, Insert 2nd VAT -	Order Update: Ordered	T	Routine
		? Nurse will activate order to support medication/fluid administration <Avail. Activations=1>			
		<b>Maintain IV</b>			
<input checked="" type="checkbox"/>		.Peripheral IV Catheter, Maintain NUR - VAD Protocol MUST be implemented and followed! <Continuous>		T	Routine
		<b>Pharmacy</b>			
<input checked="" type="checkbox"/>		Normal Saline Flush Inj - 2 ml IV q5min; PRN for VAD protocol. Flush each IV after each use or at least q8h when not in continuous use. (Peripheral IV)			Routine

**Sunrise Clinical Manager**

? This order item is mandatory in the set DOM Admission Order Set. If you delete it, you will also delete the entire set. Do you want to delete the set?

OK Cancel

**Any attempt to uncheck the order will give this alert**

Relevant Info Select All Deselect All Edit... Change Date...

OK Cancel Help

Patient Age:  
48y

Relevant Results

Combined Measurements		Weight (lb)	Weight (kg)	BSA	BMI
Height (inches)	Height (cm)	147	66.7	1.77	23

Creatinine Clearance (Estimated (Cockcroft-Gault))  
Creatinine (mg/dl) Creat Clear (est)  
1 84.7  
Entered - 07/04/2007 16:41

SECTION A: Does the patient have any major VTE risk factors?

SECTION B: Does the patient have any contraindications to pharmacologic prophylaxis?

- Previous VTE
- Age greater than 60 years
- Cancer - Metastatic or under treatment
- Stroke with paresis less than 3 months
- Known hypercoagulable state
- NYHA class III/IV heart failure
- Mechanical ventilation
- Sepsis
- Pregnancy to six weeks post partum
- No major risk factors known

- Current use of systemic anticoagulation
- Active bleeding
- High risk of bleeding
- INR greater than or equal to 1.5
- APTT greater than or equal to 1.3
- Platelet count less than 50,000 cu/mm
- No contraindications known

**Patient age, weight, renal function and relevant laboratory results imported from database**

Recommended Prophylaxis:

Prophylaxis Orders

Order	Dose	UOM	Route	Frequency	Start Date	Start Time	Priority	Side of Body	Type	Instructions/Comments
<input type="checkbox"/> Heparin Inj	5000	unit	SubQ	q8h			Routine			
<input type="checkbox"/> Heparin Inj	5000	unit	SubQ	q12h			Routine			
<input type="checkbox"/> TED Stockings				<Continuous>	T		Routine	Bilateral	Knee	Review patient status daily...
<input type="checkbox"/> Compression Device, Sequential				<Continuous>	T		Routine			Review patient status daily...
<input type="checkbox"/> Foot Pump				<Continuous>	T		Routine			

Was VTE Prophylaxis Ordered as Recommended?

- Yes
- No - Bleeding Risk Greater than VTE Risk
- No - Pork Aversion
- No - Prescriber Preference

OK Cancel

Patient Age:  
48y

Relevant Results

Combined Measurements

Height (inches)	Height (cm)	Weight (lb)	Weight (kg)	BSA	BMI
67	170.2	147	66.7	1.77	23

Creatinine Clearance (Estimated (Cockcroft-Gault))  
 Creatinine (mg/dl) Creat Clear (est)  Actual  Estimated  
 1 84.7  
 Entered - 07/04/2007 16:41

SECTION A: Does the patient have any major VTE risk factors?

SECTION B: Does the patient have any contraindications to pharmacologic prophylaxis?

**Mandatory selections  
Risk factors  
Contraindications**

- Previous VTE
- Age greater than 60 years
- Cancer - Metastatic or under treatment
- Stroke with paresis less than 3 months
- Known hypercoagulable state
- NYHA class III/IV heart failure
- Mechanical ventilation
- Sepsis
- Pregnancy to six weeks post partum
- No major risk factors known

- Current use of systemic anticoagulation
- Active bleeding
- High risk of bleeding
- INR greater than or equal to 1.5
- APTT greater than or equal to 1.3
- Platelet count less than 50,000 cu mm
- No contraindications known

Recommended Prophylaxis:

Prophylaxis Orders

Order	Dose	UOM	Route	Frequency					
<input checked="" type="checkbox"/> Heparin Inj	5000	unit	SubQ	q8h					
<input type="checkbox"/> Heparin Inj	5000	unit	SubQ	q12h					
<input type="checkbox"/> TED Stockings				<Continuous>	T	Routine	Bilateral	Knee	Review patient status daily...
<input type="checkbox"/> Compression Device, Sequential				<Continuous>	T	Routine			Review patient status daily...
<input type="checkbox"/> Foot Pump				<Continuous>	T	Routine			

**Orders and Order Sets with Warnings or Errors**

Order Set: VTE Prophylaxis: Internal Medicine

The following Order Set and/or Orders either have warnings or contain errors. Correct any errors by editing the order. You must review any Informational Messages before you can save the order.

Order Items:

- VTE Prophylaxis: Internal Medicine -
  - The SECTION Labeled A and B may not be left blank. Please enter a value into the field

Select All | Deselect All | Edit | OK | Help

Was VTE Prophylaxis Ordered as Recommended?

