Preventing Hospital-Associated Venous Thromboembolism

NJHA P4P Meeting
Greg Maynard M.D., Clinical Professor of Medicine
Director, UCSD Center for Innovation and Improvement Science
Sr. VP, Society of Hospital Medicine Center for Hospital Innovation and Improvement
Monday, October 8th, 2012

Where discoveries are delivered.℠

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Objectives: At the conclusion of this activity, participants should be able to:

- Explain and appreciate Hospital Associated Venous Thromboembolism (HA VTE) as a significant patient safety and public health problem.
- Recognize and understand the evidence-based options for VTE prophylaxis for different types of inpatients, with a context of the recently revised ACCP 9th edition of the Antithrombosis Guidelines (aka AT9 guidelines).
- Identify and become familiar with the principles of effective design and implementation techniques for VTE Prevention protocols and order sets.
- Define, discuss and adapt practical measurement strategies to assess the prevalence of HA VTE and the incidence of appropriate VTE prophylaxis in their hospital setting.

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What we will cover:

- Importance / Epidemiology / Implementation Gap
- Build the business and clinical case
- Assessing current process, where do things fail?
- Framework for breakthrough levels of improvement
- VTE Risk Assessment
- Design and Implement VTE Prevention Orders
- Measurement
- New Guidelines
- Special populations
- Spread / Maintaining the Gains
- And More….

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The Evolving Culture of Medicine

- 20th Century Characteristics
  - Autonomy
  - Solo practice
  - Continuous learning
  - Infallibility
  - Individual Knowledge
- 21st Century Characteristics
  - Teamwork & systems
  - Group practice
  - Continuous improvement
  - Multidisciplinary problem solving
  - Dynamic innovation with rapid change

Shine KI. *Acad Med*. 2002; 77:91-9.

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Quality Improvement is…

- Focus on processes of care
- Reduced variation by shifting entire practice
- A change in the *design* of care

Quality Improvement is NOT…

- Forcing people to work harder / faster / safer
- Traditional QA or peer review
- Creating order sets or protocols without monitoring use or effect

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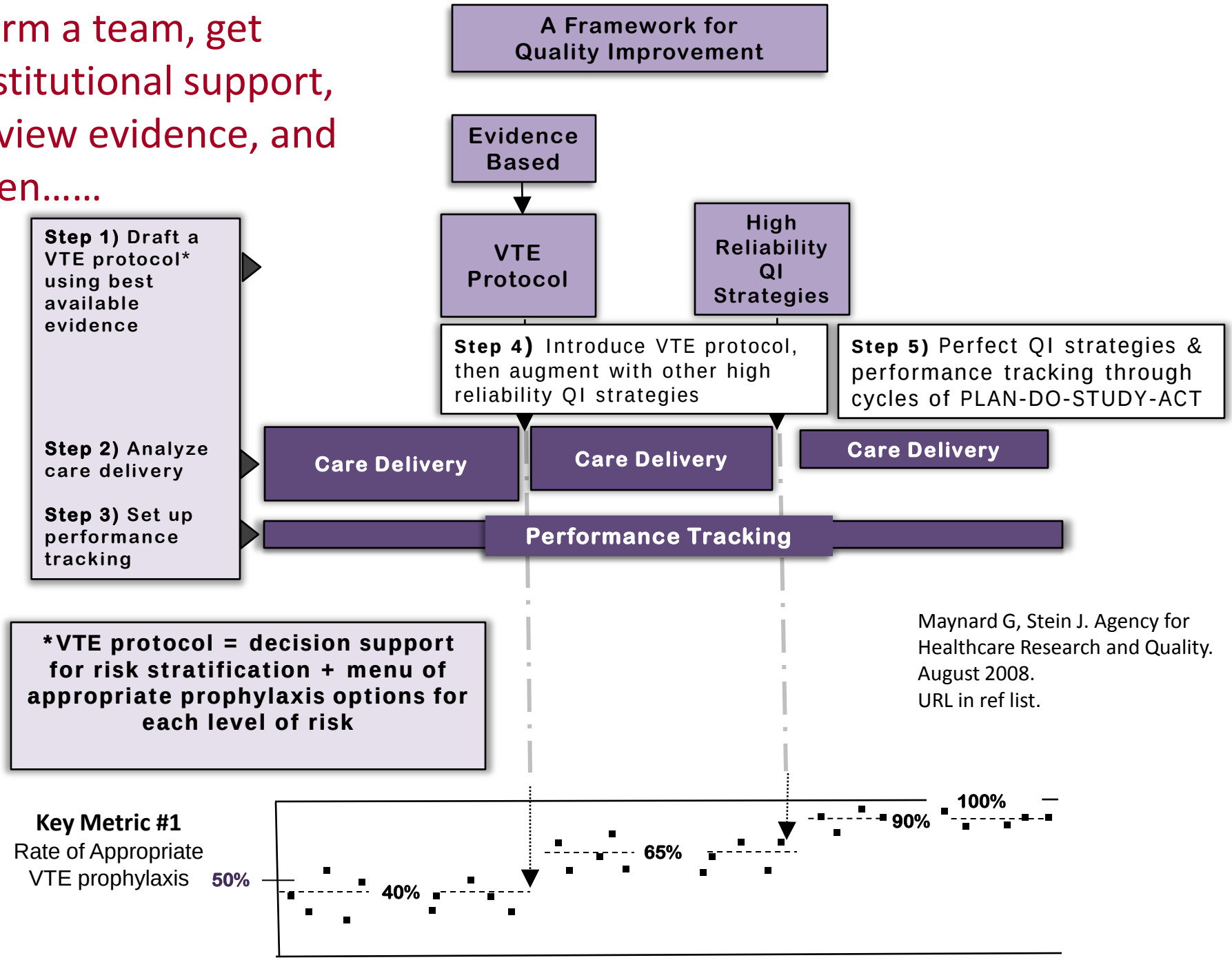
Form a team, get institutional support, review evidence, and then……



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Venous thromboembolism contributes to more mortality than:

1. HIV
2. Breast Cancer
3. Motor Vehicle Accidents
4. Political Ads
5. All of the above combined

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Which of the following does not belong on this list?

1. Dick Cheney
2. Richard M Nixon
3. Dan Quayle
4. Barack Obama
5. Zsa Zsa Gabor

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Which of the following does not belong on this list?

1. Ian Anderson (Rock star, lead for Jethro Tull)
2. David Bloom (NBC correspondent)
3. Serena Williams (#1 female tennis star, Olympic Champ)
4. Heavy D (rap star)
5. Nick Cannon (music star)
6. Tara Lipinski (Olympic ice skating champion)
7. Dan Quayle (former VP)

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Institutional Support

- Sell the project – **Build the Case for VTE Prevention**
- Aligns with Hospital Goals
  - Performance reporting
  - Medical care quality goals
  - Customer service
  - Cost containment

Maynard G, Stein J. Agency for Healthcare Research and Quality. August 2008. URL in ref list.

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Gaining Institutional Support and Making the Business Case

- Educate administration about the scope of the problem
  - Morbidity and mortality
  - Costs
- Present evidence for effective prevention strategies
- Discuss impact of this “opportunity for improvement”
  - Roadmap for improvement is available
  - Regulatory / public reporting measures for tracking progress

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Venous Thromboembolism (VTE):

A Major Source of Mortality and Morbidity

- 350,000 to 650,000 with VTE per year
- 100,000 to > 200,000 deaths per year
- Most are hospital related.
- VTE is primary cause of fatality in half-
  - More than HIV, MVAs, Breast CA *combined*
  - Equals 1 jumbo jet crash / day
- 10% of hospital deaths
  - May be the #1 preventable cause
- Huge costs and morbidity (recurrence, post-thrombotic syndrome, chronic PAH)

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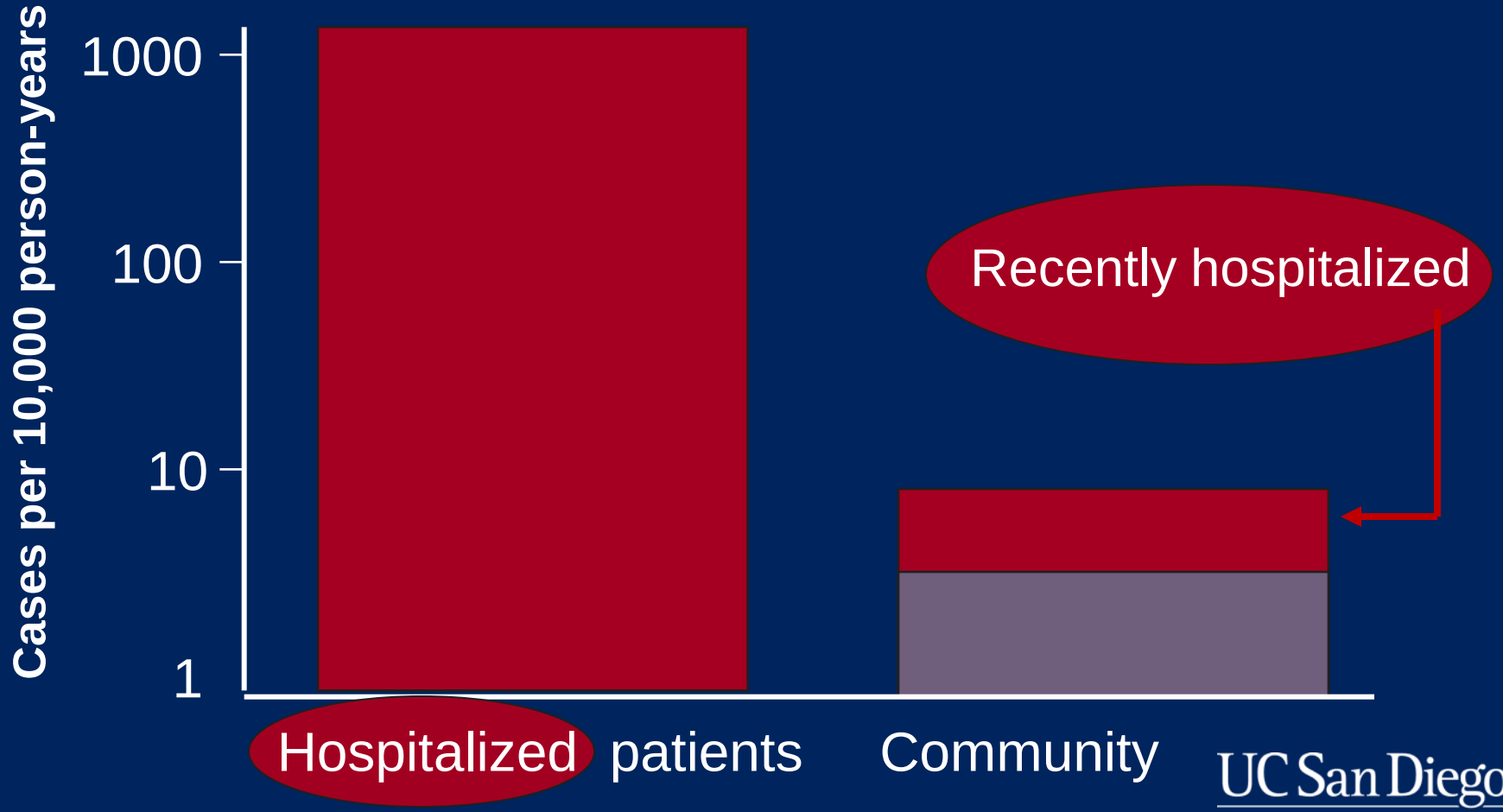
Surgeon General's Call to Action to Prevent DVT and PE 2008 DHHS

The VTE Population: Who gets clots?



Heit JA et al. *Mayo Clin Proc.* 2001; 76:1102-10.

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The Joint Commission/National Quality Forum Hospital Quality Measures

VTE Core Performance Measures
Risk Assessment and Prophylaxis
1. Documentation of VTE prophylaxis given or why no prophylaxis was given within 24 hours of hospital admission
2. Documentation of VTE prophylaxis given or why no prophylaxis was given within 24 hours of admission or transfer to ICU
VTE Outcomes
6. Incidence of potentially preventable hospital-acquired VTE
Stroke Core Performance Measures Prophylaxis
1. Documentation of VTE prophylaxis within 24 hours of hospital admission

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SCIP Surgical Care Improvement Project
A National Quality Partnership

Developed in 2007 by CMS, CDC, and other stakeholder organizations

Supported by AMA, Am Coll of Surgeons, American Hospital Association, VHA…

Pay for Performance

- VTE 1: Timely ordering of VTE prophylaxis after hospital arrival to 24 hours after Anesthesia End Time
- VTE 2: Administration of appropriate VTE prophylaxis within 24 hours prior to Anesthesia Start Time to 24 hours after Anesthesia End Time
- Proposed VTE 3 VTE 4: Two SCIP outcome measures have been proposed for DVT and PE, respectively, during hospitalization for or within 30 days after surgery

Centers for Medicare and Medicaid Services and The Joint Commission. Specifications Manual for National Hospital Inpatient Quality Measures [Version 3.1a, for discharges 04-01-10 through 09-30-10]. URL in ref. list.

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CMS “Never Events”

- CMS rules regarding “never events” are controversial
- Payment withheld for treatment of VTE following knee or hip replacement surgeries (including in hospital and up to 30 days post-discharge)
- Unintended consequences
  - Hospitals may deny care to patients at highest risk for VTE
  - Surgeon may decide NOT to do hip/knee replacements
  - Clinicians may not pursue the diagnosis of VTE when suspected
  - Encourages overly aggressive prophylaxis methods – while ignoring risk of method

Centers for Medicare and Medicaid Services. Deep vein thrombosis/pulmonary embolism. *Fed Regist. 2008;73(161):* 48480-2. URL in ref. list.
Streiff MB, Huat ER. *JAMA*. 2009; 301:1063-5.
Duska LR et al. *Gynecol Oncol*. 2009 Nov 16.

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UC San Diego Numbers –

Metrics soon available for all UC Sites

HA - DVT/PE (N=226)									
Year/Quarter	Cases	30 day Readmissions	30 day Readmissions %	DC Dead	DC Dead %	LOS	UE DVT	LE DVT	PE
20094	47	7	14.9%	6	12.8%	16.5	10	26	15
20101	40	14	35.0%	1	2.5%	12.0	10	23	13
20102	41	6	14.6%	1	2.4%	22.0	8	24	11
20103	49	9	18.4%	4	8.2%	12.8	12	19	23
20104	49	15	30.6%	3	6.1%	13.6	13	21	21
Grand Total	**226**	**51**	**22.6%**	**15**	**6.6%**	**15.3**	**53**	**113**	**83**

40 – 49 patients suffer from HA VTE per quarter (3-4 events per week)
(*Estimate 1000 HA VTE per year across the 5 UC sites)*

Inpatient mortality: 6.6%

Average LOS: 15.3 days

Readmission rate (30 day): 22.6%

Economic Burden of VTE

- Costs in the U.S. >$1.5 billion/year
  - Managing initial episode of DVT estimated at $7700 to $10,800
  - Initial PE costs $9500-16,600
  - Acute VTE in patients with cancer >$20,000
- Significant costs associated with long-term complications (recurrent VTE, chronic venous stasis / ulceration, and PE)

Dobesh PP. *Pharmacotherapy*. 2009; 29:943-53.

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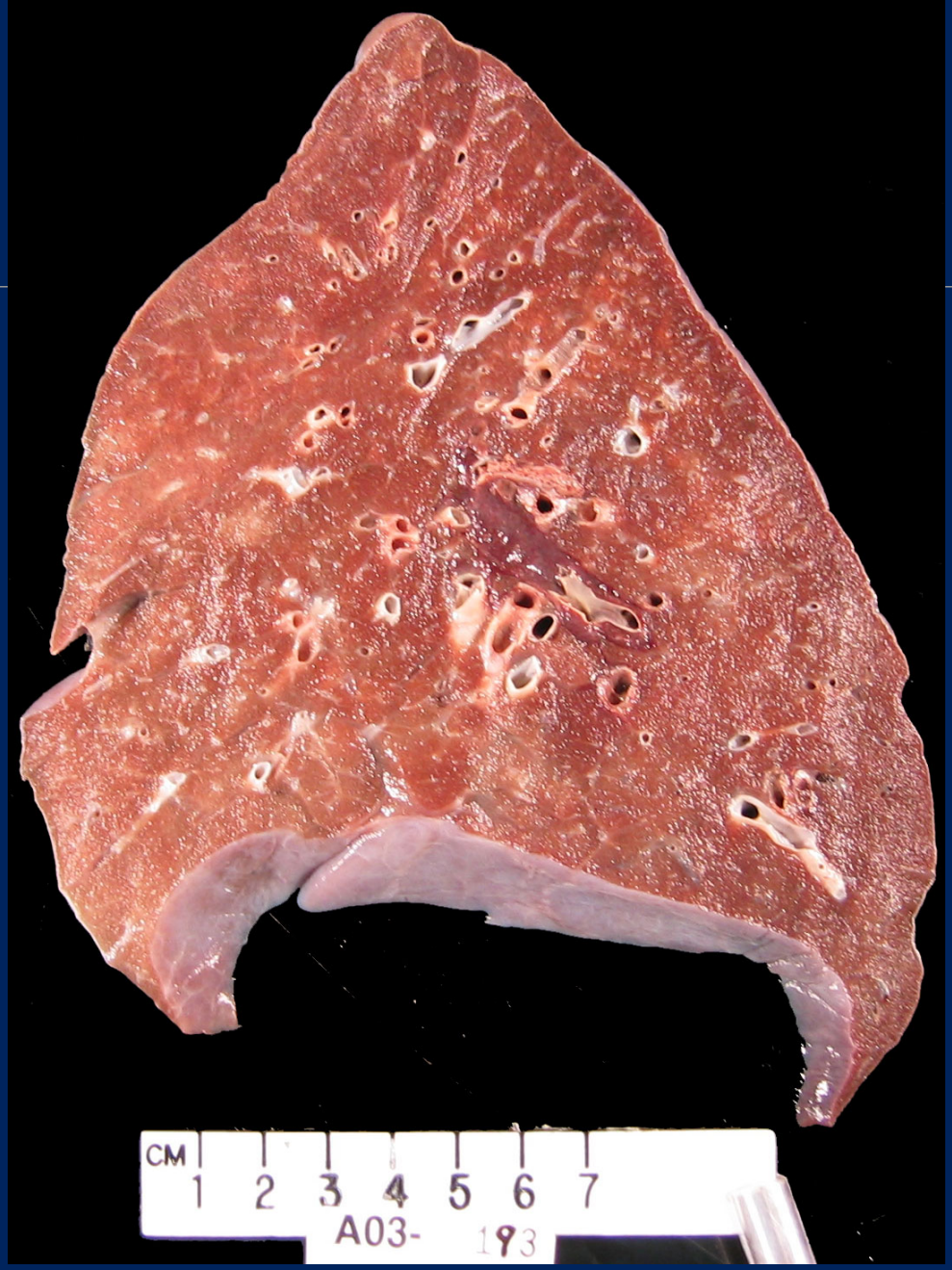
Local anecdotes can be convincing as well…

appeal to heart as well as head



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Emotional and Clinical Impact of VTE

- Some guidelines and meta-analyses discount the clinical / emotional / fiscal burden of DVT
  - (example AAOS guideline looks only at clinical PE events
- Patients and their families give a different story
- Loss of function, difficulty with therapeutic AC, fiscal burden, fear of recurrence

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Man, that clot really hurts!

……and the coumadin was a pain!!

VTE Prophylaxis

Effective, Safe, and Cost-Effective

- Pharmacologic prophylaxis substantially reduces the risk for VTE
  - Symptomatic and asymptomatic VTE reduced
- Bleeding complications are rare
- HIT: a serious but relatively rare complication
  - 2.37% with prolonged UFH in ill perioperative patients
  - 0.06% with LMWH
  - Monitoring for HIT is warranted
- Cost-effectiveness of VTE prophylaxis well documented

Geerts WH et al. *Chest*. 2008; 133(6 suppl):381S-453S.
Shojania KG et al. Making health care safer. URL in ref list.
Martel N et al. *Blood.* 2005; 106:2710-5.

HIT = heparin-induced thrombocytopenia
LMWH = low molecular weight heparin
UFH = unfractionated heparin

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Effective Preventive Measures are Available

VTE Prophylaxis Meta-Analysis - Medical patients

- 9 studies
- 19,958 medical patients
- Anticoagulant prophylaxis vs no treatment
- Results
  - 57% reduction in RR for symptomatic PE
  - 62% reduction in RR for fatal PE
  - 53% reduction in DVT
  - No significant increase in major bleeding

Dentali F, et al. *Ann Intern Med*. 2007;146:278-288.