- Yes
- No - Bleeding Risk Greater than VTE Risk
- No - Pork Aversion
- No - Prescriber Preference

OK Cancel

Patient Age: 90y

Relevant Results  
Creatinine, Serum.: 1.6(Mar01); INR, Prothrombin Time: 2.2(Mar01); Platelet Count.: 78(Mar01); Ratio:APTT: 1.8(Mar01);

Combined Measurements  
Height (inches) Height (cm) Weight (lb) Weight (kg) BSA BMI  
190 86

Creatinine Clearance (Estimated (Cockcroft-Gault))  
Creatinine (mg/dl) Creat Clear (est) Actual Estimated  
1.6 36.9  
Resulted - 03/01/2010 05:07

SECTION A: Does the patient have any major VTE risk factors?

SECTION B: Does the patient have any contraindications to pharmacologic prophylaxis?

- Previous VTE
- Age greater than 60 years
- Cancer - Metastatic or under treatment
- Stroke with paresis less than 3 months
- Known hypercoagulable state
- NYHA class III/IV heart failure
- Mechanical ventilation
- Sepsis
- Pregnancy to six weeks post partum
- No major risk factors known

- Current use of systemic anticoagulation
- Active bleeding
- High risk of bleeding
- INR greater than or equal to 1.5
- APTT greater than or equal to 1.3
- Platelet count less than 50,000 cu mm
- No contraindications known

**Prophylaxis Recommendation**

Recommended Prophylaxis:  
Choose Heparin 5000 units q8h (High Risk Prophylaxis)

Prophylaxis Orders

Order	Dose	UOM	Route	Frequency	Start Date	Start Time Priority	Side of Body	Type	Instructions/Comments
<input type="checkbox"/> Heparin Inj	5000	unit	SubQ	q8h		Routine			
<input type="checkbox"/> Heparin Inj	5000	unit	SubQ	q12h		Routine			
<input type="checkbox"/> TED Stockings				<Continuous>	T	Routine	Bilateral	Knee	Review patient status daily...
<input type="checkbox"/> Compression Device, Sequential				<Continuous>	T	Routine			Review patient status daily...
<input type="checkbox"/> Foot Pump				<Continuous>	T	Routine	Bilateral		

VTE Risk Assessment was Completed

Drug Info [v] [OK] [Cancel]



No contraindications known

Recommended Prophylaxis:

Choose Heparin 5000 units Q8H plus Mechanical Orders. (VERY HIGH Risk WITH Renal Impairment)

Prophylaxis Orders

	Order	Dose	UOM	Route	Frequency	Start Date	Start Time Priority	Pharmacy Instructions	Side of Body
<input type="checkbox"/>	Enoxaparin Inj	40	mg	SubQ	q24h		Time Critical	First dose 2 hours Pre-Op and...	
<input checked="" type="checkbox"/>	<b>Heparin Inj</b>	5000	unit	SubQ	q8h		18:00	Give first dose 2 hours Pre...	
<input type="checkbox"/>	Heparin Inj	5000	unit	SubQ	q12h		Time Critical	Give first dose 2 hours Pre...	
<input type="checkbox"/>	Ambulate with Assistance				tid	T	Routine		
<input type="checkbox"/>	Ambulate without Assistance				tid	T	Routine		
<input checked="" type="checkbox"/>	<b>TED Stockings</b>				<Continuous>	08/13/2007	Routine		Bilateral
<input checked="" type="checkbox"/>	<b>Compression Device, Sequential</b>				<Continuous>	08/13/2007	Routine		
<input type="checkbox"/>	Foot Pump				<Continuous>	T	Routine		

Was VTE Prophylaxis Ordered as Recommended?

Yes

No - Religious Reasons

No - Bleeding Risk Greater than VTE Risk

No - Prescriber Preference

No - VTE Risk Greater than Bleeding Risk

No - Other

No - Heparin Allergy/Adverse Reaction

VTE Risk Assessment was Completed

**VTE\_Risk Assess Completed - LABPOE, CHARLES**

VTE Risk Assessment was Completed - LABPOE, CHARLES

Order:  Order ID:

Requested By:  Template Name:

Messages:

Recommended Prophylaxis was:

Repeat View Document OK Cancel

**Documentation of risk assessment**

OK

Cancel

MedVitals - Windows Internet Explorer

https://medvitals.med.som.jhmi.edu/dom/dvt\_reports\_phy.aspx

File Edit View Favorites Tools Help

Convert Select

MedVitals

JOHNS HOPKINS MEDICINE

MedVitals Financial Reporting System

Reports THE DEPARTMENT OF MEDICINE BACK LOGOUT

Reports>DVT Reports Session Timeout: 75 Minute(s) | Reporting year: FY2013

- ▼ DVT Code Mapping
  - DVT Medication Codes
  - DVT Orderset Codes
- ▼ DVT Schema
  - DVT General Trauma Schema
  - DVT Neurosurgery Schema
  - DVT Ortho Spine Schema
  - DVT Ortho shoulder knee scope Schema
  - DVT Ortho Hip Knee Repl Schema
  - DVT General Surgery Schema
  - DVT Cardiac Surgery Schema
  - DVT ONHS Schema
  - DVT Neurology Schema
  - DVT General Medicine Schema
  - DVT Ortho Trauma Onc Schema
- ▼ DVT Medications
  - DVT Neurosurgery Medication Codes
  - DVT Ortho Spine Medication Codes

Report Selection/Filter

Report type  
1. Visit Stats View

Fiscal Year  
FY13

Posting Period  
OCTOBER-2012

Last Updated month & year: OCTOBER - 2012

Done Trusted sites 100%

start 7 Microsoft Office P... JHH electronic order ... MedVitals - Windows ... 10:18 PM



Johns Hopkins Department of Medicine

Datasource: POE Page 1 of 3

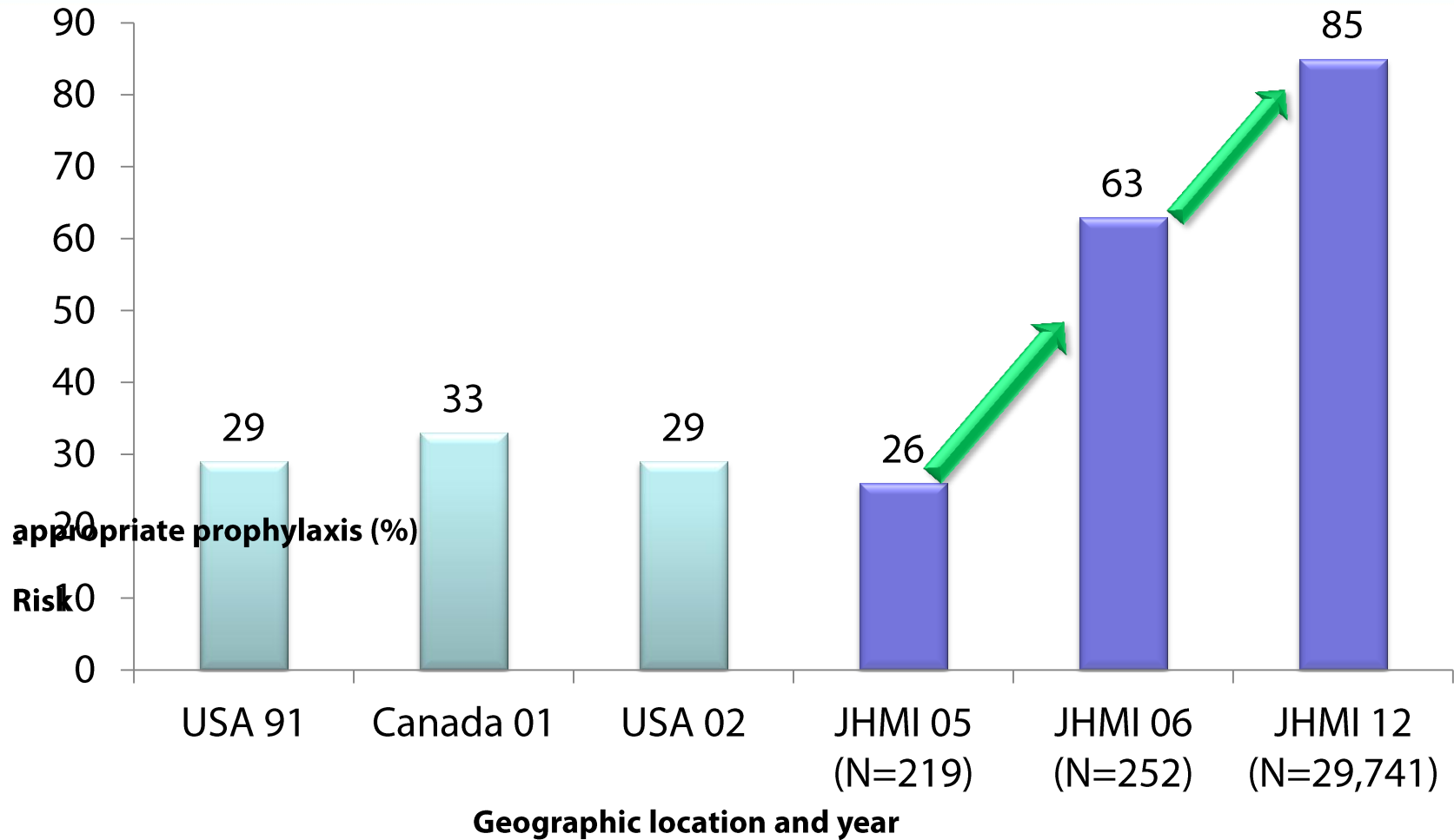
Medicine Orderset Medication Compliance w/Exception for 201210

Print date & time :11/12/2012 10:22:35 PM

Risk Category	No	Yes	Total	% Compliance
High Risk w/ contraindications	6	93	99	93.9%
High Risk w/ Systemic Anticoag	0	130	130	100.0%
High Risk w/o contraindications	28	273	301	90.7%
Moderate Risk w/ contraindications	3	61	64	95.3%
Moderate Risk w/o contraindications	23	338	361	93.6%
Moderate w/ Systemic Anticoag	0	65	65	100.0%
Systemic - Other Medication	0	13	13	100.0%
<b>Medicine</b>	<b>60</b>	<b>973</b>	<b>1,033</b>	<b>94.2%</b>