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Evidence: Medical Prophylaxis

Trial	Endpoint	Relative Risk Reduction	*P*-value
MEDENOX[1] Enoxaparin 40 mg SC daily vs placebo	Distal and proximal venographic DVT + symptomatic VTE + fatal PE	63%	< 0.001
PREVENT[2] Dalteparin 5,000 units SC daily vs placebo	Compression ultrasonographic proximal DVT + symptomatic VTE + fatal PE	45%	0.002
ARTEMIS[3] Fondaparinux 2.5 mg SC daily vs placebo	Distal and proximal venographic DVT + symptomatic VTE + fatal PE	47%	0.03

1. Samama M, et al. *N Eng J Med*. 1999;341:793-800.
2. Leizorovicz A, et al. *Circulation*. 2004;110:874-879.
3. Cohen AT, et al. *BMJ*. 2006;332:325-329.

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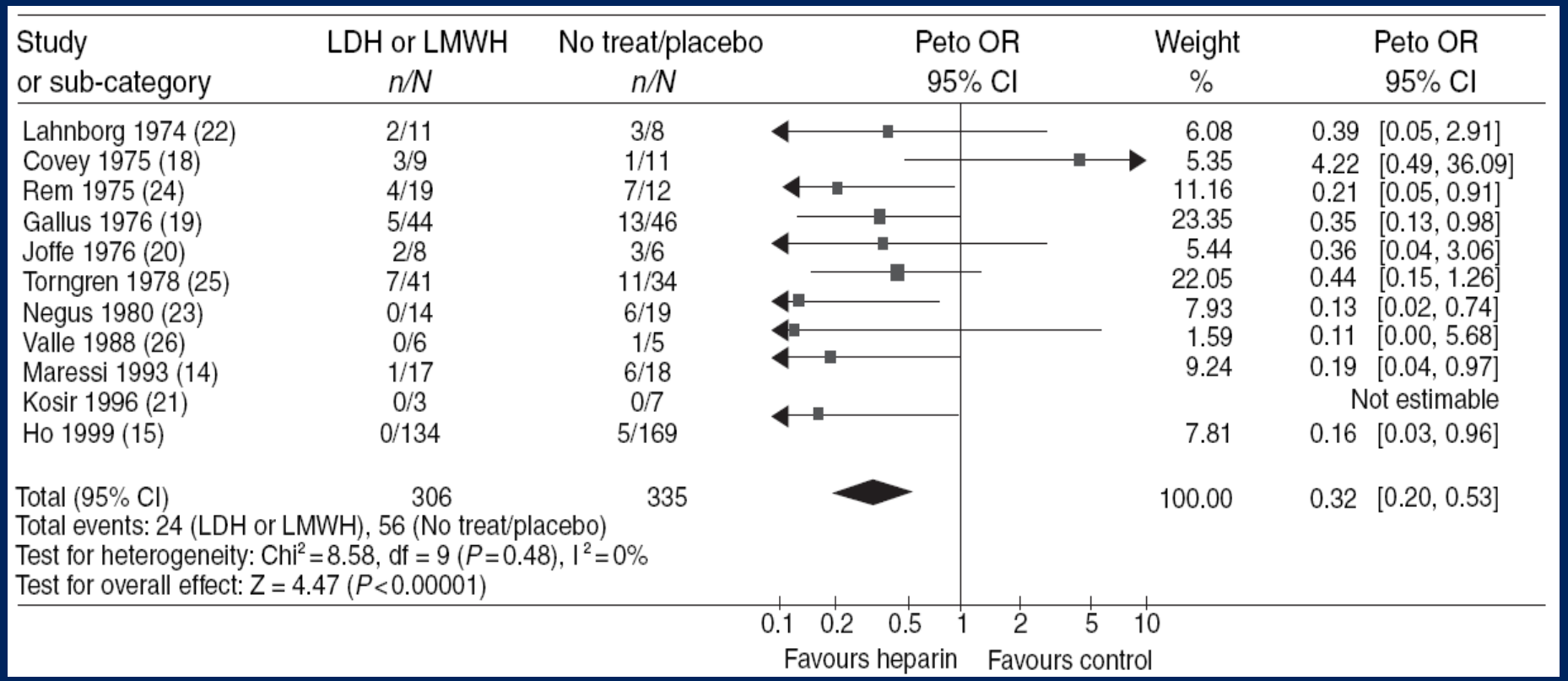
VTE Prophylaxis Regimens showing Benefit in Medical Inpatients

Trial	Regimen	VTE (DVT/PE)	Post trial VTE (Tx)
PRIME N=959	UFH 5000 units 3 x/day x 7d Enoxaparin 40 mg daily x 7 d	1.4% 0.2%	Not assessed
PRINCE N=665	UFH 5000 units 3x/day x 10 days Enoxaparin 40 mg daily x 10 days	CHF Resp 16.1% 5.9% 9.7% 7.1%	Not Assessed
MEDENOX N=1102	Placebo x 6-14 days Enoxaparin 20/40 mg daily x 6 -14 days	15% (0.7/0.7) 15% / 5.5%*(1/ 0.3 0/0)	N=9
PREVENT N=3706	Placebo Dalteparin 5000 units daily x 14 days	5.0% (0.63/0.23) 2.8% (0.28/0.28)	N=5
ARTEMIS N=849	Placebo x 6-14 days Fondaparinux 2.5 mg daily x 6 -14 days	10.5% (1.2% fatal PE) 5.6% (p=0.29) (0 PE)	N=10

Pharmacologic Prophylaxis in Colorectal Surgery



Study or sub-category	LDH or LMWH *n/N*	No treat/placebo *n/N*	Peto OR 95% CI	Weight %	Peto OR 95% CI
Lahnborg 1974 (22)	2/11	3/8		6.08	0.39 [0.05, 2.91]
Covey 1975 (18)	3/9	1/11		5.35	4.22 [0.49, 36.09]
Rem 1975 (24)	4/19	7/12		11.16	0.21 [0.05, 0.91]
Gallus 1976 (19)	5/44	13/46		23.35	0.35 [0.13, 0.98]
Joffe 1976 (20)	2/8	3/6		5.44	0.36 [0.04, 3.06]
Torngren 1978 (25)	7/41	11/34		22.05	0.44 [0.15, 1.26]
Negus 1980 (23)	0/14	6/19		7.93	0.13 [0.02, 0.74]
Valle 1988 (26)	0/6	1/5		1.59	0.11 [0.00, 5.68]
Maressi 1993 (14)	1/17	6/18		9.24	0.19 [0.04, 0.97]
Kosir 1996 (21)	0/3	0/7			Not estimable
Ho 1999 (15)	0/134	5/169		7.81	0.16 [0.03, 0.96]
Total (95% CI)	306	335		100.00	0.32 [0.20, 0.53]

Total events: 24 (LDH or LMWH), 56 (No treat/placebo)
Test for heterogeneity: $Chi^2 = 8.58$, df = 9 ($P = 0.48$), $I^2 = 0\%$
Test for overall effect: Z = 4.47 ($P < 0.00001$)

- Heparin is superior to placebo
- UFH and LMWH are equally effective

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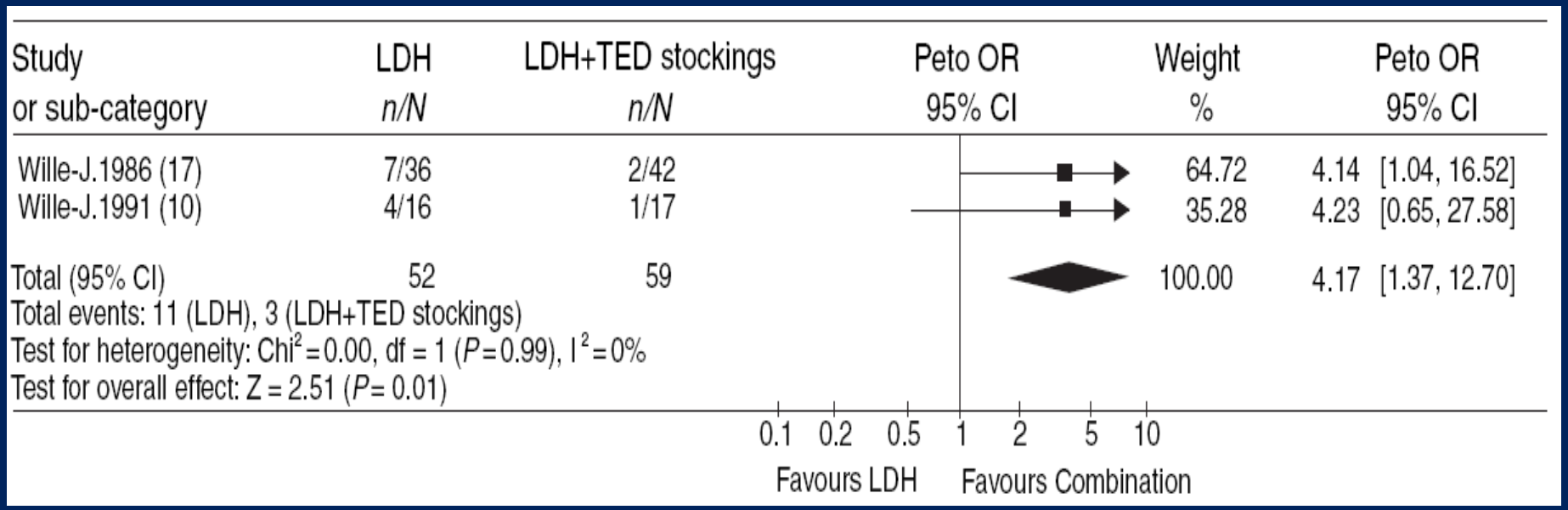
Borly L, et al. *Colorectal Dis.* 2005;7:122-127.

Pharmacologic and Mechanical Prophylaxis in Colorectal Surgery



- Pharmacologic plus mechanical prophylaxis is superior to LDH
  - In this High Risk Group

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Borly L, et al. *Colorectal Dis.* 2005;7:122-127.

National Position Statements

- Leapfrog[1]:

  PE is “the most common preventable cause of hospital death in the United States”.

- Agency for Healthcare Research and Quality (AHRQ)[2]:

  Thromboprophylaxis is the number 1 patient safety practice.

- American Public Health Association[3]:

  “The disconnect between evidence and execution as it relates to DVT prevention amounts to a public health crisis.”

1. Maynard G, Stein J. Agency for Healthcare Research and Quality. August 2008. URL in ref list.
2. Shojania KG et al. Making health care safer: a critical analysis of patient safety practices.
3. American Public Health Association. Deep-vein thrombosis: advancing awareness to protect patient lives.

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Which inpatient group has the highest VTE burden (and the largest opportunity to make in impact)?

1. Surgical inpatients
2. OB-GYN inpatients
3. Medical inpatients
4. Orthopedic inpatients
5. Administrators (because they are at their desk too much)

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Endorse Results

- Out of ~70,000 patients in 358 hospitals, appropriate prophylaxis was administered in:
  - 58.5% of surgical patients
  - 39.5% of medical patients

Cohen, Tapson, Bergmann, et al. Venous thromboembolism risk and prophylaxis in the acute hospital care setting (ENDORSE study): a multinational cross-sectional study. Lancet 2008; 371: 387–94.

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Adherence to Prophylaxis Guidelines

- Premier database; 429 hospitals; 2005 & 2006
- Age ≥40 and LOS ≥6 days and ≥1 risk factor for VTE and no contraindications to anticoagulant prophylaxis

Optimal patient group

- Appropriate prophylaxis = type, dose, daily, duration according to 7th ACCP (2004)

Prophylaxis	Medical (N=201,224)	Surgical (N=188,800)
Any (>1 dose)	66%	78%
Appropriate	13%	16%

Amin – J Hosp Med 2009;4:E15

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When do most HA VTE get diagnosed?

1. During the index hospitalization
2. On readmission to the hospital with a clot
3. At autopsy

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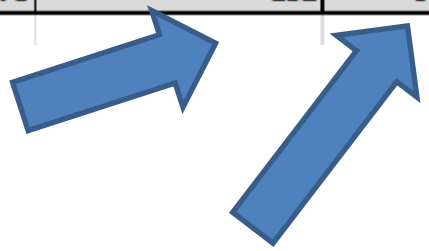
Most HA VTE are detected AFTER discharge

Patients Discharged with DVT/PE
10/01/2009 - 12/31/2010

Year/Quarter	Total DCs	Total DCs LOS	Total Cases - DVT/PE	Total Cases - DVT/PE %	POA = Y DVT/PE	POA = Y + Prior Visit DVT/PE	POA = N DVT/PE	HA - DVT/PE	HA - DVT/PE %
20094	6,049	5.3	145	2.4%	98	22	25	47	32.4%
20101	6,050	5.1	111	1.8%	71	27	13	40	36.0%
20102	6,063	5.3	109	1.8%	68	21	20	41	37.6%
20103	6,561	4.9	130	2.0%	81	34	15	49	37.7%
20104	6,570	5.2	109	1.7%	60	28	21	49	45.0%
Grand Total	**31,293**	**5.2**	**604**	**1.9%**	**378**	**132**	**94**	**226**	**37.4%**



Readmitted Hospital Associated VTE cases = 132

De Novo Cases discovered while the patient is an inpatient = 94

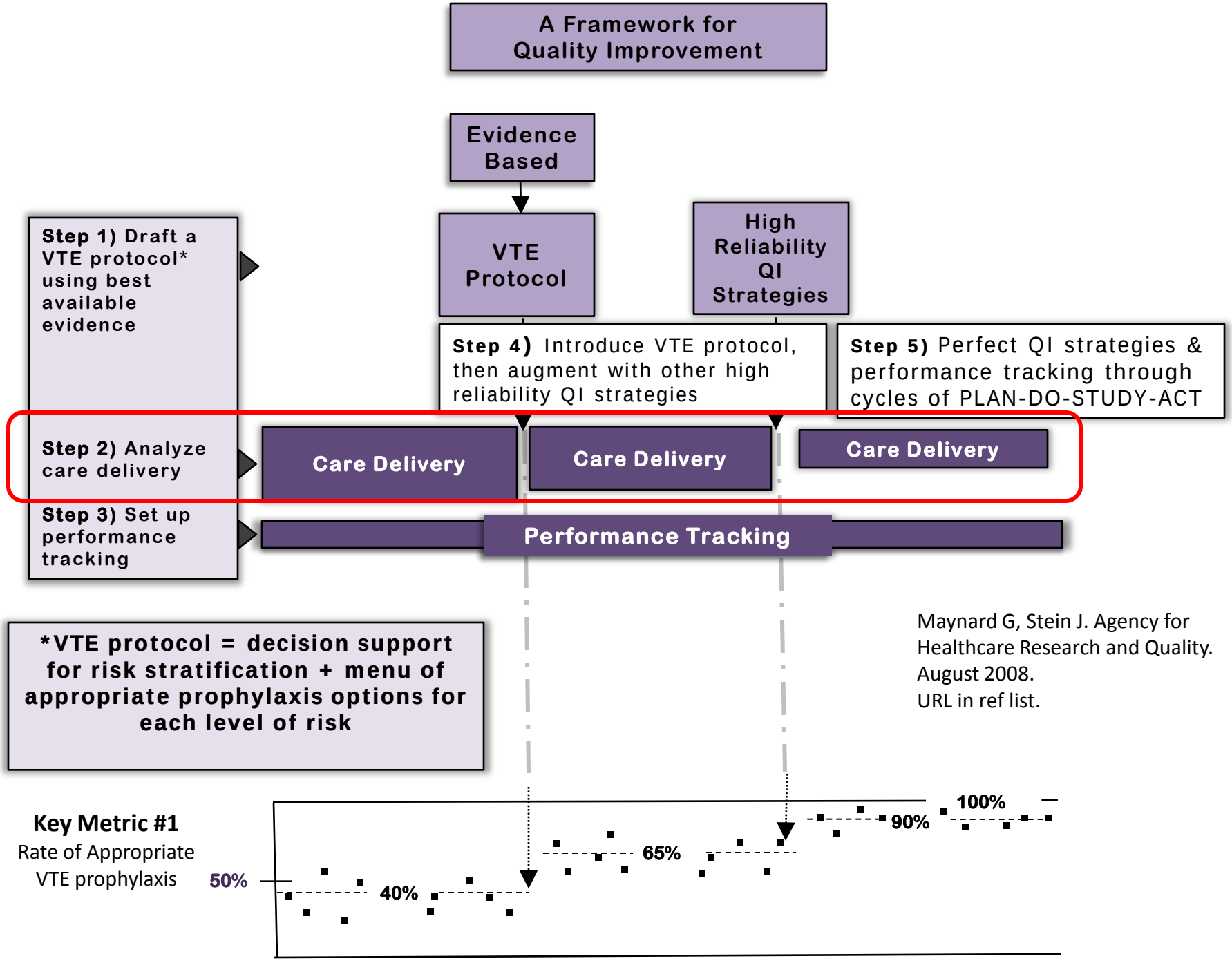
OK, I get it!

- VTE is a MAJOR source of morbidity and mortality.
- Safe and effective prophylaxis is underutilized.
- A business and clinical case can be made for making this a top priority.

Why isn't it better?

What's happening now at my center?

Where do the failures occur?


A Framework for Quality Improvement
Evidence Based
VTE Protocol
High Reliability QI Strategies
Step 1) Draft a VTE protocol* using best available evidence
Step 4) Introduce VTE protocol, then augment with other high reliability QI strategies
Step 5) Perfect QI strategies & performance tracking through cycles of PLAN-DO-STUDY-ACT
Step 2) Analyze care delivery
Care Delivery
Care Delivery
Care Delivery
Step 3) Set up performance tracking
Performance Tracking
*VTE protocol = decision support for risk stratification + menu of appropriate prophylaxis options for each level of risk
Maynard G, Stein J. Agency for Healthcare Research and Quality. August 2008.
URL in ref list.
Key Metric #1
Rate of Appropriate VTE prophylaxis
50%
40%
65%
90%
100%

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My clinical position is:

1. Case manager
2. Nurse
3. Nurse practitioner
4. Pharmacist
5. Physician
6. Other

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The following describes my current leadership position:

1. Physician administrator
2. Nurse manager or administrator
3. Nurse practitioner administrator
4. Pharmacist manager or director
5. Not applicable or other

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Before this effort, did you have a VTE prevention or quality improvement team at your institution?

a) Yes
b) No
c) Not Sure

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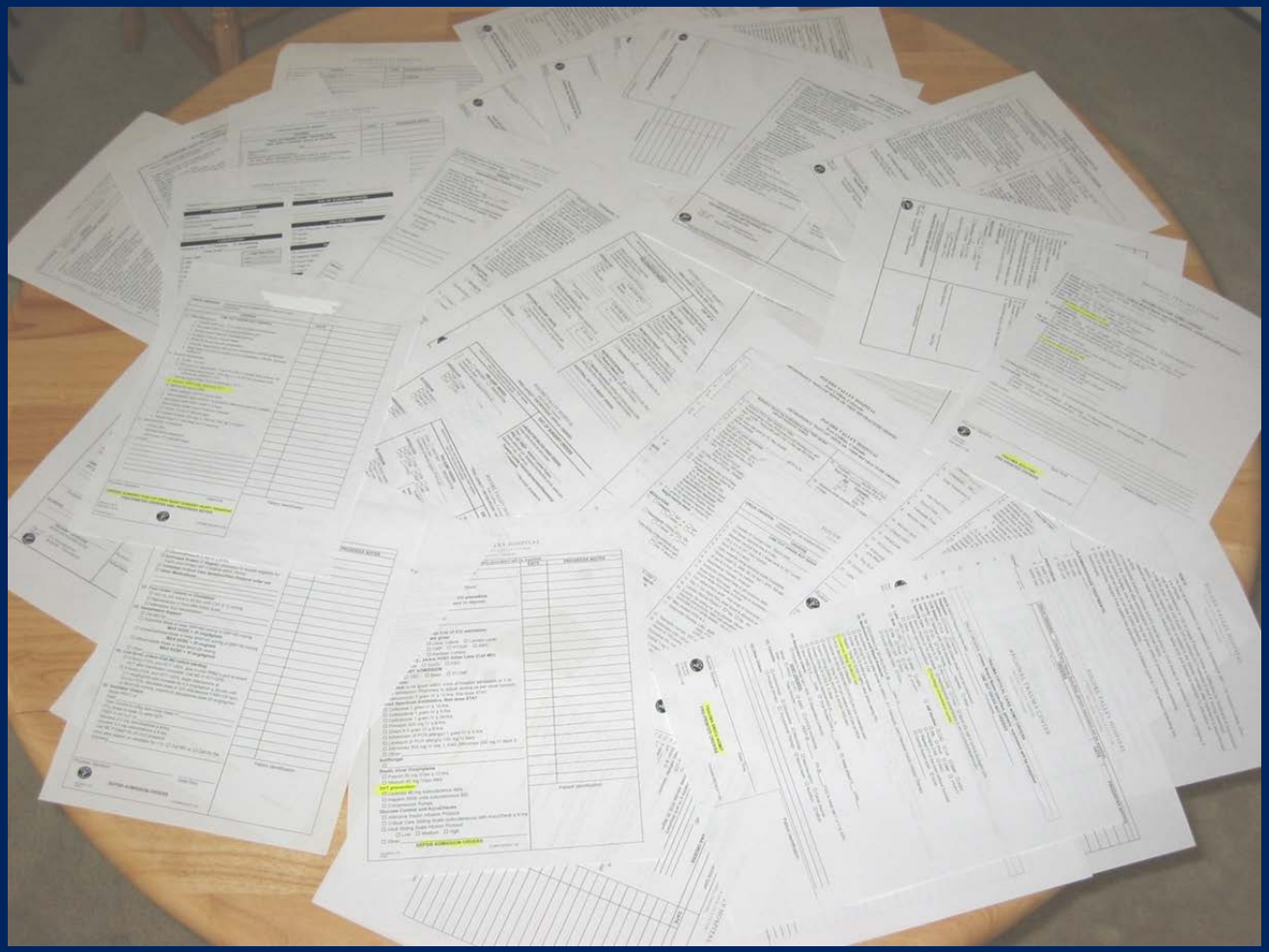
Is your VTE order set in a competition?



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How many order sets at your institution include VTE Prevention orders?

a) None
b) 1 – 5
c) 6 – 10
d) > 10
e) I have no idea!

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In the past quarter, approximately what percentage of medical inpatients at your institution received adequate VTE prophylaxis?

a) < 50%
b) 50 – 75%
c) 76 – 90%
d) > 90%
e) I have no clue!

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Which of these describes your medical center

environment / infrastructure?

---

a) Electronic health record deployed, complete with computerized physician order entry (CPOE)
b) Hybrid record - electronic health record in place, but some aspects (progress notes or orders) commonly performed on paper.
c) All paper, but we can retrieve lab / data results
d) In flux - within 6 months before / after transition to EHR and CPOE

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Survey Prior / Ongoing Efforts

Survey Prior

- Assess infrastructure
- Current process for risk assessment – review existing order sets
- Leveraging of resources
- Performance reporting capabilities?
- IT status (CPOE?)
- Role of pharmacists
- Role of nurses
- Formulary issues
- Educational needs

Ongoing Efforts

- Formulary issues
- Extended prophylaxis
- Monitoring systems
- Integration of VTE prophylaxis into existing order sets
- Care transitions
- Continuing education
- Measure improvements

IT = information technology
CPOE = computerized physician order entry

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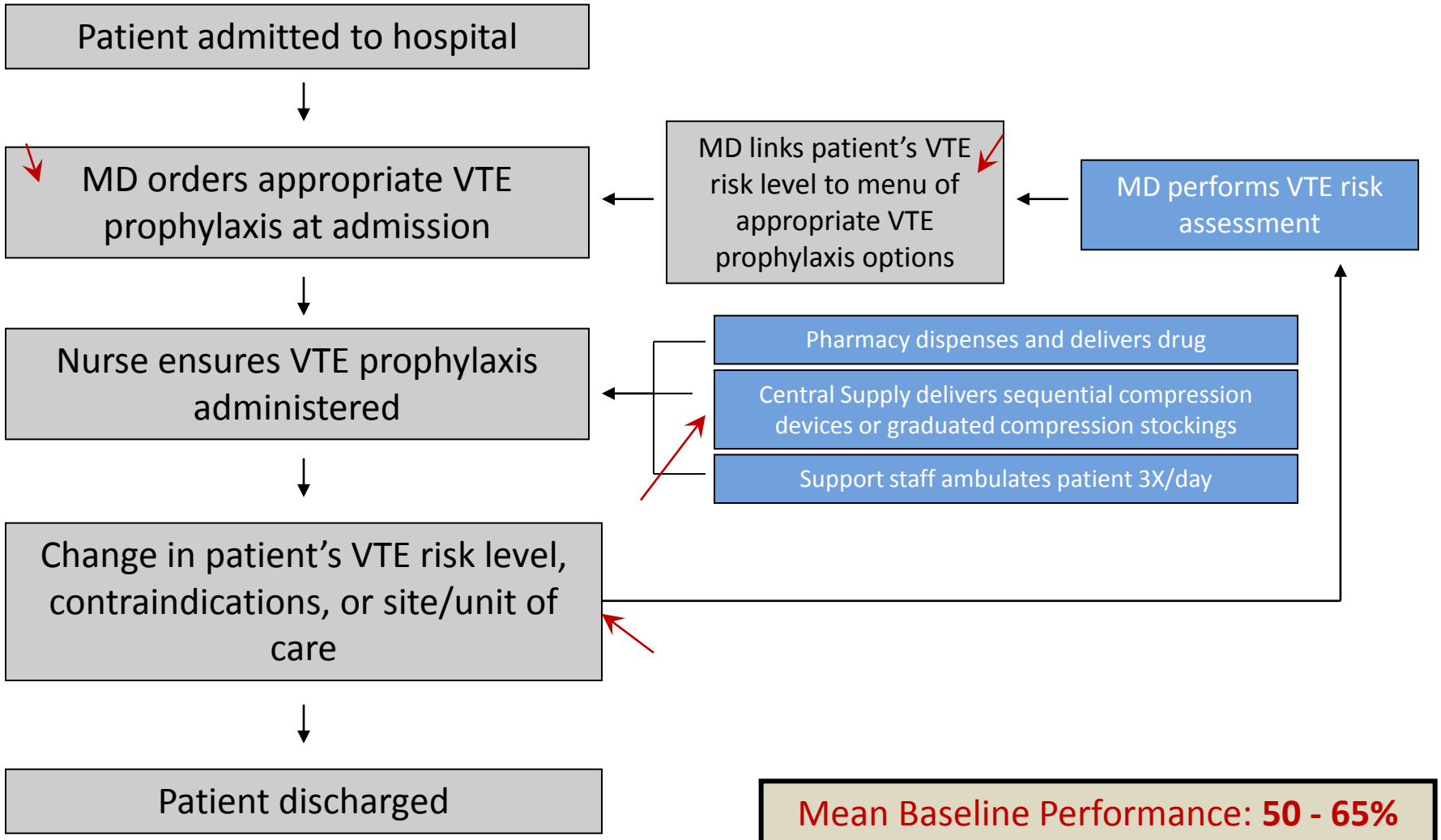
Analyze Care Delivery: Delivering Appropriate VTE Prophylaxis

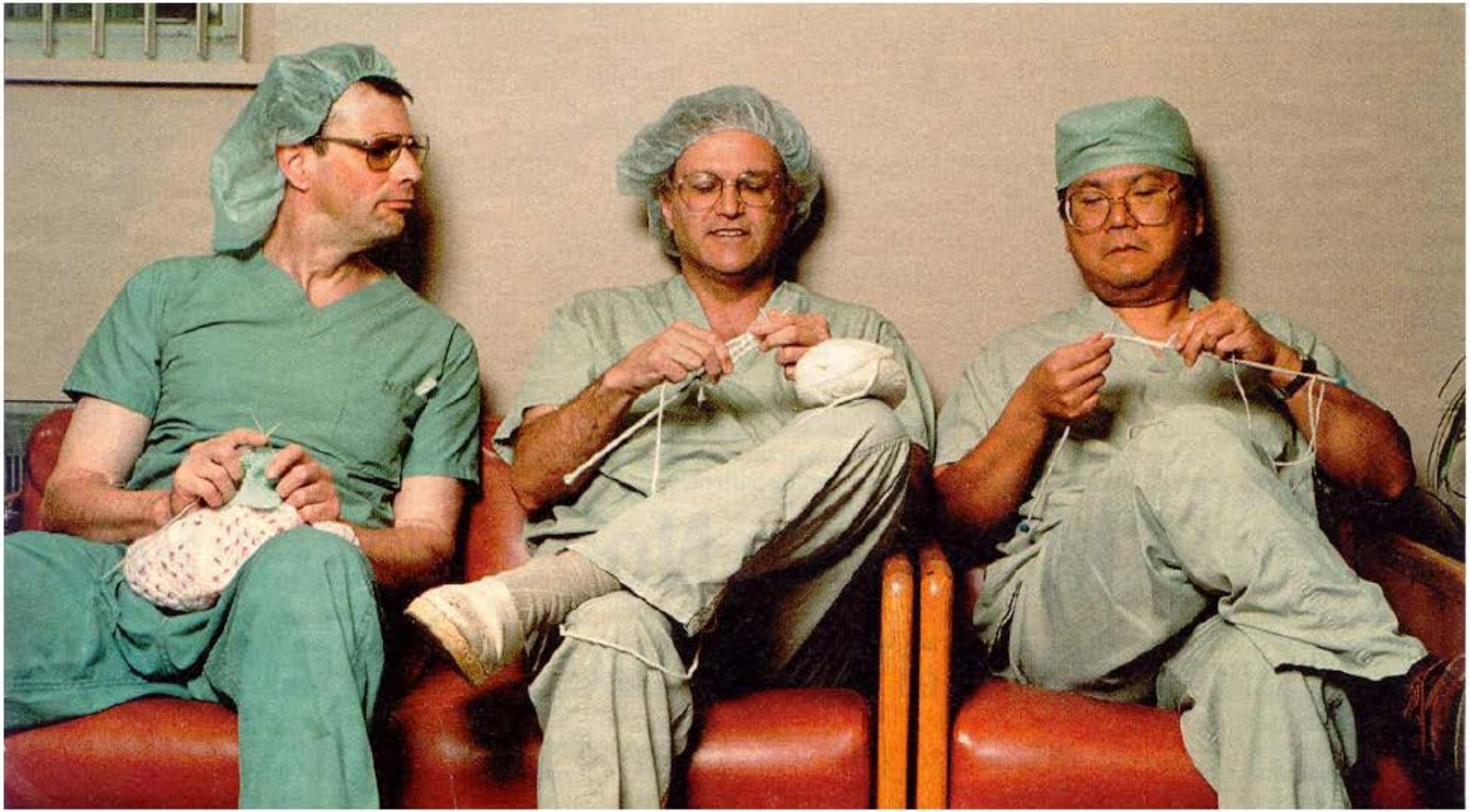


VTE prophylaxis can be *complicated!*

Mean Baseline Performance: **50 - 65%**
(% of patients on appropriate VTE prophylaxis in the hospital)

Maynard G, Stein J. Agency for Healthcare Research and Quality. August 2008. URL in ref list.

Why is VTE Prophylaxis Under-Used?



Exercise – Table Top 10 minutes

- List top 5 failure modes in the process of providing the best VTE prophylaxis to your inpatients
- Rank 1 – 5 in terms of importance
  - Example failure mode - doc orders prophylaxis, but it is not administered.
- List 5 barriers / practical reasons that makes overcoming these failure modes difficult
  - Example barrier - getting consensus on VTE risk assessment

A successful approach must address these!!!!

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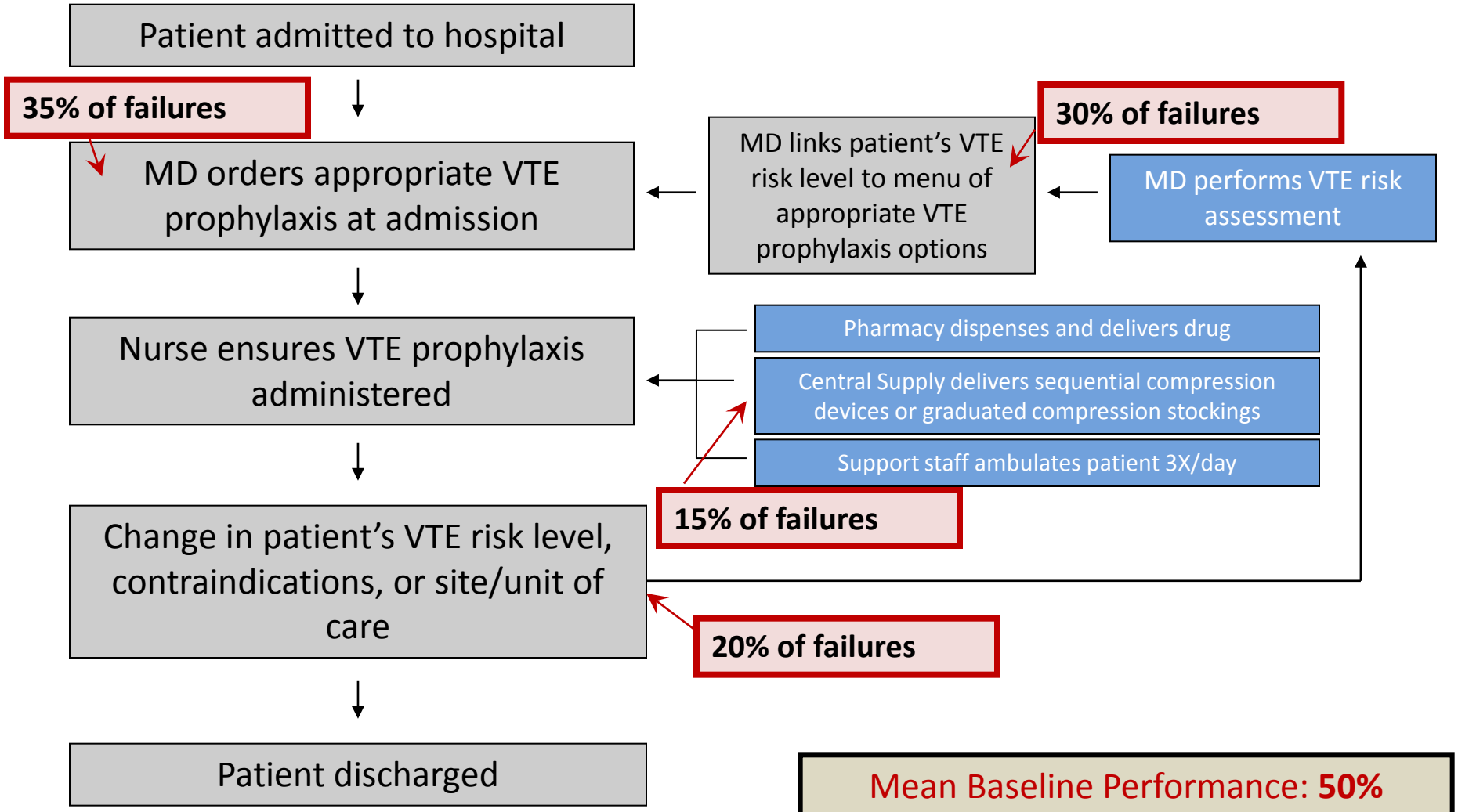
Barriers and Failure Modes - Table Top Sharing

Barriers	Failure Modes

Analyze Care Delivery: Delivering Appropriate VTE Prophylaxis



VTE prophylaxis can be *complicated!*

Mean Baseline Performance: **50%**
(% of patients on appropriate VTE prophylaxis in the hospital)

Maynard G, Stein J. Agency for Healthcare Research and Quality. August 2008.

Common failures in process

- No protocol / standardized order sets
- Order sets / prompts for VTE P in place, but no guidance
- Order sets with guidance in place but bypassed
- Order sets with guidance in place and used, but used incorrectly
- Patient gets placed on right prophylaxis, but VTE / bleeding risk changes and adjustment not made.
- Prophylaxis gets missed / changed on transfer / peri-op setting
- Correct prophylaxis ordered, but not administered, or patient refuses.
- Patient a candidate for extended duration prophylaxis, but prophylaxis stops at discharge anyway.

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Common barriers

- Competing Priorities
- National Policies / Incentives / Initiatives / Accreditation not all in place
- Lack of awareness of guidelines, battling guidelines
- Underestimation of clot risk, overestimation of bleeding risk
- Validated *and practical* risk assessment models needed
- Measurement Issues
- Translating complicated guidelines into everyday practice is difficult
- Medical training failures (QI and systems re-design)
- Failure to use a good QI framework

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BREAK

In the next session:

- Lay out the big picture strategy for improving VTE Prevention
- Learn how we will address all failure modes / barriers
- Some things that *don't* work too well
- Review some VTE risk assessment models
- Definition for VTE Prevention Protocol

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Overcoming barriers and failure modes

A framework for Improvement and the Hierarchy of Reliability

Where discoveries are delivered.℠

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Common failures in process

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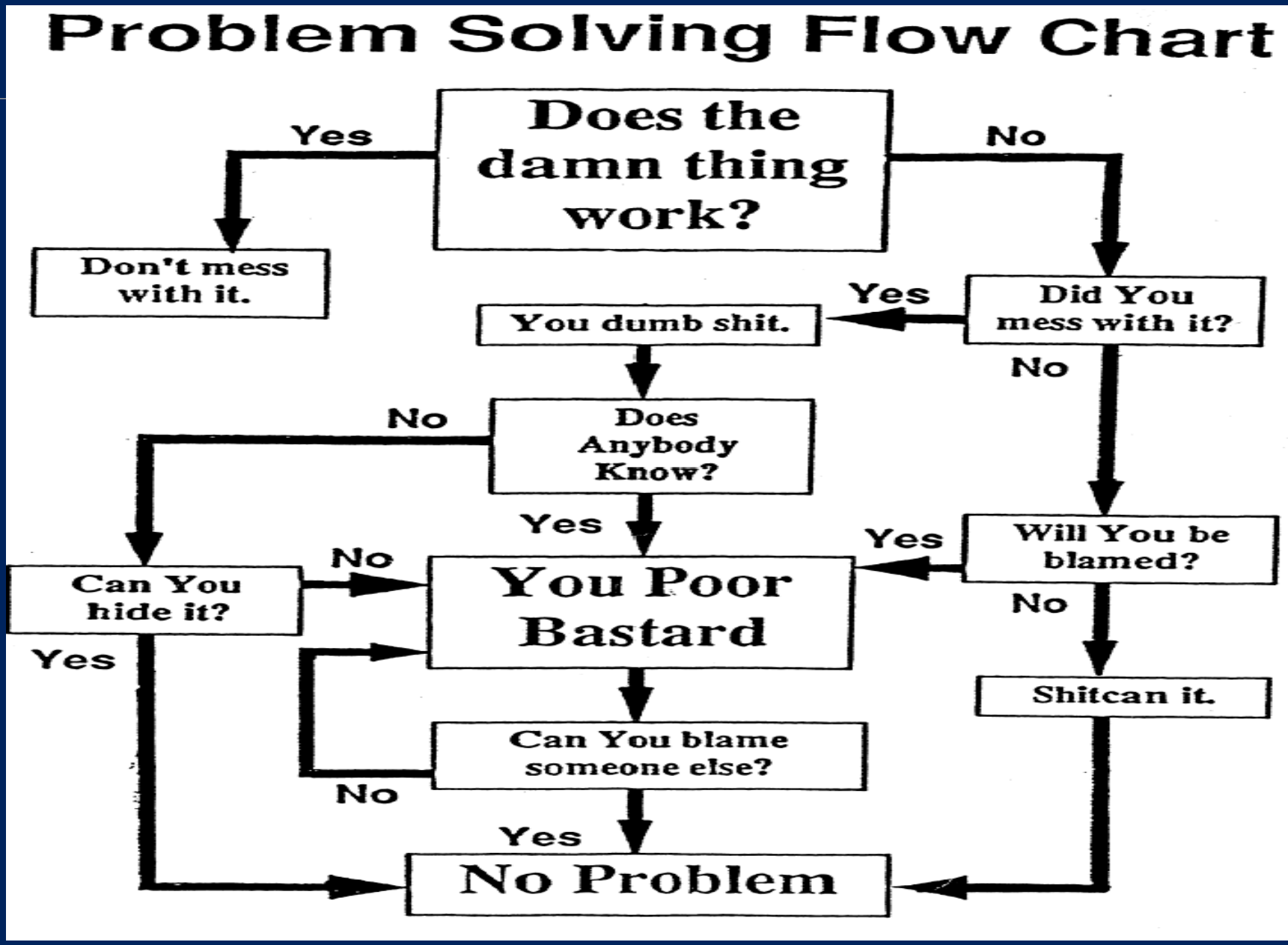
My First Algorithm for Process Improvement



Methods and Approach - UC San Diego

AHRQ funded study to implement VTEP Protocol

- Multi-disciplinary team
- Targeted population: All adult medical / surgical inpatients
- VTE Risk Assessment Model
  - Consensus agreement on risk levels
  - Each level linked to appropriate options for prophylaxis
  - Contraindications and “leeway times” standardized
- Interobserver agreement assessed, model refined
- VTE Risk Assessment integrated into order sets
- Adequacy of VTE Prophylaxis and HA – VTE tracked over time

J Hosp Med 2010 Jan:5(1):10-18.