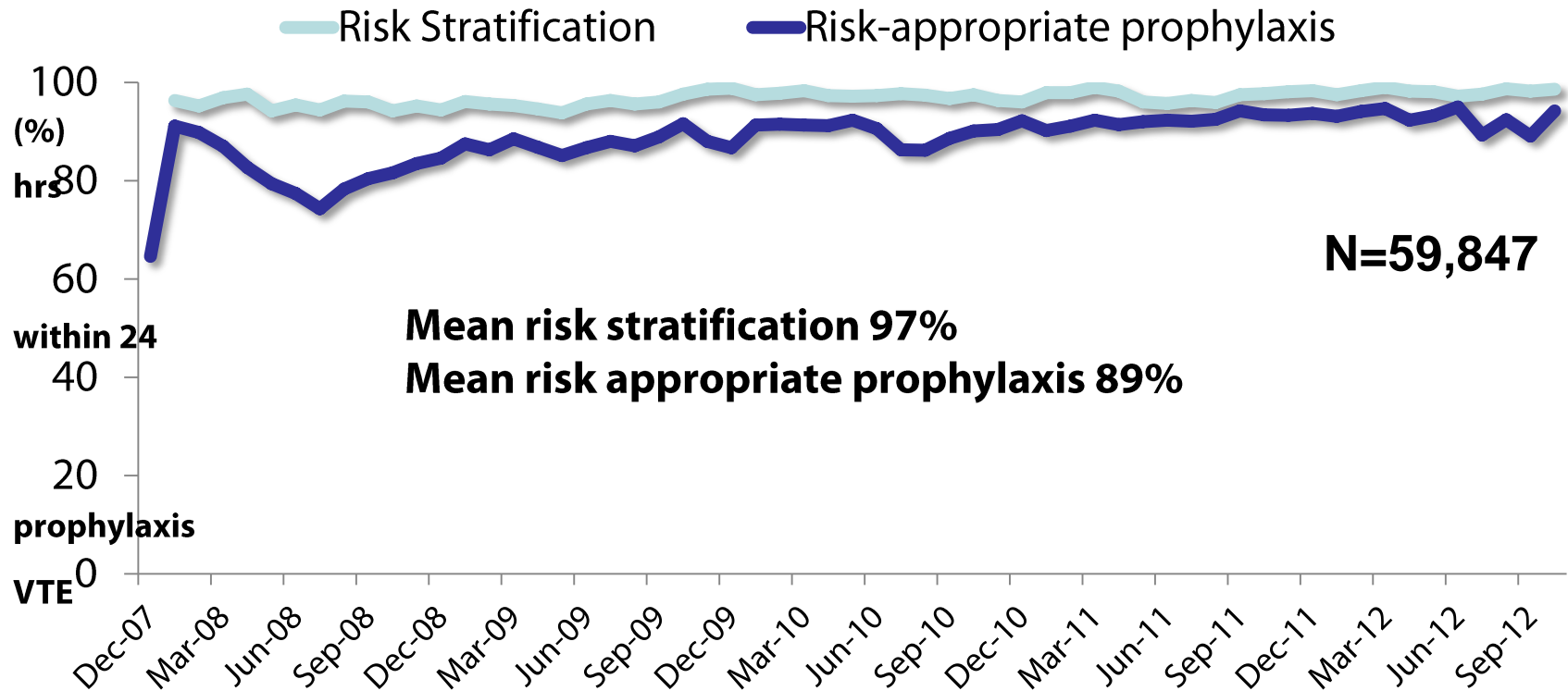
Risk Category	No	Yes	Total	% Compliance
High Risk w/ contraindications	0	6	6	100.0%
High Risk w/ Systemic Anticoag	0	12	12	100.0%