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Measures- UC San Diego VTE Prophylaxis Study

- Appropriate VTE Prophylaxis
  - Randomly sampled inpatients (observation patients, psychiatric wing, OB/GYN, children excluded)
  - Research nurse assessed risk level and adequacy of prophylaxis against protocol

- Hospital Acquired VTE
  - All imaging tests that detect VTE reviewed every 1-3 days
  - If acute VTE present on test, manual / electronic chart review determined if VTE case was Hospital acquired or community acquired.
  - If HA VTE, further review determined if patient was on VTE prophylaxis consistent with UC San Diego Protocol
  - “Preventable HA VTE” = Hospital Acquired AND not on VTE prophylaxis consistent with protocol during time period that clot formed.
  - Also tracked: adherence to ordered mechanical prophylaxis

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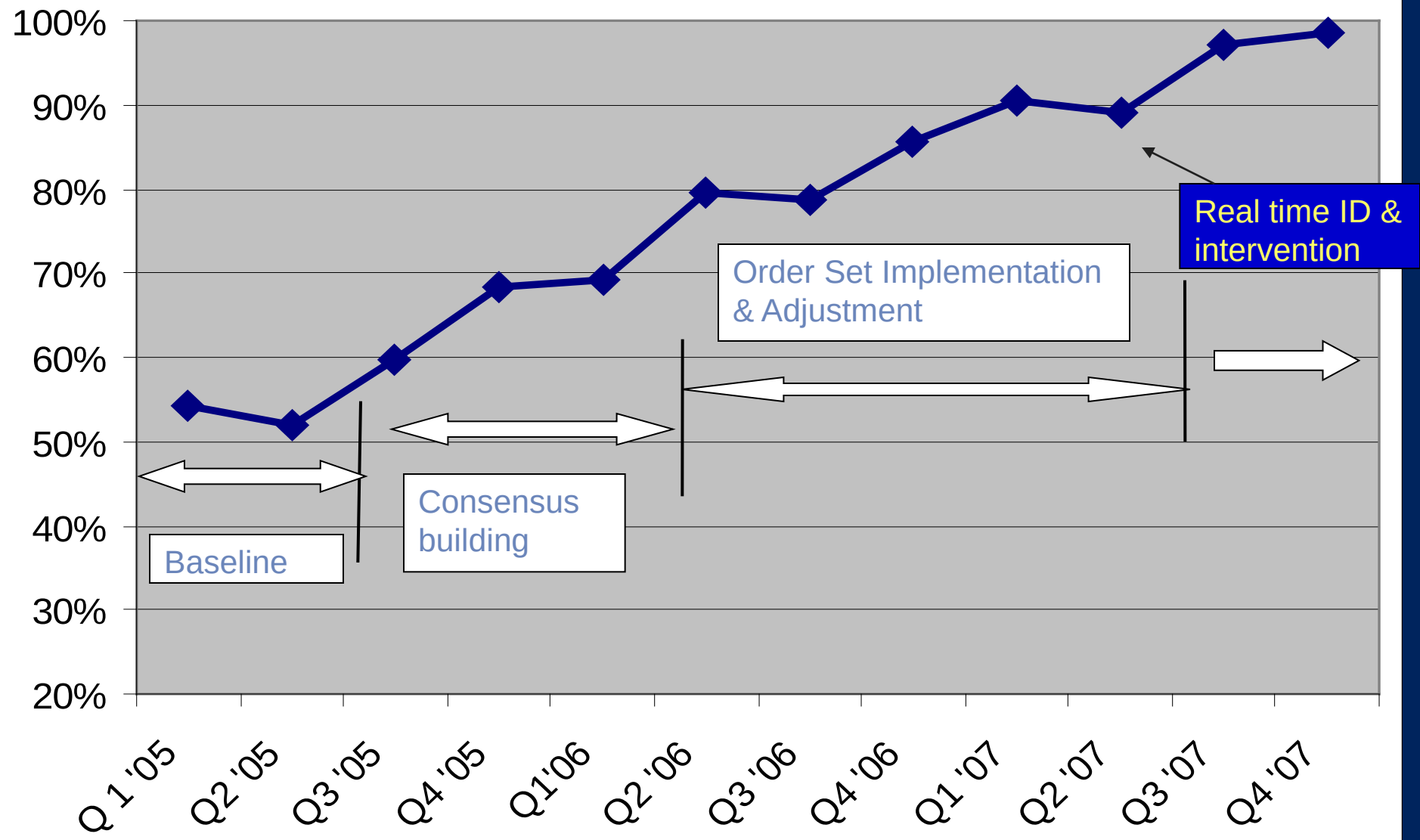
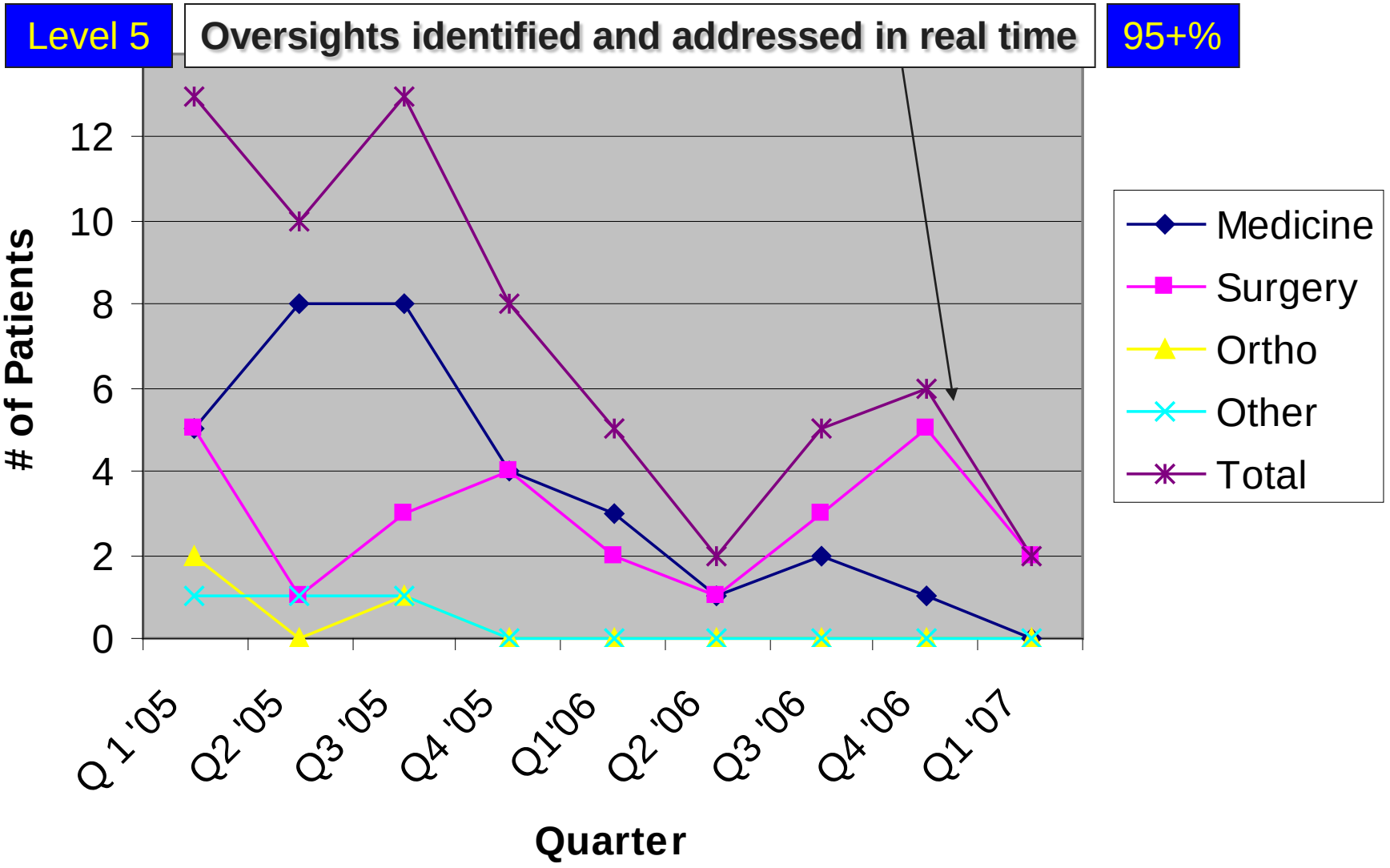
Percent of Randomly Sampled Inpatients with Adequate VTE Prophylaxis

J Hosp Med 2010 Jan:5(1):10-18. N = 2,944 mean 82 audits / month



UCSD - Decrease in Patients with Preventable HA VTE



Hospital Acquired VTE by Year

	2005	2006	2007	2008
Patients at Risk	9,720	9,923	11,207	
Cases w/ any VTE	131	138	92	80
Risk for HA VTE	1 in 76	1 in 73	1 in 122	
Odds Ratio	1.0	1.03	0.61#	
(95% CI)		(0.81, 1.32)	(0.46, 0.80)	
Cases with PE	21	22	15	12
Risk for PE	1 in 463	1 in 451	1 in 747	
Odds Ratio	1.0	1.02	0.62	
(95% CI)		(0.54, 1.96)	(0.30, 1.26)	
Cases with DVT (and no PE)	110	116	77	68
Risk for DVT	1 in 88	1 in 85	1 in 146	
Odds Ratio	1.0	1.03	0.61*	
(95% CI)		(0.79, 1.96)	(0.45, 0.82)	
Cases w/ Preventable VTE	44	21	7	6
Risk for Preventable VTE	1 in 221	1 in 473	1 in 1,601	
Odds Ratio	1.0	0.47#	0.14*	
(95% CI)		(0.26, 0.80)	(0.05, 0.31)	

# $p < 0.01$ *$p < 0.001$

J Hosp Med 2010 Jan:5(1):10-18.

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No Increase in HIT with VTEP Protocol

Table 2. Numbers and Adjusted Risk Ratios for Cases of Heparin-Induced Thrombocytopenia (HIT) at UCSD, January 1, 2005–April 8, 2010*

	Jan. 1, 2005–Dec. 31, 2005	Jan. 1, 2006–Dec. 31, 2006	Jan. 1, 2007–Apr. 8, 2010
Approximate VTE Prophylaxis Rate	54%	78%	95%
Census, > 48 hours	9,720	9,923	14,982
All Suspected Cases	117	125	175
Risk Ratio [95% CI]		1.05 [0.81, 1.34]	0.976 [0.77, 1.23]
Confirmed HIT	2	2	3
Risk Ratio [95% CI]		0.87 [0.38, 7.11]	0.91 [0.10, 10.9]
Confirmed HIT Plus "Treated as" HIT	6	9	10
Risk Ratio [95% CI]		1.46 [0.52, 4.12]	1.09 [0.39, 2.99]

* All comparisons are of Periods 2 and 3 of the study compared with Period 1 (baseline). "Confirmed HIT" cases were test positive. "Treated as" HIT were cases that were test negative but for which the physicians acted as if they were positive anyway. UCSD, University of California, San Diego; VTE, venous thromboembolism; CI, confidence interval.

Jenkins et al. , TJC J Quality and Patient Safety. April 2011; Vol 37. No 4 163-169

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UCSD
VTE Protocol Validated

- Easy to use, on direct observation – a few seconds
- Inter-observer agreement –
  - 150 patients, 5 observers- Kappa 0.8 and 0.9
- Predictive of VTE
- Implementation = high levels of VTE prophylaxis
  - From 50% to sustained 98% adequate prophylaxis
  - Rates determined by over 2,900 random sample audits
- Safe – no discernible increase in HIT or bleeding
- Effective – 40% reduction in HA VTE
  - 86% reduction in risk of preventable VTE

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J Hosp Med 2010 Jan:5(1):10-18.

VTE Prevention Guides

Preventing Hospital-Acquired
Venous Thromboembolism

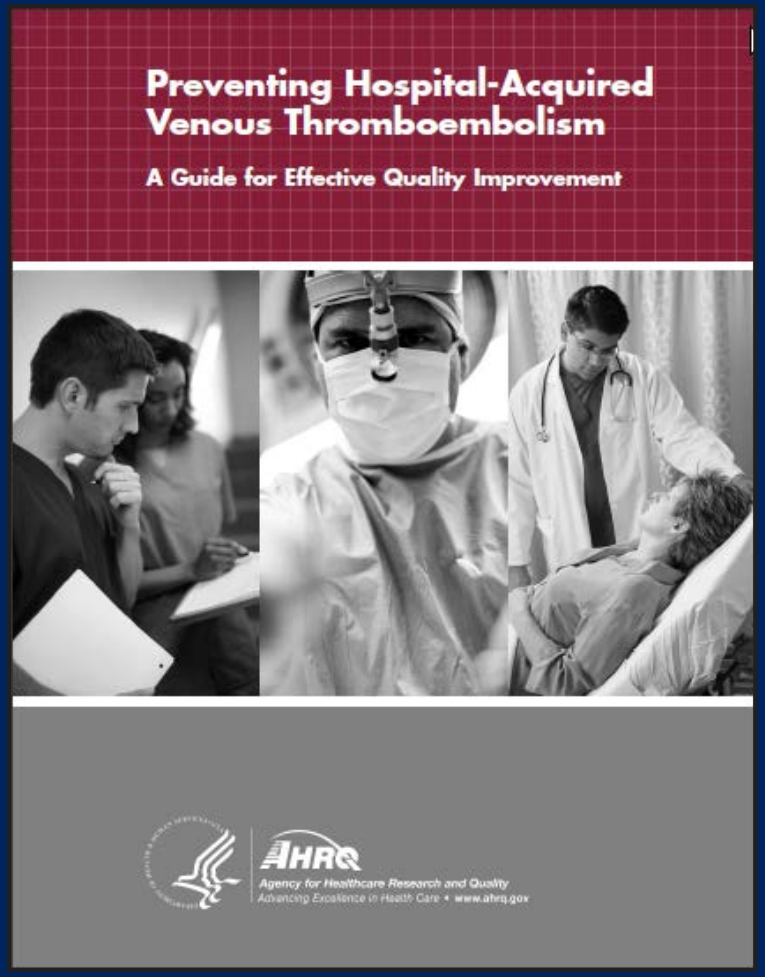
A Guide for Effective Quality Improvement

Version 3.0

Society of Hospital Medicine

Greg Maynard MD, MSc
UCSD

Jason Stein, MD
Emory University Hospitals



Great tools used by hundreds:
Caveat: currently undergoing updates / revision

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VTE Prevention Collaboratives Using UCSD Model

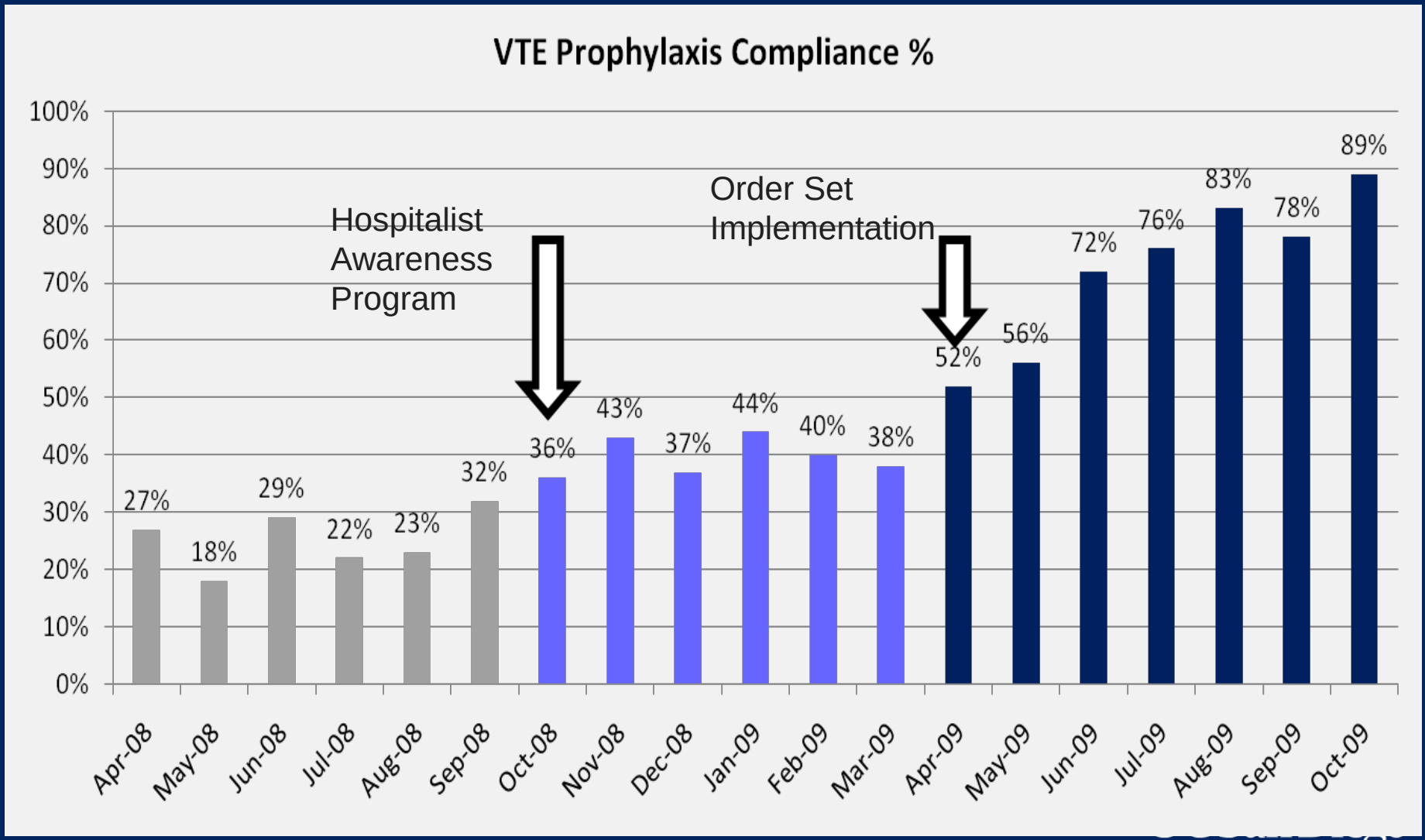
Over 250 Hospitals

- Society of Hospital Medicine (SHM)
- AHRQ and Quality Improvement Organizations
- Institute for Healthcare Improvement (IHI) Expedition
- British Columbia Hospital Medicine
- American Society of Healthsystems Pharmacists (ASHP)

- Awards to UCSD, Emory, UNM, Washington DC VA, Blessing (Quincy IL) and British Columbia based on these strategies (all members of mentored implementation)

- Effective across variety of settings
  - Paper and Computerized / Electronic
  - Small and large institutions
  - Academic and community

Vancouver General Hospital Results



Courtesy of Dr. David Wilton and Dr. Rod Tukker, Vancouver, BC

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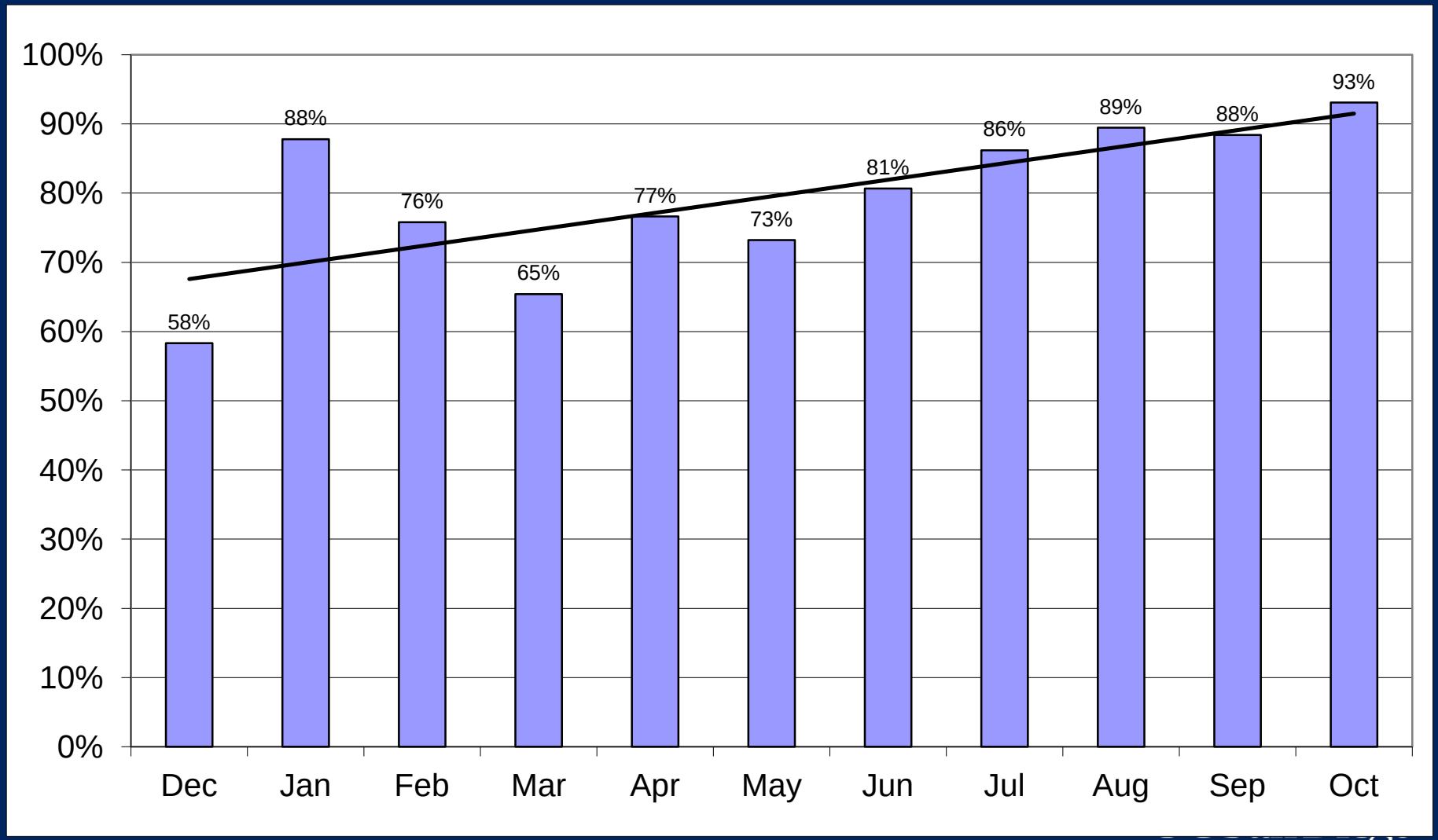
BC VTE Collaborative Results



Courtesy of Dr. David Wilton and Dr. Rod Tukker, Vancouver, BC

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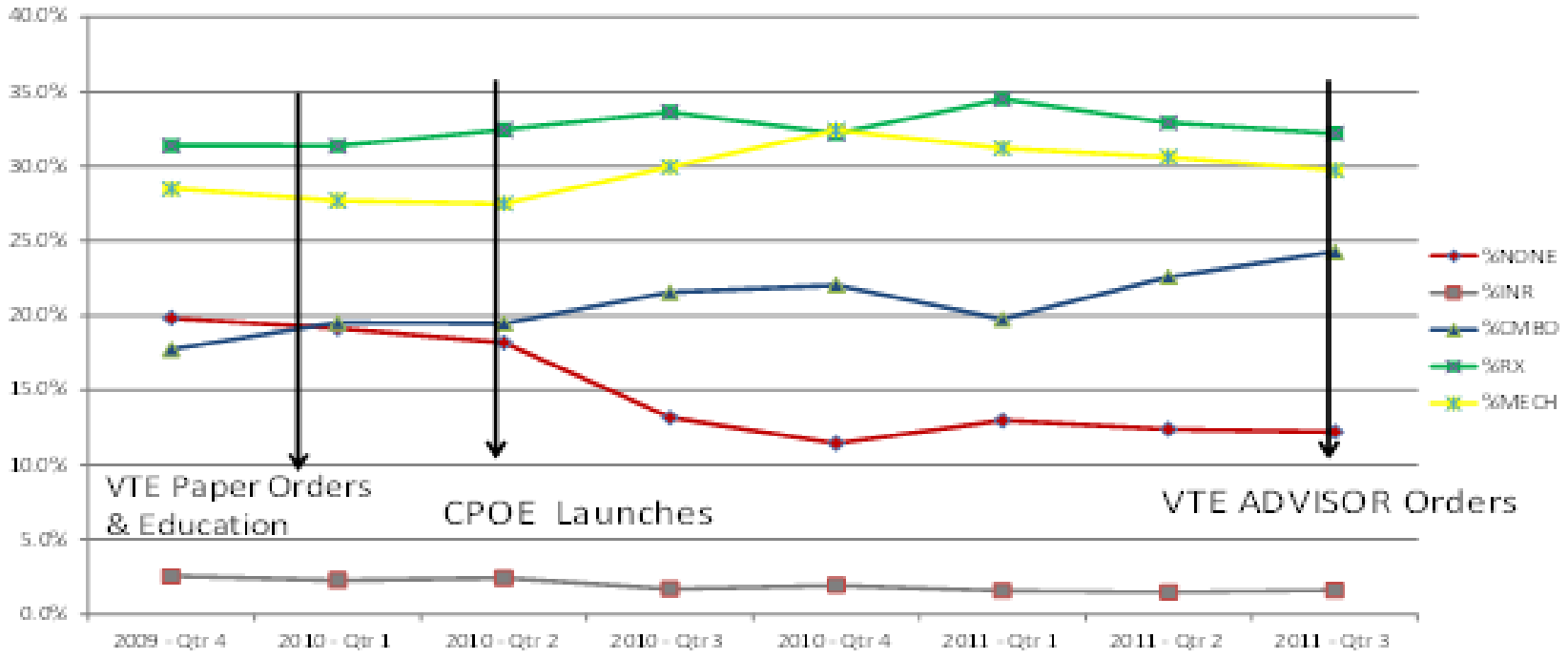
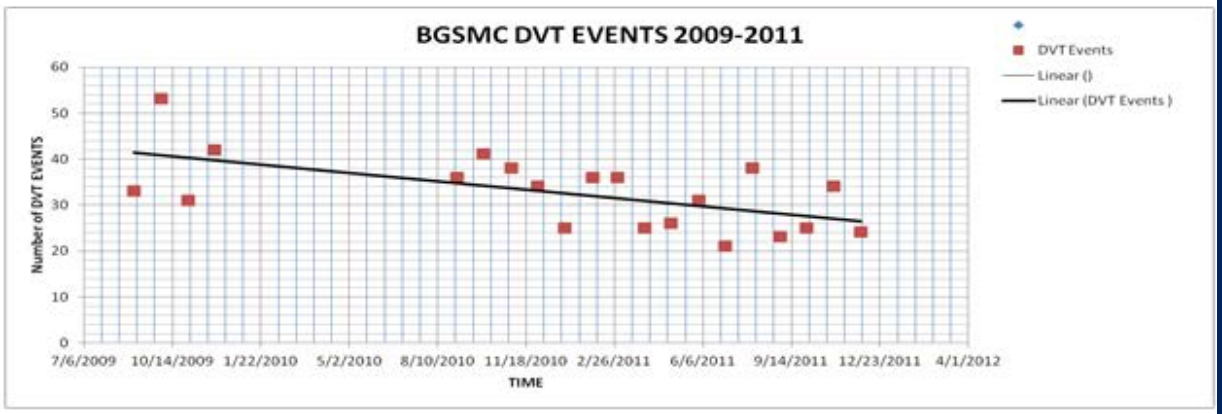
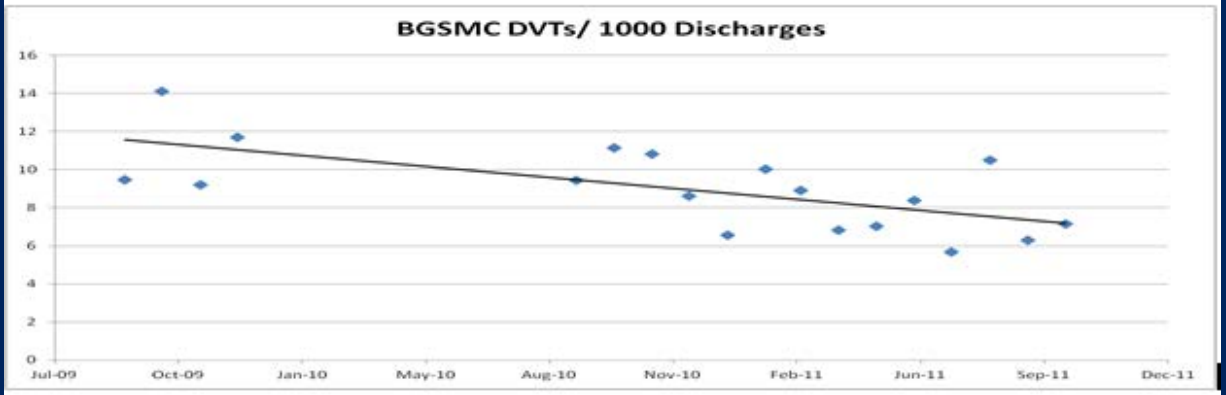
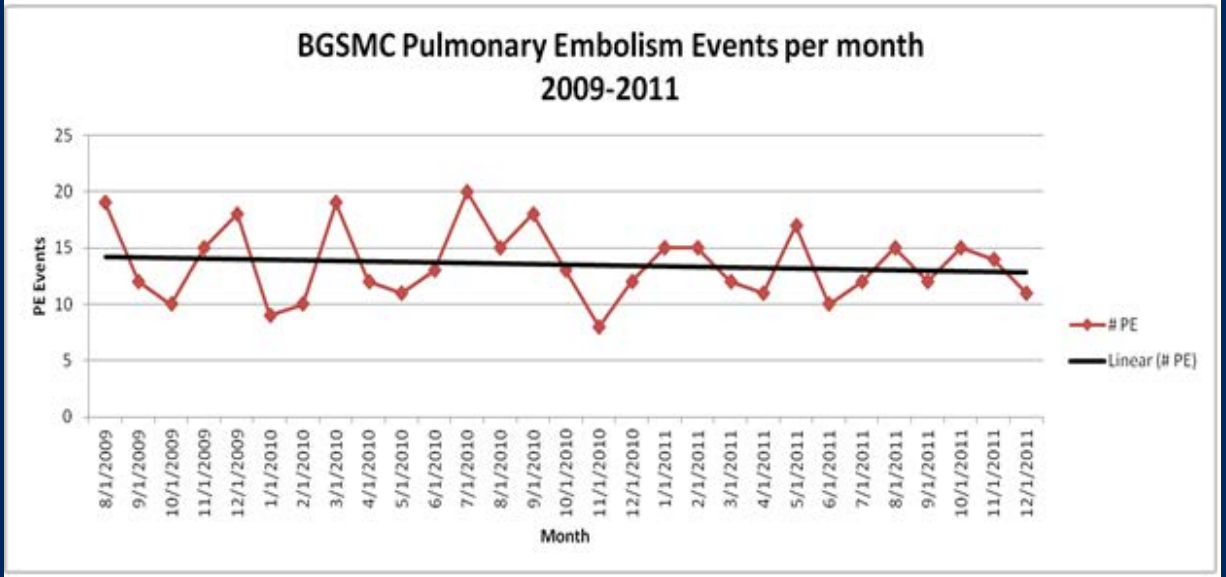
BGSMC VTE Prophylaxis Trend 2009-2011









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Framework for Accelerated Improvement

- Align with institutional interests: Get support
  - Will to standardize and assistance with metrics are key!
- Interdisciplinary team
  - Do things *with* or *for* practitioners, not *to* them
- Measures and Goals
- Define best practice
- Integrate best practice guidance in multiple ways
- Monitor / Refine
- Real time measurement and feedback

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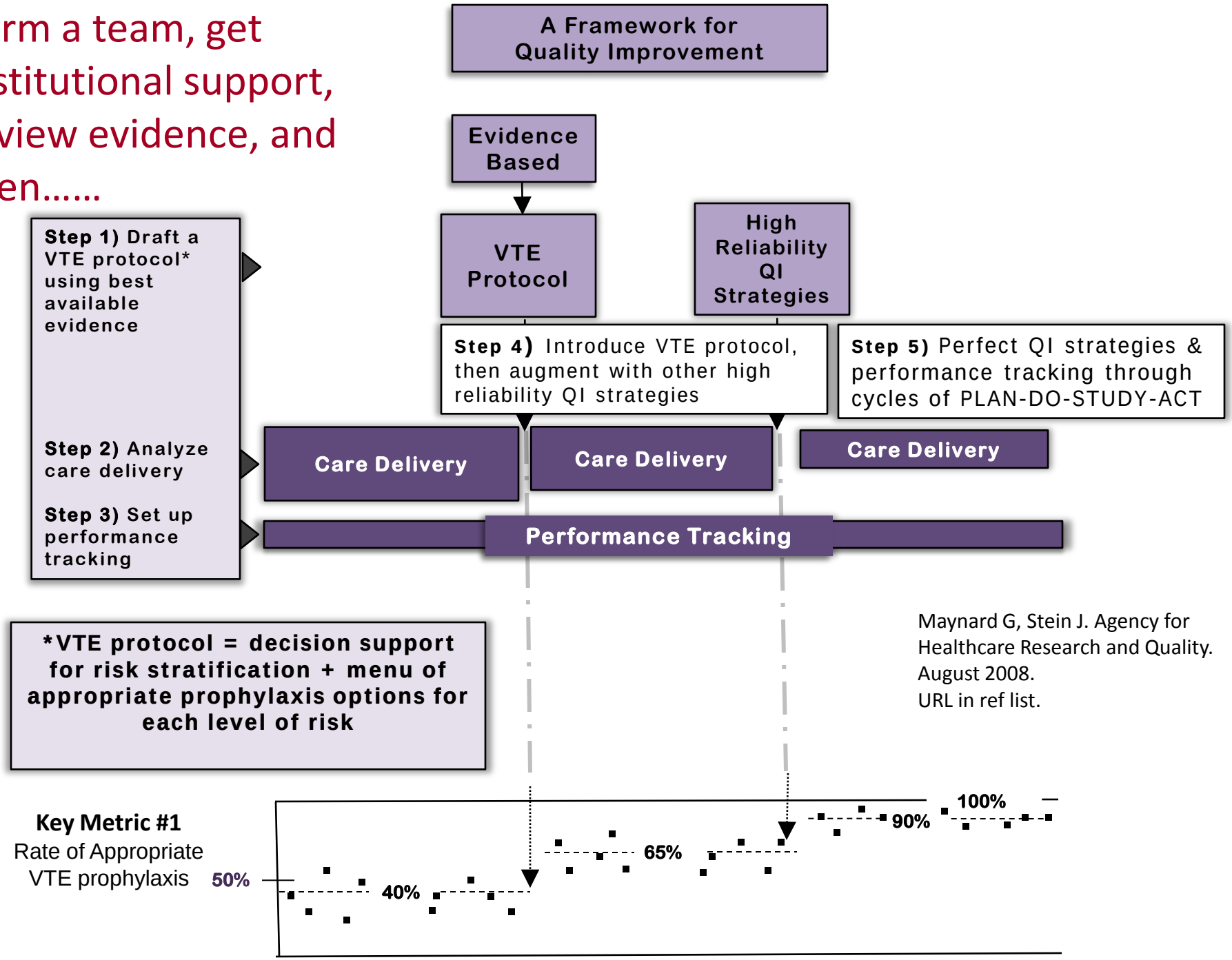
Form a team, get institutional support, review evidence, and then……



Big Picture Strategy –

- Distill evidence into protocol
- Integrate protocol with risk assessment into all admit / transfer orders
- Ongoing monitoring of impact to tweak protocol
- Devise method to detect those without prophylaxis in real time and intervene using multiple methods.

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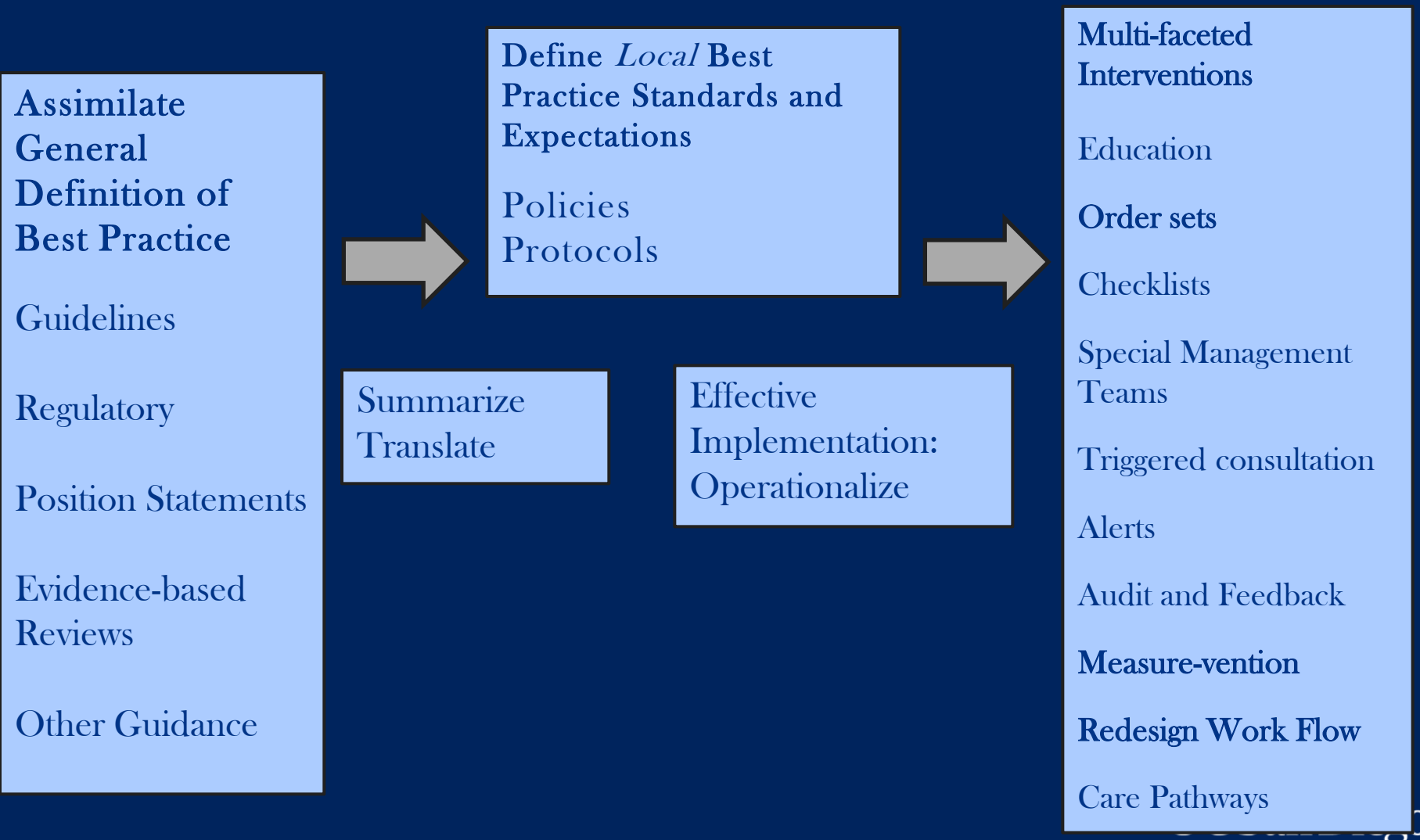
Framework for Effective Implementation- No Single Intervention Will Do It!



The Essential First Intervention

VTE Protocol

1) a standardized VTE risk assessment, linked to…
2) a menu of appropriate prophylaxis options, plus…
3) a list of contraindications to pharmacologic VTE prophylaxis

Challenges:

Make it easy to use ("automatic")

Make sure it captures almost all patients

Trade-off between guidance and ease of use / efficiency

Hierarchy of Reliability

Level	Reliability Strategies	Predicted Prophylaxis Rate
1	No protocol* (“State of Nature”)	40%
2	Decision support exists but not linked to order writing, or prompts within orders but no decision support	50%
3	**Protocol well-integrated (into orders at point-of-care)**	65 – 85%
4	Protocol enhanced (by complementary QI and high reliability strategies)	90%
5	Oversights identified and addressed in real time	95+%

Maynard G, Stein J. Agency for Healthcare Research and Quality. August 2008.

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Measure-vention

Daily measurement drives concurrent intervention
(i.e. same as Level 5 in Hierarchy of Reliability)

Identify patients not receiving VTE prophylaxis in real time

1) Suitable for ongoing assessment, reporting to governing body

   Archive-able data (!)

2) Can be used for real time intervention

   Actionable data (!)

Maynard G, Stein J. Designing and Implementing Effective VTE Prevention Protocols: Lessons from Collaboratives. J Thromb Thrombolysis 2010 Feb:29(2):159-166.