# JHMI VTE Prophylaxis Performance, 2012

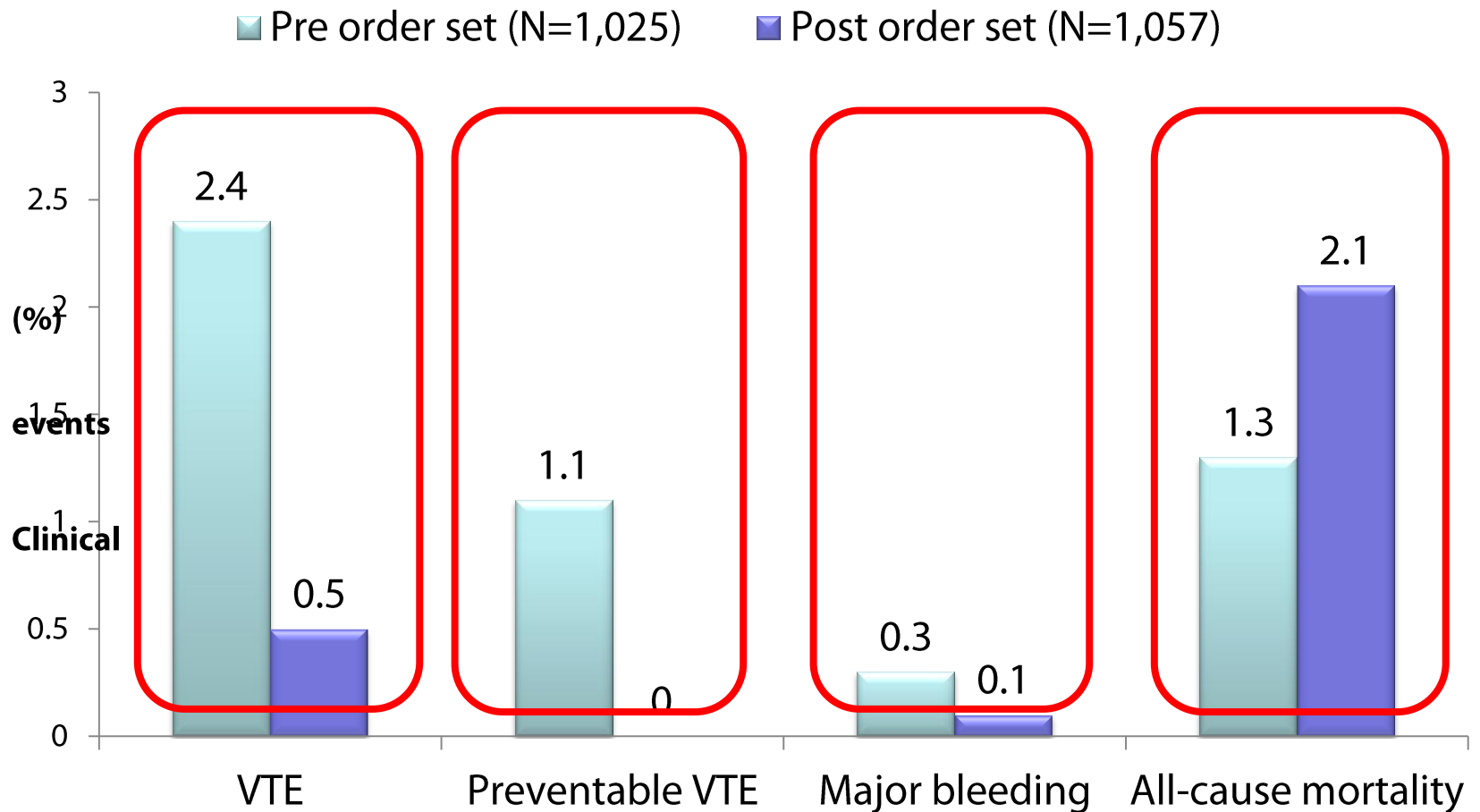


# JHMI Medicine

## VTE Performance, 2008-2012



# Higher Rates of VTE Prophylaxis Lead to Fewer Thrombotic Events



# Keys to Successful Implementation of a VTE Prophylaxis Program

- ❑ **Multidisciplinary team**
- ❑ **Institutional leadership**
- ❑ **Education of front-line providers**
- ❑ **Collaboration with service-specific teams**
- ❑ **Implementation of evidence-based protocols**
- ❑ **Computer-based decision support**
- ❑ **Focus on performance**
  - Measure baseline performance
  - Conduct ongoing performance evaluations
  - Obtain service and provider feedback



Johns Hopkins Medical Institutions

# Patient Safety and Prevention of Hospital-associated Venous Thromboembolism



**P. Jeffrey Brady, MD, MPH**

*Associate Director*

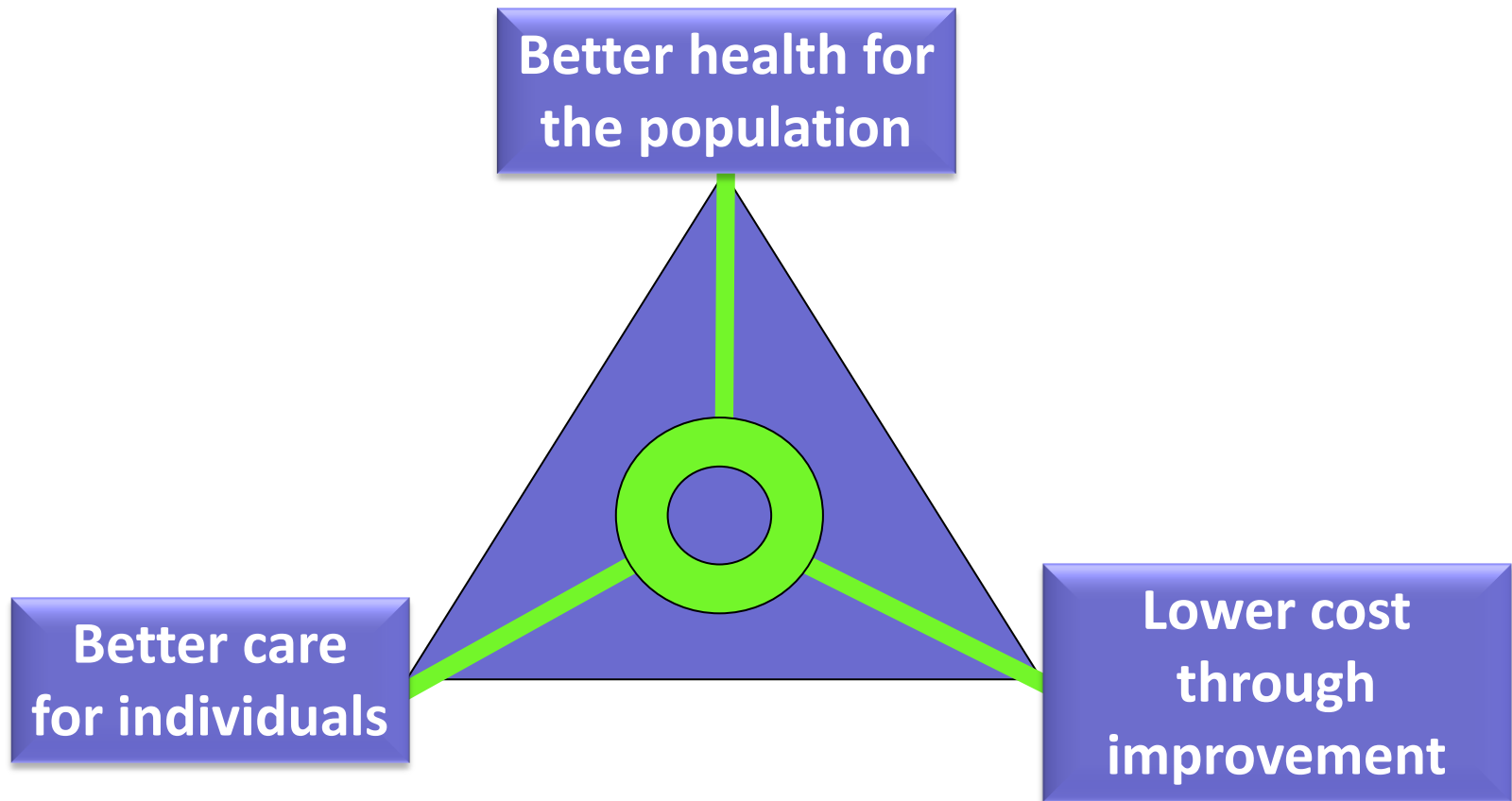
Center for Quality Improvement and Patient Safety  
Agency for Healthcare Research and Quality (AHRQ)