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Focus on the VTE Protocol

Where discoveries are delivered.℠

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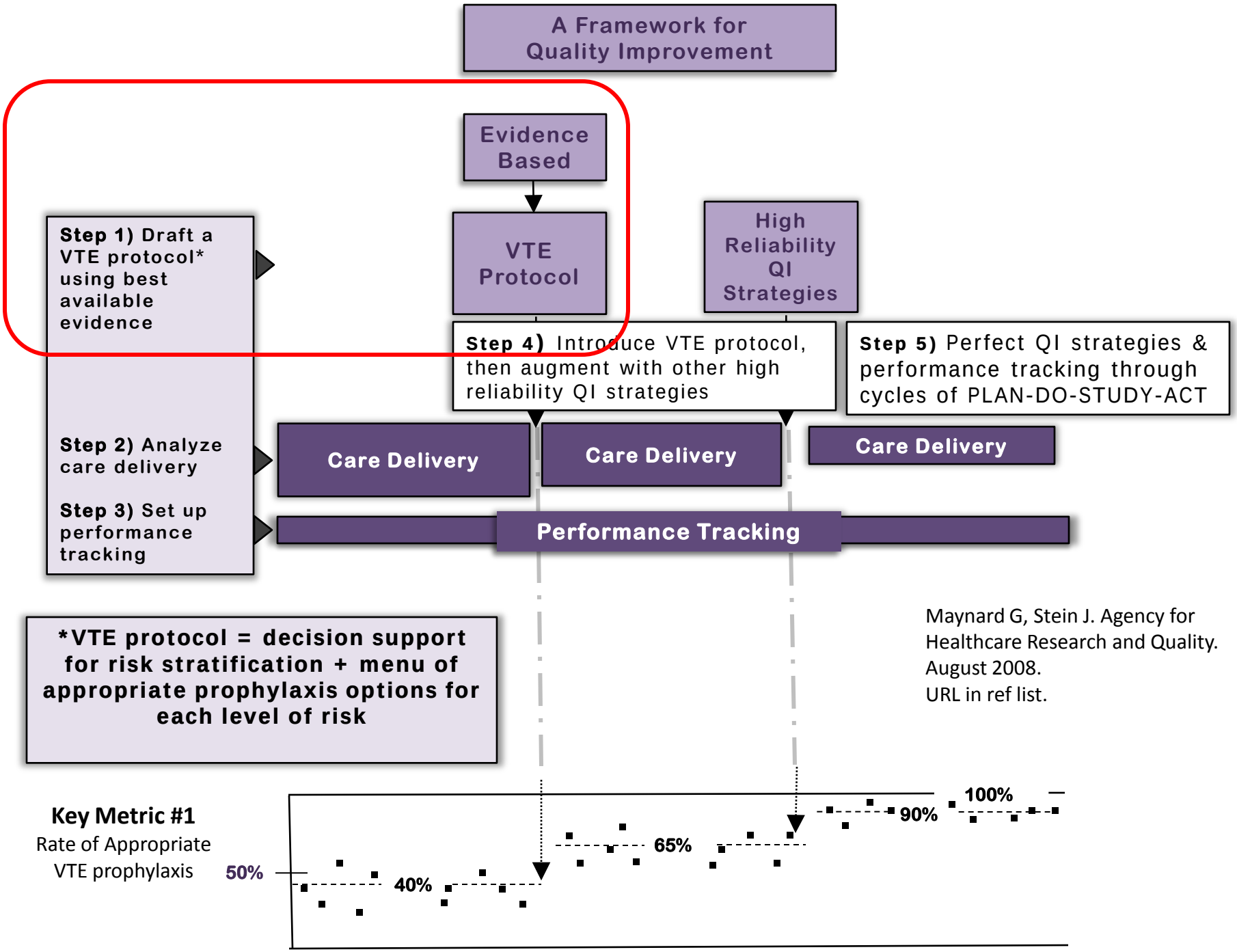
A Framework for Quality Improvement
Evidence Based
VTE Protocol
High Reliability QI Strategies
Step 1) Draft a VTE protocol* using best available evidence
Step 4) Introduce VTE protocol, then augment with other high reliability QI strategies
Step 5) Perfect QI strategies & performance tracking through cycles of PLAN-DO-STUDY-ACT
Step 2) Analyze care delivery
Step 3) Set up performance tracking
Care Delivery
Care Delivery
Care Delivery
Performance Tracking
*VTE protocol = decision support for risk stratification + menu of appropriate prophylaxis options for each level of risk
Maynard G, Stein J. Agency for Healthcare Research and Quality. August 2008.
URL in ref list.
Key Metric #1
Rate of Appropriate VTE prophylaxis
50%
40%
65%
90%
100%

VTE Protocol Key Principles

1. **Keep protocol simple to access and use**
2. **Don’t interrupt the workflow**
3. **Design reliability into the new process**
4. Monitor use of your protocol
5. Allow for variation from the protocol based on patient characteristics (rather than providers)
   - improve protocol based on feedback and justifiable variation
6. Fail faster (pilot small scale w/ongoing feedback & refinement before wider implementation)

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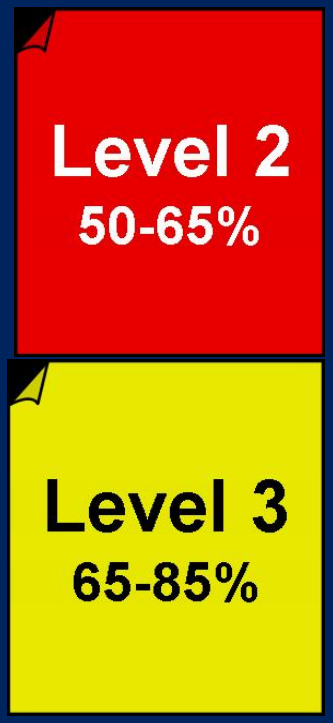

VTE Protocols

1. Keep protocol simple to access and use
2. Don’t interrupt the workflow
3. Design reliability into the process

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High Reliability Principles

- Standardize VTE and anticoagulation risk assessment into the process of admission and transfers
- "Opt out" of default choices (not opt in)
- Prompts for VTE risk assessment at point-of-care
- Scheduled reassessments
- Redundant responsibility and prompts

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Review VTE Protocol in the Context of Patient Cases

69-yr-old male admitted from ED to ward with SOB x 3-4 days

- subjective fever and cough
- Hx compensated CHF, COPD, HTN, and HL
- Still smokes
- CXR c/w RLL pneumonia

PEx reveals RR=22, HR=106, BP= 120 / 70 mm Hg

Obese, mildly dyspneic at rest, PICC line in place

Dull at R base Cor – RRR no S3

2+ pedal edema and acute / chronic stasis and varicose veins

Ht: 67 in. Wt: 91 kg

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Exercise 2 :

Critique of Sample VTE Protocols

Insert direction here on where to locate protocol examples

- List at least 2 ways that each VTE protocol successfully embodies the first 2 key principles.

    1. Simple to access and use
    2. Don’t interrupt the workflow

- List at least 2 ways that each protocol fails to embody key principles 1 and 2.
- List at least 2 things you will do differently to improve the effectiveness of your VTE protocol when returning to your institution.

Exercise:
Focus on the VTE Protocol

- What should a VTE protocol include?
- How restrictive should it be?
- Exercise Summary
  - Review and discuss strengths and weaknesses of each sample VTE protocol
  - How might each protocol succeed or fail?
  - What should be avoided in your VTE protocol?
  - How can you minimize the number of patients who manage to bypass your VTE protocol?

Protocol 1

DVT PROPHYLAXIS ORDERS

- Anti thromboembolism Stockings
- Sequential Compression Devices
- UFH 5000 units SubQ q 12 hours
- UFH 5000 units SubQ q 8 hours
- LMWH (Enoxaparin) 40 mg SubQ q day
- LMWH (Enoxaparin) 30 mg SubQ q 12 hours
- No Prophylaxis, Ambulate

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Protocol 2- See Word document

SAMPLE REGIONAL MEDICAL CENTER

Venous Thromboembolism Risk Assessment and Prophylaxis Order Sheet

To be completed at admission,post-op, transfer to ICU/CCU and discharge

FAX TO PHARMACY

Step 1: Contraindications to anticoagulants:

Relative: (check if applicable)

- ☐ Cerebral hemorrhage at any time
- ☐ GI, GU bleed or stroke in last 6 months
- ☐ Thrombocytopenia (<100,000)
- ☐ Coagulopathy
- ☐ Active intracranial lesions/neoplasms
- ☐ Proliferative retinopathy
- ☐ Vascular access/biopsy sites inaccessible to hemostatic control
- ☐ Low Molecular Weight Heparin in dialysis patients or those with Creatinine clearance <=30

Absolute: (check if applicable)

- ☐ Active hemorrhage from wounds, drains, lesions
- ☐ Unfractionated or Low Molecular weight Heparin use in Heparin Induced Thrombocytopenia
- ☐ Severe trauma to head, spinal cord, abdomen with spleen or liver laceration or hemorrhage in last 4 weeks
- ☐ Spinal or epidural anesthesia planned or performed, discuss with anesthesiologist
- ☐ Warfarin use in pregnancy

Contraindication(s) to pharmacological prophylaxis with anticoagulants?

Yes: If yes explain _____

and choose non pharmacological method unless also contraindicated (Peripheral vascular disease or wounds)

Step 2: Risk Factors Associated with Clinical Setting:

Choose one with the HIGHEST risk score for the patient

Score 1 point

- ☐ Minor Surgery
- ☐ Trauma
- ☐ Observation
- ☐ Bed rest >12 hours

Score 2 points

- ☐ Major surgery (>45 min)
- ☐ Laparoscopic surgery (>45 min)
- ☐ Patients confined to bed >24 hr
- ☐ Immobilizing plaster cast
- ☐ Central Venous Access

Score 3 points

- ☐ Major surgery with
  - myocardial infarction
  - congestive heart failure
  - severe sepsis/infection
- ☐ Medical patient with additional risk factors (MI, CHF, Sepsis, Immobile)

Score 5 points

- ☐ Elective lower extremity arthroplasty
- ☐ Hip, pelvis or leg fracture
- ☐ Stroke new onset
- ☐ Multiple trauma
- ☐ Acute spinal cord injury (paralysis)

BASELINE RISK SCORE (IF SCORE =5, GO TO STEP4)→☐

STEP 3: Risk Factors Associated with the Patient:

Protocol 3 – See Word Document

MED/SURG SERVICES
VENOUS THROMBOEMBOLIC (VTE) PROPHYLAXIS ORDERS (ADULT)

ORDER NUMBER: MS-27.0 **LAST REVIEWED/REVISED:** PILOT
DATE OF ORIGIN: 08/03 **APPROVED:**

DATE/TIME: _____ **Height/Weight:** _____
DIAGNOSIS: _____
ALLERGIES: _____

Risk Factors:
Any **two or more** is an indication for VTE prophylaxis
- Age over 40 years
- Obesity
- ICU admission
- Presence of a central venous line
- Prolonged immobility, more than 24 hours
- Past history of Chronic Lung Disease or an inflammatory disorder
- Admitted with or a history of heart failure, pneumonia or serious infection, varicose veins, nephrotic syndrome, sickle cell disease, pregnancy or estrogen use

"High" Risk Factors:
Any **One** is an indication for VTE prophylaxis

- Major trauma (abdomen, pelvis, hip or leg)
- Ischemic (non hemorrhagic) stroke or paralysis
- Malignancy
- Any prior history of deep vein thrombosis or pulmonary embolism

Anticoagulant prophylaxis exclusion criteria:
- Significant renal insufficiency (affects low molecular weight heparin only!)
- Uncontrolled hypertension
- Presence or history of heparin induced thrombocytopenia
- Recent intraocular or intracranial surgery
- Spinal tap or epidural anesthesia within the previous 24 hours
- Any active bleeding
- Coagulopathy or thrombocytopenia
- Current treatment with anticoagulants

Protocol 4 – See Word Document

Hospital

ADULT DVT PROPHYLAXIS

PHYSICIAN ORDER SHEET

ALLERGIES (FOOD AND/OR DRUG): [ ] NKA

HEIGHT: WEIGHT:

Risk Factors for Deep Vein Thrombosis / Pulmonary Embolism (DVT/PE) *(Check risk factors)*

Major

- ☐ Prior DVT or PE
- ☐ Malignancy
- ☐ Age greater than 60 yrs
- ☐ Hypercoagulable state, inherited or acquired
- ☐ Central venous access
- ☐ Nonhemorrhagic Stroke
- ☐ Prolonged Immobility (greater than 72 hrs), or Paralysis
- ☐ Major Surgery
- ☐ Immobilizing Lower Extremity Cast
- ☐ Myocardial Infarction
- ☐ Heart Failure (Decompensated)
- ☐ Sepsis or Severe Infection

Minor

- ☐ Age 40-60 yrs
- ☐ Heart Failure, Compensated
- ☐ Obesity (BMI greater than or equal to 30)
- ☐ Inflammatory bowel disease
- ☐ Trauma/Burns
- ☐ Smoking
- ☐ Minor Surgery
- ☐ Pregnancy or less than 1 month postpartum
- ☐ Oral Contraceptive, Hormone Replacement Therapy use
- ☐ Estrogen Receptor Modulators (i.e.Tamoxifen, Raloxifene)
- ☐ Varicose veins

Contraindications for Anticoagulation Therapy

Hx -Heparin Induced Thrombocytopenia	Hemorrhagic blood dyscrasia	Active peptic ulcer disease
Severe hypertension (uncontrolled)	PT or aPTT greater than 1.5 x control	Bacterial endocarditis
Head or spinal trauma (w/ hemorrhage)	Severe thrombocytopenia (Plt below 100,000)	Threatened abortion
Hemorrhagic CVA	Active, uncontrolled bleeding	Pre/post spinal decompression surgery (within 10 days)
Dissecting or cerebral aneurysm	Recent TURP (within 6 weeks)	Eye or brain surgery (within 48 hours)

Use of epidural requires clearance by anesthesiology

DVT Prophylaxis for Medical and Surgical Patients

Review risk factors/Contraindications prior to ordering appropriate prophylaxis

Patient Category (Risk Factors (RF))	Risk	Prophylaxis Method
• Minor procedure and less than 40 yrs and no additional RF • Medical inpatient with no major or minor RF	Low	☐ Early ambulation – Prophylaxis Not Indicated
• Non-major procedure (less than 45 min) and 40-60 yrs or additional RF • Major surgery (greater than 45 min) and less than 40 yrs without additional RF	Moderate	☐ Heparin 5000 units subcut every 12 hours

Protocol 5 –

VTE RISK ASSESSMENT ORDERS

DOCTOR: _____

DATE:_____ DIAGNOSIS: _____

PATIENTS NAME:_____ ALLERGIES: _____

VTE Risk Assessment Score *(Nurse complete - Circle one)*

Low Moderate High

Nurse signature: _____Date: _____Time_____

VTE prophylaxis ordered in another order set: Prophylaxis:_____ Date:_____ Time____

Physician Orders (Check all that apply)

Low Risk

___Early aggressive ambulation and discharge is expected within 24 - 48 hours

___Receiving therapeutic anticoagulant for other indication *(Warfarin, Dalteparin, Enoxaparin, IV Heparin or Fondaparinux)*

Moderate and High Risk

(Use of Pharmacologic prophylaxis AND SCD/TEDs recommended for High Risk)

___ Dalteparin (Fragmin) 5000 units sub-Q every 24 hours *(Caution for CrCl <30mL/min)***Preferred Agent***

___ Fondaparinux (Arixtra) 2.5 mg sub-Q every 24 hours *(Contraindicated if CrCl <30mL/min or weight <50kg; use with caution if CrCl = 30-50 mL/min or age > 65)*

___ Heparin 5000 units sub-Q every 8 hours *(Reserve for end stage renal disease)*

___ SCD/TED's *(Should NOT be ordered alone unless pharmacologic prophylaxis is contraindicated)*

The risk of adverse effects outweigh the risk of DVT/PE

___Palliative Care/Comfort Measures only

Pharmacologic Prophylaxis Contraindicated *(SCD/TEDs should be ordered unless contraindicated)*

___Contraindication to anticoagulants: _____

SCD/TED's Contraindicated:

___Contraindication to SCD/TED's: _____

(See contraindication list on back)

PAGE 1 OF 1

SIGNED_____DATE_____TIME_____

Owensboro Medical Health System REV: 03-10

Patients Sticker

Protocol 6

Complete Assessment at ADMISSION, POST-OP, AND TRANSFER

DVT/ PE RISK LEVEL & PROPHYLAXIS ORDERS

☐ **Low** Risk Observation patients, expected LOS <48 hrs: Minor/ Ambulatory surgery **or** Age< 50 and NO other risk factors , or Already on therapeutic anticoagulation	☐ Early ambulation, education ☐ Education
☐ **Moderate** Risk **Most medical /surgical patients** CHF,pneumonia, active inflammation, advanced age, dehydration, varicose veins, less than fully and independently ambulatory, many other factors. All patients not in the Low or Highest Risk Categories (see reverse for more risk factors)	**CHOOSE ONE** PHARMACOLOGIC option ☐ Enoxaparin 40 mg SC q 24 hrs ☐ Enoxaparin 30 mg SC q 24 hrs (renal insufficiency dosing) ☐ Heparin 5000 units SC q 8 hrs ☐ Heparin 5000 units SC every 12hrs (if weight <50kg or age> 75) **Also (OPTIONAL)** ☐ Sequential compression device
☐ **Highest** Risk Elective hip or knee arthroplasty Acute spinal cord injury with paresis Multiple major trauma Abdominal or pelvic surgery for cancer	**CHOOSE ONE** PHARMACOLOGIC option ☐ Enoxaparin 40 mg SC q day ☐ Enoxaparin 30 mg SC q 24 hrs (for renal insufficiency) ☐ Heparin 5000 units SC q 8 hrs (End stage renal disease only) ☐ Enoxaparin 30 mg SC q 12 hrs (knee replacement) ☐ Fondaparinux 2.5 mg SC q day **AND** ■ Sequential compression device

OR

The risk of adverse effects of pharmacologic prophylaxis outweighs the risk of DVT / PE
Contraindication to pharmacologic prophylaxis (see reverse): _____

☐ Mechanical prophylaxis with sequential compression device OR
☐ Contraindicated (peripheral vascular disease or wounds)

_____ SIGNATURE / PROVIDER ID

_____ DATE / TIME

Summary:

Developing an Effective VTE Protocol

Where discoveries are delivered.℠

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Mistakes in VTE Prevention Orders

- Too Complicated (Point Based models especially)
- No real guidance (Prompt ≠ Protocol)
- Failure to revise old order sets
- Too many categories of risk
- Allowing mechanical prophylaxis too much
- Failure to pilot, revise, monitor
- Linkage between risk level and prophy choices are separated in time or space

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Too Complicated?

To be completed at admission, post-op, transfer to ICU/CCU and discharge

FAX TO PHARMACY

Step 1: Contraindications to anticoagulants:

Relative: (check if applicable)

- ☐ Cerebral hemorrhage at any time
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- ☐ Thrombocytopenia (<100,000)
- ☐ Coagulopathy
- ☐ Active intracranial lesions/neoplasms
- ☐ Proliferative retinopathy
- ☐ Vascular access/biopsy sites inaccessible to hemostatic control
- ☐ Low Molecular Weight Heparin in dialysis patients or those with Creatinine clearance <=30

Absolute: (check if applicable)

- ☐ Active hemorrhage from wounds, drains, lesions
- ☐ Unfractionated or Low Molecular weight Heparin use in Heparin Induced Thrombocytopenia
- ☐ Severe trauma to head, spinal cord, abdomen with spleen or liver laceration or hemorrhage in last 4 weeks
- ☐ Spinal or epidural anesthesia planned or performed, discuss with anesthesiologist
- ☐ Warfarin use in pregnancy

Contraindication(s) to pharmacological prophylaxis with anticoagulants?