# Outline

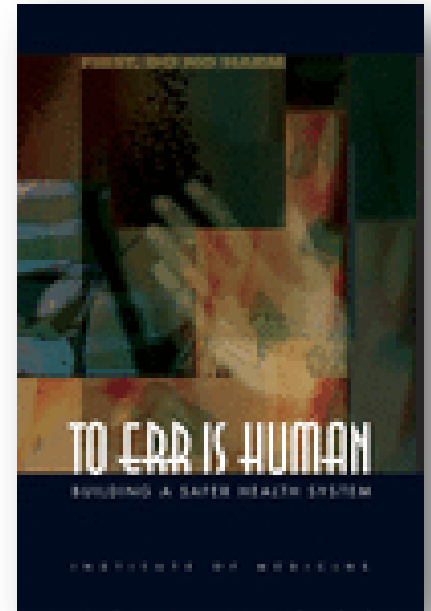
- ❑ **Patient safety context for hospital VTE prevention**
- ❑ **Tools and resources for implementation and improvement**
- ❑ **Measuring the occurrence of patient safety events**
- ❑ **National initiative “Partnership for Patients”**
- ❑ **Challenges and opportunities to reduce VTE and improve patient safety**

# Why Patient Safety? The Triple Aim



# Patient Safety and Recent History

- ❑ **To Err is Human, Institute of Medicine, 1999**
- ❑ **Making Health Care Safer, AHRQ, 2001**
- ❑ **Patient Safety and Quality Improvement Act of 2005**
- ❑ **Deficit Reduction Act of 2005 and reduced payments for preventable hospital-acquired conditions**



# Patient Safety Events: Examples

## □ Hospital-Acquired Conditions (HACs) targeted in the Partnership for Patients safety initiative

- Adverse drug events
- Catheter-associated urinary tract infections
- Central line-associated bloodstream infections
- Injuries from falls and immobility
- Pressure ulcers
- **Venous thromboembolism**
- Ventilator-associated pneumonia
- Obstetric adverse events
- Surgical site infections



# General and Specific Components of Patient Safety Improvements

## ❑ **General, foundational components affecting many types of events**

- Patient safety culture
- Human factors, teamwork, and communication
- Care coordination and workflow
- Information technology

## ❑ **Event-specific (e.g., VTE-specific)**

- Patient variability
- Risk-benefit assessment
- Evidence-based practices (e.g., recommended prophylaxis)

# Patient Safety Implementation Tools Improving Safety at the Point of Care

- ❑ Patient safety improvements rely on an understanding of health care risks and hazards
- ❑ Implementing patient safety improvements is challenging
- ❑ Implementation tools help health care institutions and clinicians provide—and consumers receive—safe, high-quality health care
  - Summaries of relevant information
  - Training materials
  - Medication guides and sample checklists that are easily adapted to diverse institutions and care settings

<http://www.ahrq.gov/qual/pstools.htm>

The Agency for Healthcare Research and Quality (AHRQ) offers tools for health care organizations, providers, and policymakers to improve patient safety in health care settings. The five tools and resources listed here are available online and in print.

**Contents**

- Tools for Health Care Organizations and Providers ..... 1
- Patient Safety Measurement and Reporting Tools ..... 1
- Implementation Guides for Improving Patient Safety ..... 3
- Patient Safety Training Tools ..... 4
- Resources for Health Care Organizations, Providers, and Policymakers ..... 5
- Tools for Patients and Families ..... 6
- How to Cite Resources ..... 8

**Tools for Health Care Organizations and Providers**

**Patient Safety Measurement and Reporting Tools**

The **Hospital Survey on Patient Safety Culture** examines patient safety culture from a hospital staff perspective and allows hospitals to assess their safety culture and track changes over time. Hospitals that administer the patient safety culture survey can voluntarily submit their data to the Comparative Database, a resource for hospitals wishing to compare their survey results to similar types of hospitals.

Print: AHRQ Publication No. 08-0048  
Web: <http://www.ahrq.gov/patient-safety/culture/hospital/index.htm>

The **Hospital Survey on Patient Safety Culture: Comparative Database Reports** give benchmark data collected voluntarily from more than 1,000 U.S. hospitals. Survey results from these hospitals are averaged over the entire sample by topical composite or individual survey item. Two appendices report the average responses, which are broken down by hospital or respondent characteristics.

2012 report  
Print: AHRQ Publication No. 12-0017  
Web: <http://www.ahrq.gov/qual/hospitalurvey12>

2011 report  
Print: AHRQ Publication No. 11-0010  
Web: <http://www.ahrq.gov/qual/hospitalurvey11>

2010 report  
Print: AHRQ Publication No. 10-0025  
Web: <http://www.ahrq.gov/qual/hospitalurvey10>

2009 report  
Print: AHRQ Publication No. 09-0030  
Web: <http://www.ahrq.gov/qual/hospitalurvey09>

2008 report  
Print: AHRQ Publication No. 08-0039  
Web: <http://www.ahrq.gov/qual/hospitalurvey08>

2007 report  
Print: AHRQ Publication No. 07-0025  
Web: <http://www.ahrq.gov/qual/hospitalurvey07>

The **Medical Office Survey on Patient Safety Culture** measures issues relevant to patient safety in the ambulatory medical office setting. Pilot tested in approximately 100 medical offices, the survey asks providers and staff across their safety culture, identify areas where improvement is needed, track changes in patient safety, and evaluate the effect of interventions. Researchers can also use the survey to assess patient safety culture improvement initiatives.