Yes: If yes explain _____

and choose non pharmacological method unless also contraindicated (Peripheral vascular disease or wounds)

Step 2: Risk Factors Associated with Clinical Setting:

Choose one with the HIGHEST risk score for the patient

Score 1 point

- ☐ Minor Surgery
- ☐ Trauma
- ☐ Observation
- ☐ Bed rest >12 hours

Score 2 points

- ☐ Major surgery (>45 min)
- ☐ Laparoscopic surgery (>45 min)
- ☐ Patients confined to bed >24 hr
- ☐ Immobilizing plaster cast
- ☐ Central Venous Access

Score 3 points

- ☐ Major surgery with
  - myocardial infarction
  - congestive heart failure
  - severe sepsis/infection
- ☐ Medical patient with additional risk factors (MI, CHF, Sepsis, Immobile)

Score 5 points

- ☐ Elective lower extremity arthroplasty
- ☐ Hip, pelvis or leg fracture
- ☐ Stroke new onset
- ☐ Multiple trauma
- ☐ Acute spinal cord injury (paralysis)

BASELINE RISK SCORE (IF SCORE =5, GO TO STEP4)→☐

STEP 3: Risk Factors Associated with the Patient:

CLINICAL

(1 point each unless otherwise indicated)

- ☐ Age 41 to 60 years
- ☐ Age over 60 years (2 points)
- ☐ History of DVT/PE (3 points)
- ☐ Pregnancy or postpartum <1 month
- ☐ Varicose veins
- ☐ Inflammatory Bowel disease
- ☐ Active Malignancy (2 points)
- ☐ Stroke, history of (5 points)
- ☐ Obesity (BMI>30)
- ☐ Oral contraceptives or hormone replacement
- ☐ Hypercoagulable states (3 points)
- ☐ Current tobacco use

TOTAL ADDITIONAL RISK POINTS→☐

TOTAL ADDITIONAL RISK POINT SCORE (BASELINE + ADDITIONAL)→☐

STEP 4: DVT/PE Prophylaxis Orders

Score of 1 or less
Low Risk

- ☐ Early ambulation

Score of 2
Moderate Risk

- ☐ Sequential compression device and/or
- ☐ Heparin 5000 units q 12 hrs Subcut

Score of 3-4
High Risk

- ☐ Sequential compression device and/or
- ☐ Heparin 5000 units q 8 hrs subcut

Score of 5 or more
Highest Risk

- ☐ Sequential compression device **AND at least one of the following**
- ☐ Heparin 5000 units q 8 hrs subcut
- ☐ Enoxaparin 40 mg subcut daily
- ☐ Enoxaparin 30 mg subcut q 12 hrs
- ☐ **Warfarin daily with goal INR 2-3** (see warfarin orders) along with Heparin or Enoxaparin as above due to concerns for Hypercoagulable states and Warfarin Alone

PHYSICIAN SIGNATURE_____ Date/Time_____

Questions and My Biased Answers

Q. What is the best VTE risk assessment model?

A. Simple, text based model with only 2-3 layers of VTE Risk

Q. Who should do the VTE risk assessment?

A. Doctors (via admit transfer order sets), with back up risk assessment by front line nurses or pharmacists, focusing on those without prophylaxis.

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Complete Assessment at ADMISSION, POST-OP, AND TRANSFER

DVT/ PE RISK LEVEL & PROPHYLAXIS ORDERS

☐ **Low** Risk Observation patients, expected LOS <48 hrs: Minor/ Ambulatory surgery **or** Age< 50 and NO other risk factors , or Already on therapeutic anticoagulation	☐ Early ambulation, education ☐ Education
☐ **Moderate** Risk **Most medical /surgical patients** CHF,pneumonia, active inflammation, advanced age, dehydration, varicose veins, less than fully and independently ambulatory, many other factors. All patients not in the Low or Highest Risk Categories (see reverse for more risk factors)	**CHOOSE ONE** PHARMACOLOGIC option ☐ Enoxaparin 40 mg SC q 24 hrs ☐ Enoxaparin 30 mg SC q 24 hrs (renal insufficiency dosing) ☐ Heparin 5000 units SC q 8 hrs ☐ Heparin 5000 units SC every 12hrs (if weight <50kg or age> 75) **Also (OPTIONAL)** ☐ Sequential compression device
☐ **Highest** Risk Elective hip or knee arthroplasty Acute spinal cord injury with paresis Multiple major trauma Abdominal or pelvic surgery for cancer	**CHOOSE ONE** PHARMACOLOGIC option ☐ Enoxaparin 40 mg SC q day ☐ Enoxaparin 30 mg SC q 24 hrs (for renal insufficiency) ☐ Heparin 5000 units SC q 8 hrs (End stage renal disease only) ☐ Enoxaparin 30 mg SC q 12 hrs (knee replacement) ☐ Fondaparinux 2.5 mg SC q day **AND** ■ Sequential compression device

OR

The risk of adverse effects of pharmacologic prophylaxis outweighs the risk of DVT / PE
Contraindication to pharmacologic prophylaxis (see reverse): _____

☐ Mechanical prophylaxis with sequential compression device OR
☐ Contraindicated (peripheral vascular disease or wounds)

_____ _____

SIGNATURE / PROVIDER ID DATE / TIME

Discern: zzzdiscern, advisor vte

Banner Health

Help

Patient Name: zzzdiscern, advisor vte **Sex:** Male **MRN:** 999999
Location: 05 A4E - VA4E **Age/DOB:** 31 Years / June 04, 1980 **FIN:** 222222

VTE Risk Assessment - Discern Advisor®

The VTE Risk Assessment Advisor is **optional** for your documented patient relationship. You may click the Done button to close the Advisor or complete the documentation and orders.

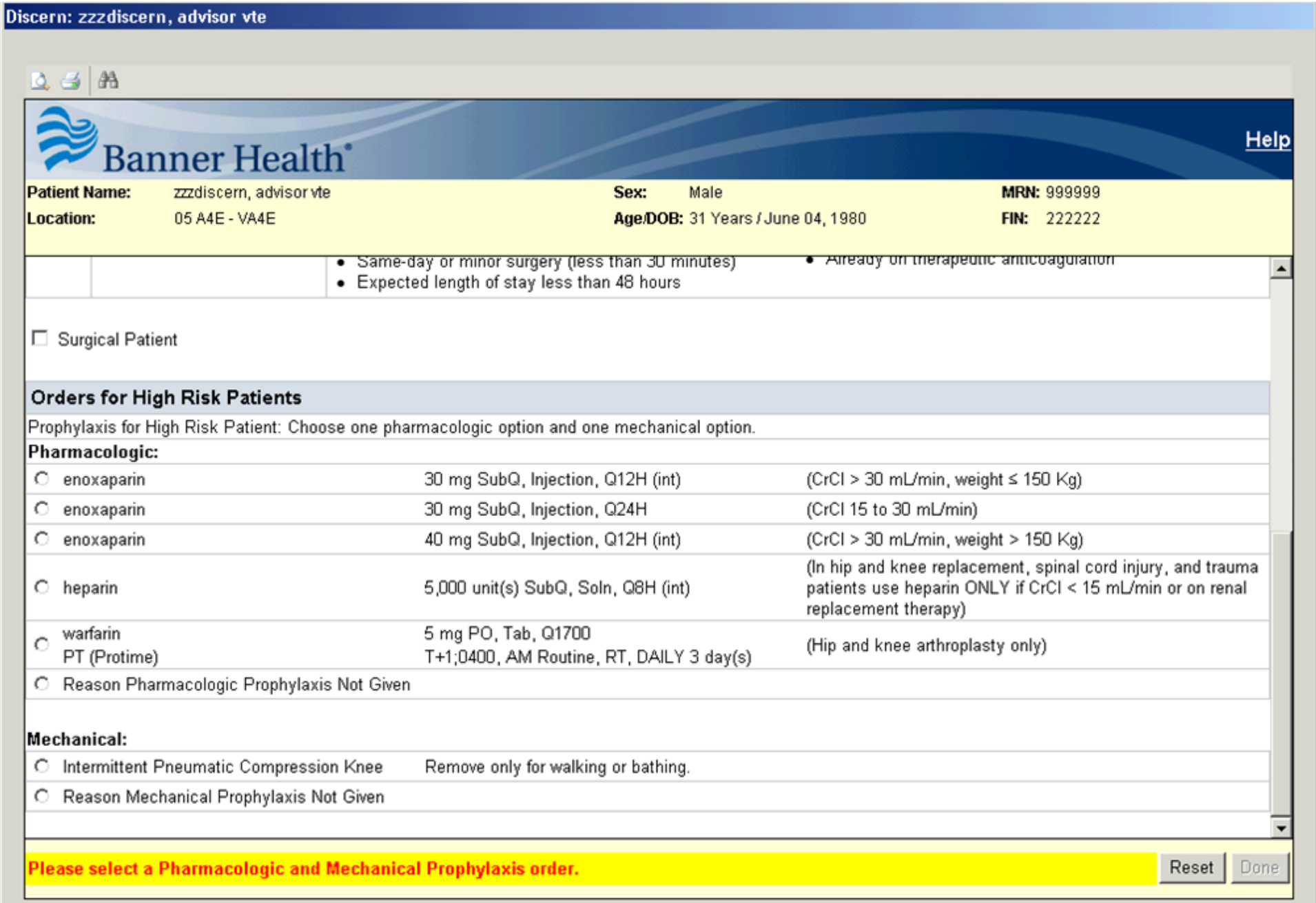
Please Determine and Document appropriately the Risk Profile of this patient based on your clinical assessment and the criteria listed for development of Venous thromboembolism. Place the appropriate prophylactic treatment measure suggested OR document any contraindications that preclude the same.

Patient Weight: 65.000 Kg Patient Creatinine Clearance: 131.20 mL/min

	Risk Level	Risk Factors
○	High Risk	• Elective hip or knee arthroplasty • Hip, pelvic, or severe lower extremity fractures • Acute spinal cord injury with paresis • Multiple major trauma • Morbid obesity (> 150 kg)
○	Moderate Risk	• Inpatient with an Acute Medical Illness **Including but not limited to:** h/o PE or DVT, acute CHF, malignancy, age > 40, pneumonia, cellulitis, BMI > 30, limited mobility, active tobacco use, CVL or PICC line in place, sepsis, ischemic CVA or previous CVA with paresis, recent major surgery (< 3 months), myocardial infarction (< 3 months), varicose veins, acute or chronic lung disease, severe dehydration, IBD, sickle cell disease, nephrotic syndrome, on estrogen based therapy, post partum < 1 month, collagen vascular disease, etc...
○	Low Risk	Less than 5% of inpatients are low risk: • Observation patients • Same-day or minor surgery (less than 30 minutes) • Expected length of stay less than 48 hours • Zero risk factors • Already on therapeutic anticoagulation

Please select the VTE Risk for this patient. Reset Done

High risk requires Pharmacologic and Mechanical prophylaxis



Discern: zzzdiscern, advisor vte

Banner Health

Help

Patient Name: zzzdiscern, advisor vte **Sex:** Male **MRN:** 999999
Location: 05 A4E - VA4E **Age/DOB:** 31 Years / June 04, 1980 **FIN:** 222222

- Same-day or minor surgery (less than 30 minutes)
- Expected length of stay less than 48 hours
- Already on therapeutic anticoagulation

☐ Surgical Patient

Orders for High Risk Patients

Prophylaxis for High Risk Patient: Choose one pharmacologic option and one mechanical option.

Pharmacologic:

○ enoxaparin	30 mg SubQ, Injection, Q12H (int)	(CrCl > 30 mL/min, weight ≤ 150 Kg)
○ enoxaparin	30 mg SubQ, Injection, Q24H	(CrCl 15 to 30 mL/min)
○ enoxaparin	40 mg SubQ, Injection, Q12H (int)	(CrCl > 30 mL/min, weight > 150 Kg)
○ heparin	5,000 unit(s) SubQ, Soln, Q8H (int)	(In hip and knee replacement, spinal cord injury, and trauma patients use heparin ONLY if CrCl < 15 mL/min or on renal replacement therapy)
○ warfarin PT (Protime)	5 mg PO, Tab, Q1700 T+1;0400, AM Routine, RT, DAILY 3 day(s)	(Hip and knee arthroplasty only)
○ Reason Pharmacologic Prophylaxis Not Given		

Mechanical:

○ Intermittent Pneumatic Compression Knee	Remove only for walking or bathing.
○ Reason Mechanical Prophylaxis Not Given	

Please select a Pharmacologic and Mechanical Prophylaxis order.

Reset Done

Discern: zzzdiscern, advisor vte

Banner Health

Help

Patient Name: zzzdiscern, advisor vte **Sex:** Male **MRN:** 999999
Location: 05 A4E - VA4E **Age/DOB:** 31 Years / June 04, 1980 **FIN:** 222222

		• Acute spinal cord injury with paresis
◉	Moderate Risk	• Inpatient with an Acute Medical Illness **Including but not limited to:** h/o PE or DVT, acute CHF, malignancy, age > 40, pneumonia, cellulitis, BMI > 30, limited mobility, active tobacco use, CVL or PICC line in place, sepsis, ischemic CVA or previous CVA with paresis, recent major surgery (< 3 months), myocardial infarction (< 3 months), varicose veins, acute or chronic lung disease, severe dehydration, IBD, sickle cell disease, nephrotic syndrome, on estrogen based therapy, post partum < 1 month, collagen vascular disease, etc...
○	Low Risk	Less than 5% of inpatients are low risk: • Observation patients • Same-day or minor surgery (less than 30 minutes) • Expected length of stay less than 48 hours • Zero risk factors • Already on therapeutic anticoagulation

☐ Surgical Patient

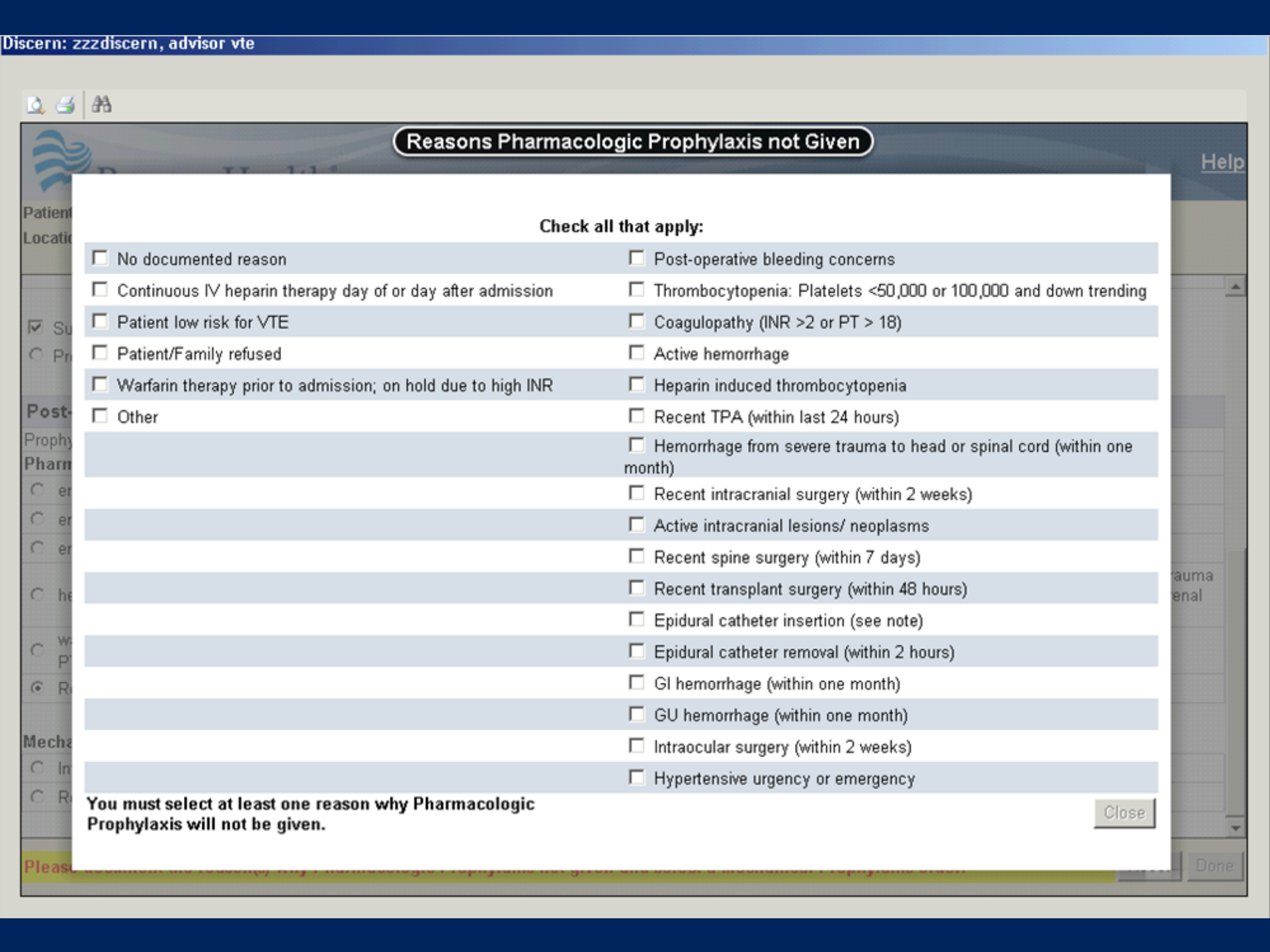
Orders for Moderate Risk Patients

Prophylaxis for Moderate Risk Patient: Choose one pharmacologic option.

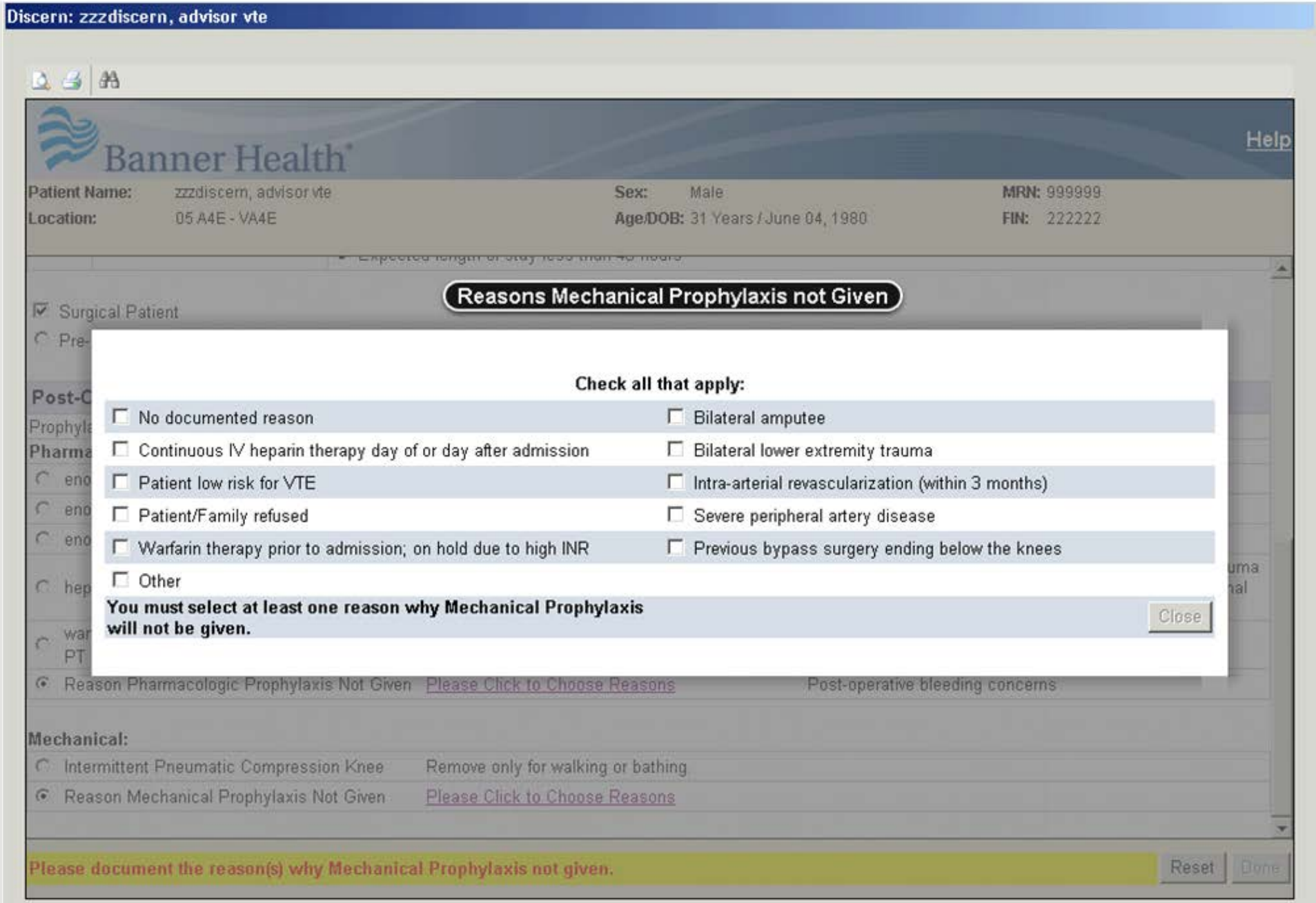
Pharmacologic:

○	enoxaparin	40 mg SubQ, Injection, Q24H	(CrCl > 30 mL/min, weight ≤ 150 Kg)
○	enoxaparin	40 mg SubQ, Injection, Q12H (int)	(CrCl > 30 mL/min, weight > 150 Kg)
○	enoxaparin	30 mg SubQ, Injection, Q24H	(CrCl 15 to 30 mL/min)
○	heparin	5,000 unit(s) SubQ, Soln, Q8H (int)	(Recommended if CrCl < 15 mL/min)
○	Reason Pharmacologic Prophylaxis Not Given		

Please select a Pharmacologic Prophylaxis order. Reset Done


Discern: zzzdiscern, advisor vte
Reasons Pharmacologic Prophylaxis not Given
Help
Check all that apply:
No documented reason
Continuous IV heparin therapy day of or day after admission
Patient low risk for VTE
Patient/Family refused
Warfarin therapy prior to admission; on hold due to high INR
Other
Post-operative bleeding concerns
Thrombocytopenia: Platelets <50,000 or 100,000 and down trending
Coagulopathy (INR >2 or PT > 18)
Active hemorrhage
Heparin induced thrombocytopenia
Recent TPA (within last 24 hours)
Hemorrhage from severe trauma to head or spinal cord (within one month)
Recent intracranial surgery (within 2 weeks)
Active intracranial lesions/ neoplasms
Recent spine surgery (within 7 days)
Recent transplant surgery (within 48 hours)
Epidural catheter insertion (see note)
Epidural catheter removal (within 2 hours)
GI hemorrhage (within one month)
GU hemorrhage (within one month)
Intraocular surgery (within 2 weeks)
Hypertensive urgency or emergency
You must select at least one reason why Pharmacologic Prophylaxis will not be given.
Close
Done

Mechanical Contraindication Reasons



Carve Outs ?