Print: AHRQ Publication No. 06(09)-0059  
Web: <http://www.ahrq.gov/patient-safety/culture/medical-office/index.htm>

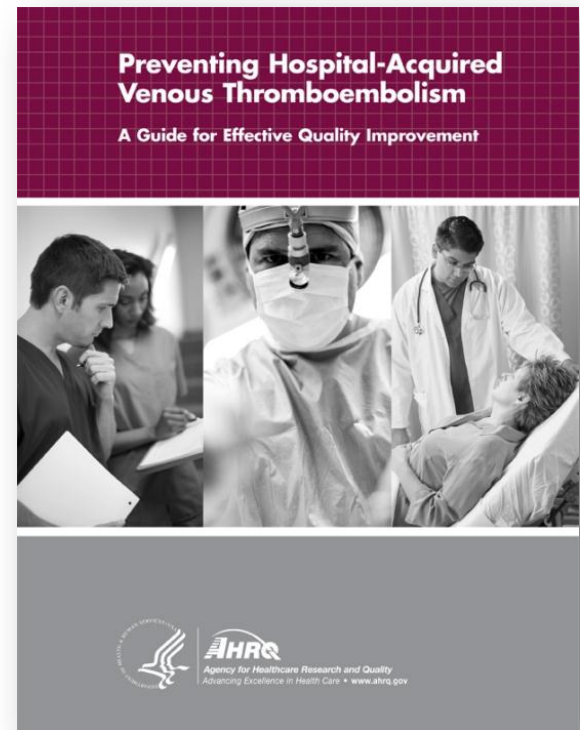
# VTE Patient Safety Tool

## ❑ Help hospitals implement processes to prevent VTE

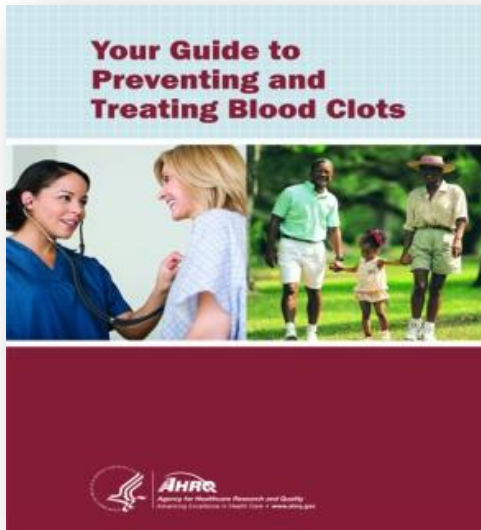
## ❑ Clinician-focused tool

- Order sets
- Organizational policies
- Clinical champions
- Executive leadership and commitment
- Robust measurement strategy
- Collaborative approach

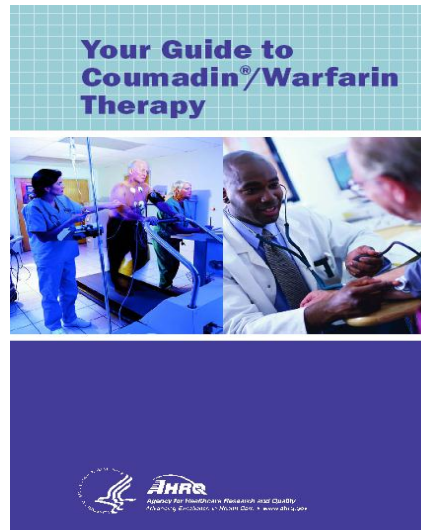
## ❑ Sample forms, protocols, etc.



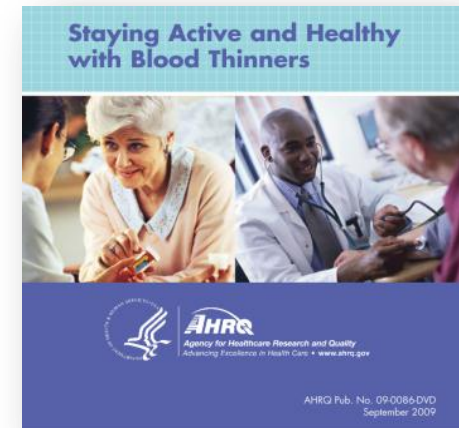
# Patient Safety Consumer Publications



**Booklet helps patients learn how to prevent and treat blood clots**



**Booklet explains what to expect and watch out for while undergoing Coumadin®/warfarin therapy**



**10-minute video helps educate patients about how to use blood thinners safely**

All available in English/Spanish at [www.ahrq.gov](http://www.ahrq.gov)



# Systems for Monitoring Patient Safety

## □ Measurement, reporting, and surveillance occur at institutional, state, and national levels

### ➤ **AHRQ Common Formats**

- Report events to identify problems and improve safety

### ➤ **Medicare Patient Safety Monitoring System (MPSMS)**

- National surveillance system from abstraction of medical records

### ➤ **Quality and Safety Review System** (in development)

- Surveillance from medical records using Common Formats-based event descriptions

### ➤ **AHRQ Patient Safety Indicators**

- Administrative data found in the typical discharge record

### ➤ **National Surgical Quality Improvement Program**

- Outcome measures for tracking quality improvement

# Monitoring Hospital Use of VTE Prophylaxis

## ❑ CMS Hospital Inpatient Quality Reporting

- Hospitals report to CMS to qualify for full Medicare payment
- Measures reported @ [www.medicare.gov/hospitalcompare/](http://www.medicare.gov/hospitalcompare/)

## ❑ Surgical Care Improvement Project (SCIP)

- Surgery patients ordered and received appropriate VTE prophylaxis within 24 hours pre/post surgery

## ❑ National Quality Forum/the Joint Commission

- Reporting began January 1, 2013
- VTE prophylaxis in hospital or ICU patients
- Number of patients who received VTE prophylaxis or have documentation why no VTE prophylaxis was given the day of or the day after hospital admission or surgery

# Partnership for Patients (PfP)

## ❑ **Nationwide campaign to reduce harm to patients over 3 years: 2011-2013**

- Launched April 2011; 2010 is the “baseline” year
- Commitment by >7,700 partners, including >3,700 hospitals, consumer groups, and employers

## ❑ **Public-private and cross-agency collaboration**

- Led by Center for Medicare and Medicaid Innovation (CMMI), a component of the Centers for Medicare and Medicaid Services (CMS)

## ❑ **Hospital Engagement Networks (HENs)**

- Provide technical assistance to hospitals across the country in order to achieve PfP goals



# Partnership for Patients Baseline and Goals

## ❑ 2010 baselines measured by PfP

- 145 measured hospital-acquired conditions (HACs) per 1,000 discharges (4.75 million total)
- 14.4% (30-day) readmissions

## ❑ Goals

- 40% reduction in 9 preventable HACs, including VTE
- 1.8 million fewer injuries
- 60,000 lives saved
- 20% reduction in 30-day readmissions
- 1.6 million patients recovered without readmission
- Potential to save more than \$30 billion



# Partnership for Patients Hospital-Acquired Conditions (HACs)

## ❑ Requirements for measured HACs

- Available for the baseline year 2010
- Can be collected consistently through 2013
- Taken together, set of HACs can capture a large and varied collection of HACs (both 9 targeted and all other conditions)

## ❑ Medicare Patient Safety Monitoring System (MPSMS)

- National surveillance project aimed at identifying the rates of specific adverse events in hospital patients
- Data obtained from medical chart abstraction
- This data has proven useful for the PfP initiative



# Nine Targeted Hospital-Acquired Conditions (HACs)

- Adverse drug events
  - Catheter-associated urinary tract infections
  - Central line-associated bloodstream infections
  - Injuries from falls and immobility
  - Pressure ulcers
  - Venous thromboembolism**
  - Ventilator-associated pneumonia
  - Obstetric adverse events – from Patient Safety Indicators
  - Surgical site infections – from National Healthcare Safety Network
- From MPSMS

**These 9 HACs comprise about 80% of measured 2010 HACs**



# VTE at the Intersection of Patient Safety and Public Health

## ❑ VTE is a public health problem

- 300,000–900,000 people affected each year
- 30,000–100,000 deaths
- ~50% associated with recent hospitalization

## ❑ VTE is a preventable patient safety concern

- Hospital patient safety interventions can reduce preventable VTE and cut health care costs

## ❑ Public health and patient safety can work together to improve population health: The Triple Aim

- Better health care
- Better population health
- Lower health care costs

# Way Forward for Prevention of HA-VTE

## ❑ Intervention priorities

- Clarify balance of risk and benefit of prophylaxis
- Validate and compare risk assessment models
- Integrate HA-VTE prevention seamlessly with other care processes (a systems approach)

## ❑ Monitoring and surveillance

- Establish optimal performance metrics for
  - Risk-appropriate VTE prophylaxis (process measure)
  - HA-VTE occurrence (outcome measure)
- Develop population-based reporting systems for public health accountability

## ❑ Collaboration of public and private stakeholders



# Patient Safety and Opportunities for Prevention

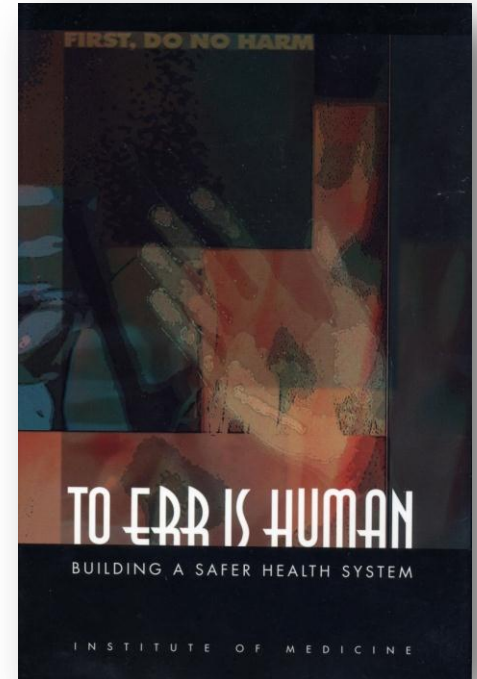
- ❑ **The complexity of prevention strategies and their consistent application is important for successful implementation**
- ❑ **Establishing and maintaining an institutional culture conducive to patient safety is crucial for preventing harm**
- ❑ **Institutional patient safety “success stories” translate into meaningful public health impact**
- ❑ **A collaborative, team-based approach**
  - Necessary for success
  - Offers synergy and capacity to solve other patient safety problems

# Culture and Safety

**“The biggest challenge to moving toward a safer health system is changing the culture from one of blaming individuals for errors to one in which errors are treated not as personal failures, but opportunities to improve the system and prevent harm.”**

## **☐ Organizations with a positive safety culture are characterized by**

- Communications founded on mutual trust
- Shared perceptions of the importance of safety
- Shared ownership of patient safety problems and solutions



# CDC PUBLIC HEALTH GRAND ROUNDS

## Prevention of Venous Thromboembolism