- Orthopedics, depending on local culture / practice
- OB – GYN
- Elective CV surgery (with mobility program and no complications)

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Contraindications and leeway times

Need definitions, but conserve real estate

Contraindications or other Conditions to Consider with Pharmacologic VTE Prophylaxis		
❑ **ABSOLUTE** ▪ Active hemorrhage ▪ Severe trauma to head or spinal cord *with hemorrhage* in the last 4 weeks ▪ Other_____	❑ **RELATIVE** ▪ Intracranial hemorrhage within last year ▪ Craniotomy within 2 weeks ▪ Intraocular surgery within 2 weeks ▪ GI, GU hemorrhage within the last month ▪ Thrombocytopenia (<50K) or coagulopathy (PT > 18 seconds) ▪ End stage liver disease ▪ Active intracranial lesions/neoplasms ▪ Hypertensive urgency / emergency ▪ Post-operative bleeding concerns*	❑ **OTHER CONDITION** ▪ Immune mediated HIT ▪ Epidural analgesia with spinal catheter (current or planned)

*Scheduled return to OR within the next 24 hours *Major Ortho, general surgery: 24 hours leeway
*Spinal cord or Ortho Spine: 7 days leeway s/p transplant, s/p Trauma admission: 48 hours leeway

Also: How will you define “ambulatory”?

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Simplifying Thromboprophylaxis

Patient Group	Prophylaxis	Duration
Medical	LMWH or UFH	Discharge
General surgical	LMWH or UFH	Discharge
Orthopedics	LMWH Rivaroxaban plus mech	25 days 15 days
Trauma / SCI	LMWH plus mech	Rehab discharge
ICU	LMWH plus mech	discharge
High bleeding risk	Mechanical until risk diminishes, then LMWH	

Q & A on

VTE Protocol Design and Implementation

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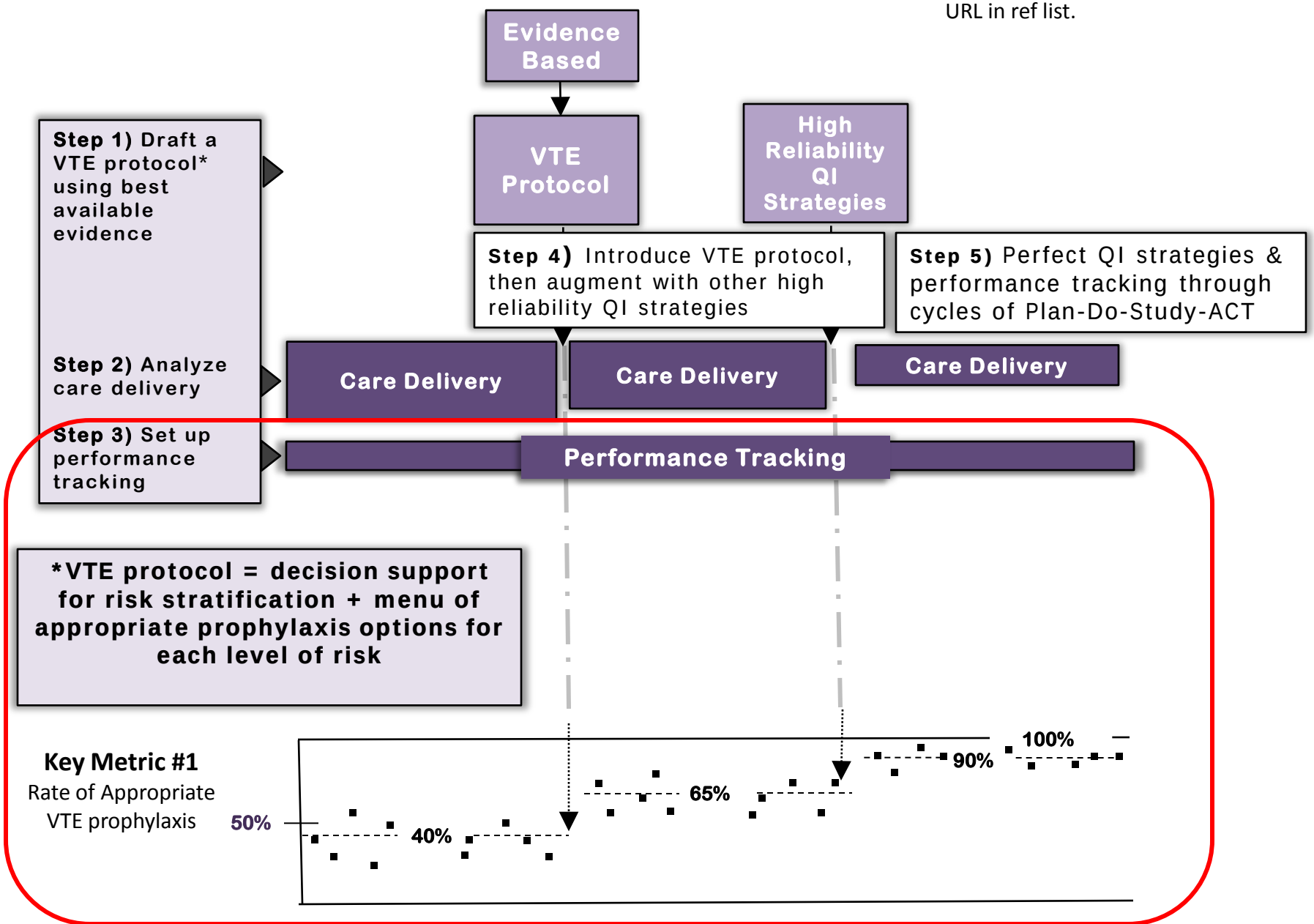
A Framework for Quality Improvement

Maynard G, Stein J. Agency for Healthcare Research and Quality. August 2008.
URL in ref list.



Next:

Intro to measurement –

Issues for you to munch on over lunch

- How will you know if you are making a difference or not?
- Think about SCIP measures, TJC measures for measuring VTE prophylaxis
- Think about how best to measure outcomes of HA VTE, and how that compares with currently used metrics.

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Let's critique these measures

HAC/Topic (# Hospitals partic. as of 4/30/12)	Meaure Type	Performance Measure Name	Required vs. Optional	Numerator Definition	Denominator Definition
VTE (37)	Process 1	Venous Thromboembolism Prophylaxis (VTE-1)	Required	Patients who received VTE prophylaxis or have documentation why no VTE prophylaxis was given	All patients
	Process 2	Surgery Patients Who Received Appropriate VTE Prophylaxis Within 24 Hours Prior to Surgery to 24 Hours After Surgery (SCIP-VTE-2)	Required	Surgery patients who received appropriate VTE prophylaxis within 24 hours prior to Anesthesia Start Time to 24 hours after Anesthesia End Time	All selected surgery patients
	Outcome	Incidence of Potentially-Preventable VTE (VTE-6)	Required	Patients who received no VTE prophylaxis prior to the VTE diagnostic test order date	Patients who developed confirmed VTE during hospitalization

How should you track and trend these key metrics?

- Prevalence of adequate VTE prophylaxis
- Incidence of HA VTE
- How does this compare to currently available measures?
- How would you best communicate progress back to front line?
- What other measures might be useful?
- Will your measures actually drive QI?

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Focus on Metrics:
Performance Tracking

A. Selecting Metrics
B. Effective Data Collection
C. Effective Data Display (Run Charts)

Where discoveries are delivered.℠

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Let's critique these measures

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	Outcome	Incidence of Potentially-Preventable VTE (VTE-6)	Required	Patients who received no VTE prophylaxis prior to the VTE diagnostic test order date	Patients who developed confirmed VTE during hospitalization

Thoughts on outcomes measure for HA VTE and Preventable VTE?

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Thoughts on outcomes measure for HA VTE and Preventable VTE -

- Real time capture using imaging system, and concurrent review of cases to see if they are HA or community acquired, preventable / not preventable. Not practical for most, but may be gold standard.

- Improved methodology using administrative data outlined in hand out.
  - Captures readmitted patients as well as those with POA = No
  - Captures UE DVT, but tracks them separately
  - Higher bar for ‘preventable’
  - Audits to validate coding

- Report cases regularly, add stories, use peer review

- SPC charts, have a denominator

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UC San Diego Numbers -

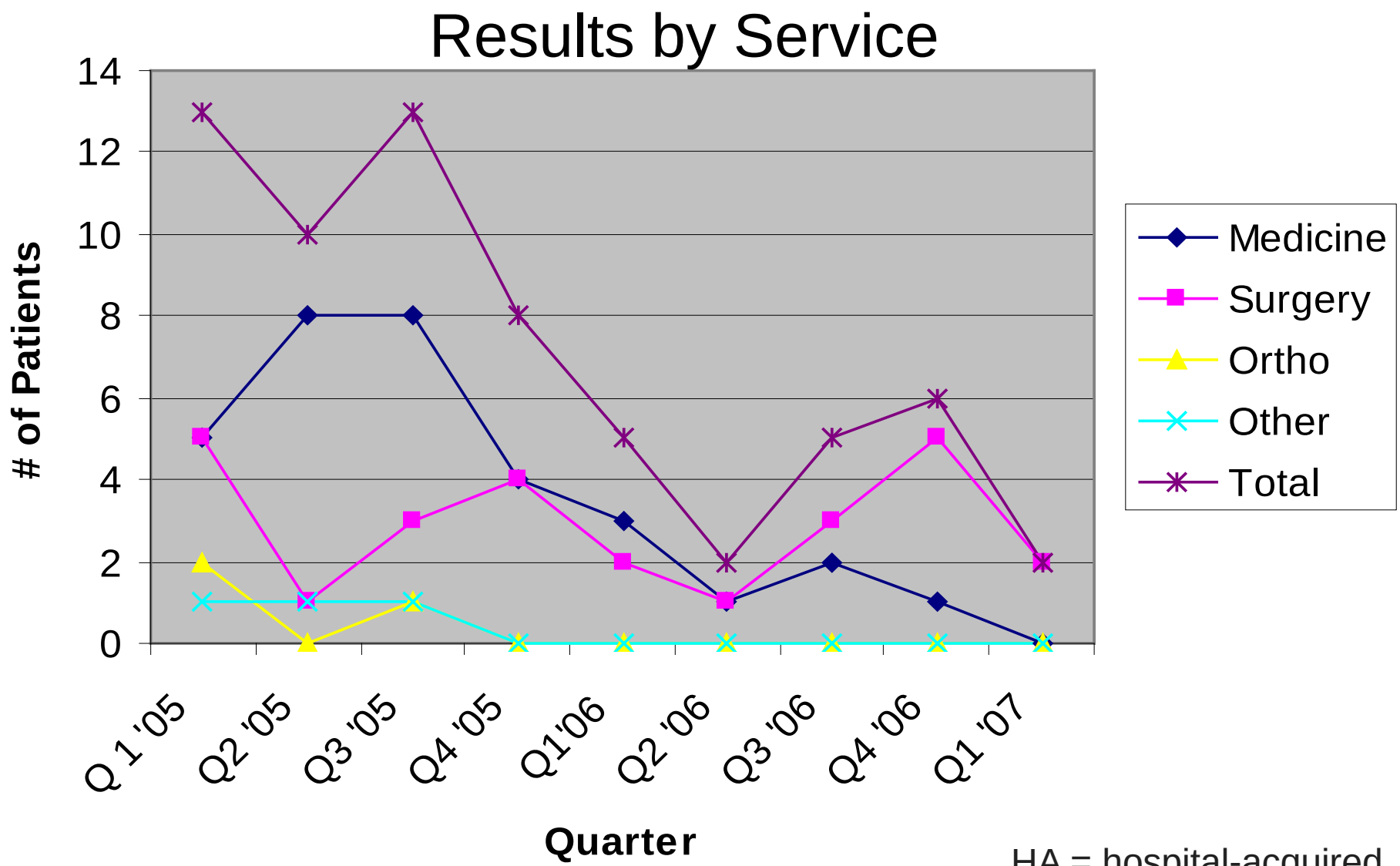
Patients Discharged with DVT/PE
10/01/2009 - 12/31/2010

Patients Discharged with DVT/PE
10/01/2009 - 12/31/2010

Year/Quarter	Total DCs	Total DCs LOS	Total Cases - DVT/PE	Total Cases - DVT/PE %	POA = Y DVT/PE	POA = Y + Prior Visit DVT/PE	POA = N DVT/PE	HA - DVT/PE	HA - DVT/PE %
20094	6,049	5.3	145	2.4%	98	22	25	47	32.4%
20101	6,050	5.1	111	1.8%	71	27	13	40	36.0%
20102	6,063	5.3	109	1.8%	68	21	20	41	37.6%
20103	6,561	4.9	130	2.0%	81	34	15	49	37.7%
20104	6,570	5.2	109	1.7%	60	28	21	49	45.0%
Grand Total	**31,293**	**5.2**	**604**	**1.9%**	**378**	**132**	**94**	**226**	**37.4%**

Year/Quarter	Cases	Readmissions	Readmissions %	DC Dead	DC Dead %	LOS	UE DVT	LE DVT	PE
20094	47	7	14.9%	6	12.8%	16.5	10	26	15
20101	40	14	35.0%	1	2.5%	12.0	10	23	13
20102	41	6	14.6%	1	2.4%	22.0	8	24	11
20103	49	9	18.4%	4	8.2%	12.8	12	19	23
20104	49	15	30.6%	3	6.1%	13.6	13	21	21
Grand Total	**226**	**51**	**22.6%**	**15**	**6.6%**	**15.3**	**53**	**113**	**83**

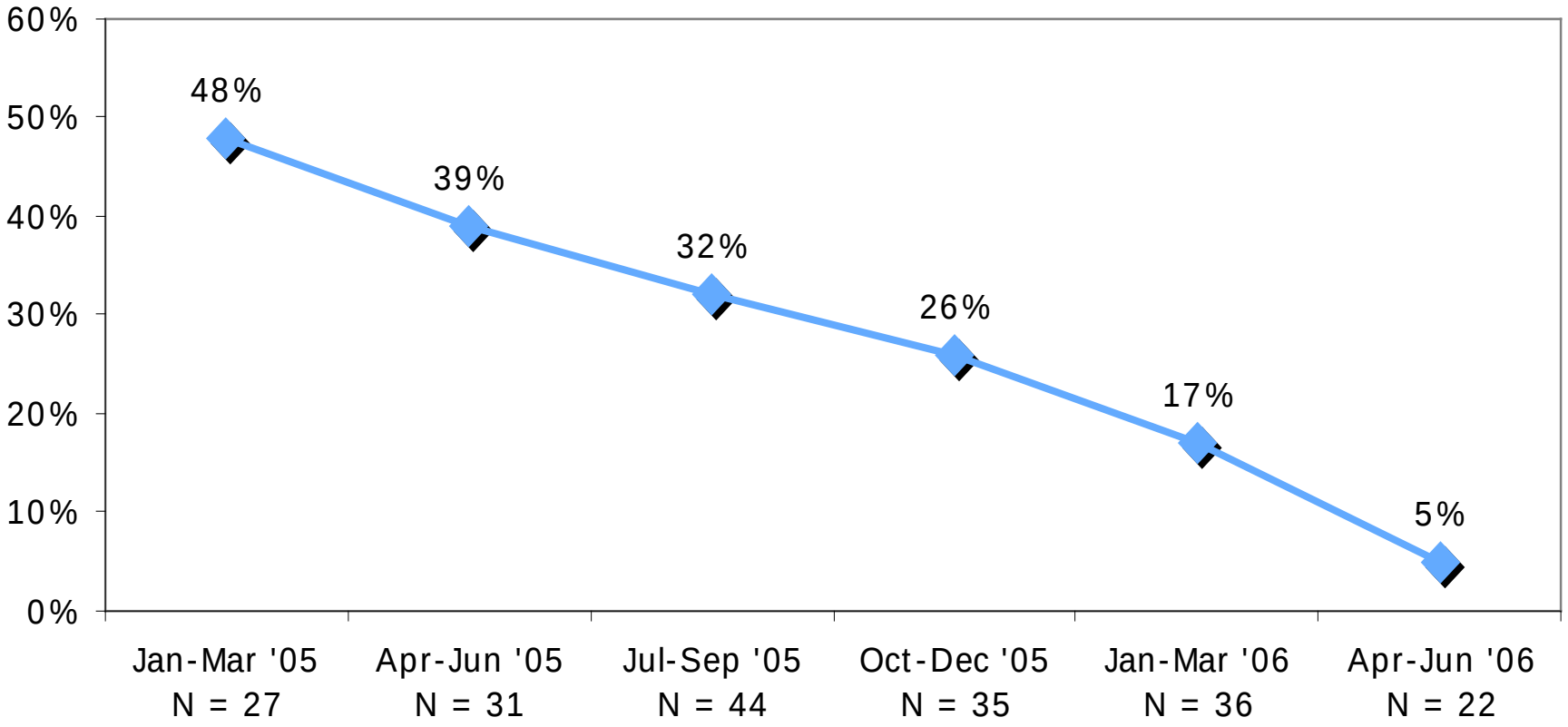
UCSD - Decrease in Patients with Preventable HA VTE



HA = hospital-acquired

Maynard G et al. *J Thromb Thrombolysis.* 2010; 29:159-66.

Percent of “Preventable” HA VTE



Thoughts on measuring adequate VTE prophylaxis?

- TJC measures?
- SCIP measures?
- Order set utilization?
- Other measures?

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TJC and SCIP

- Relatively low bar
- Does not drive rapid cycle QI
- Looks only at set points in hospitalization
  - Does not address patients who “fall off” protocol
- TJC measures: any prophylaxis = adequate prophylaxis

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VTE Prophylaxis Audits

Assessing Prevalence of Adequate VTE Prophylaxis

- Order set use
- Detailed audits based on your protocol
- Less detailed audits
  - (Red / Yellow / Green strategy)

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Audits - Order Set Use

Pros

- Easy to collect data
- Assesses integration of order set into admission / transfer orders
- With CPOE, can generate / collect more data from orders in automated fashion

Cons

- A crude measure
- Does not tell you if order set is being used correctly

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Audits - Detailed Audits

Pros

- Most accurate assessment of appropriate / adequate VTE prophylaxis, provides leeway for and takes into account , anticoagulant contraindications, level of VTE risk
- Assess integration of order set into admission / transfer orders

Cons

- Need sampling methods
- Involve paper-based information retrieval
- Too labor-intensive to review >5-10 cases/week
- Require dedicated resources to perform task well
- Require data entry

Recommended Strategy for Adequacy of VTE Prophylaxis in Multi-site Improvement Efforts
Red / Yellow / Green Strategy

- Data collection relatively easy to do
- Amenable to automation
- Feasibility of including the entire population
- Can spur action (actionable) in real time
- More detail on selected patients on contraindications and VTE risk level can give good estimates of Appropriate / Adequate VTE prophylaxis rates.

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Situational Awareness and Measure-vention: Getting to 95%

- Identify patients on no anticoagulation
- Empower nurses to place mechanical prophylaxis.
- Contact MD if no anticoagulant in place and no obvious contraindication
  - Templated note, text page, etc
- Back up these interventions
  - Docs cannot “shoot the messenger”

Maynard G, Stein J. Designing and Implementing Effective VTE Prevention Protocols: Lessons from Collaboratives. J Thromb Thrombolysis 2010 Feb:29(2):159-166.

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UCSD 28 patients: 20 on anticoagulation

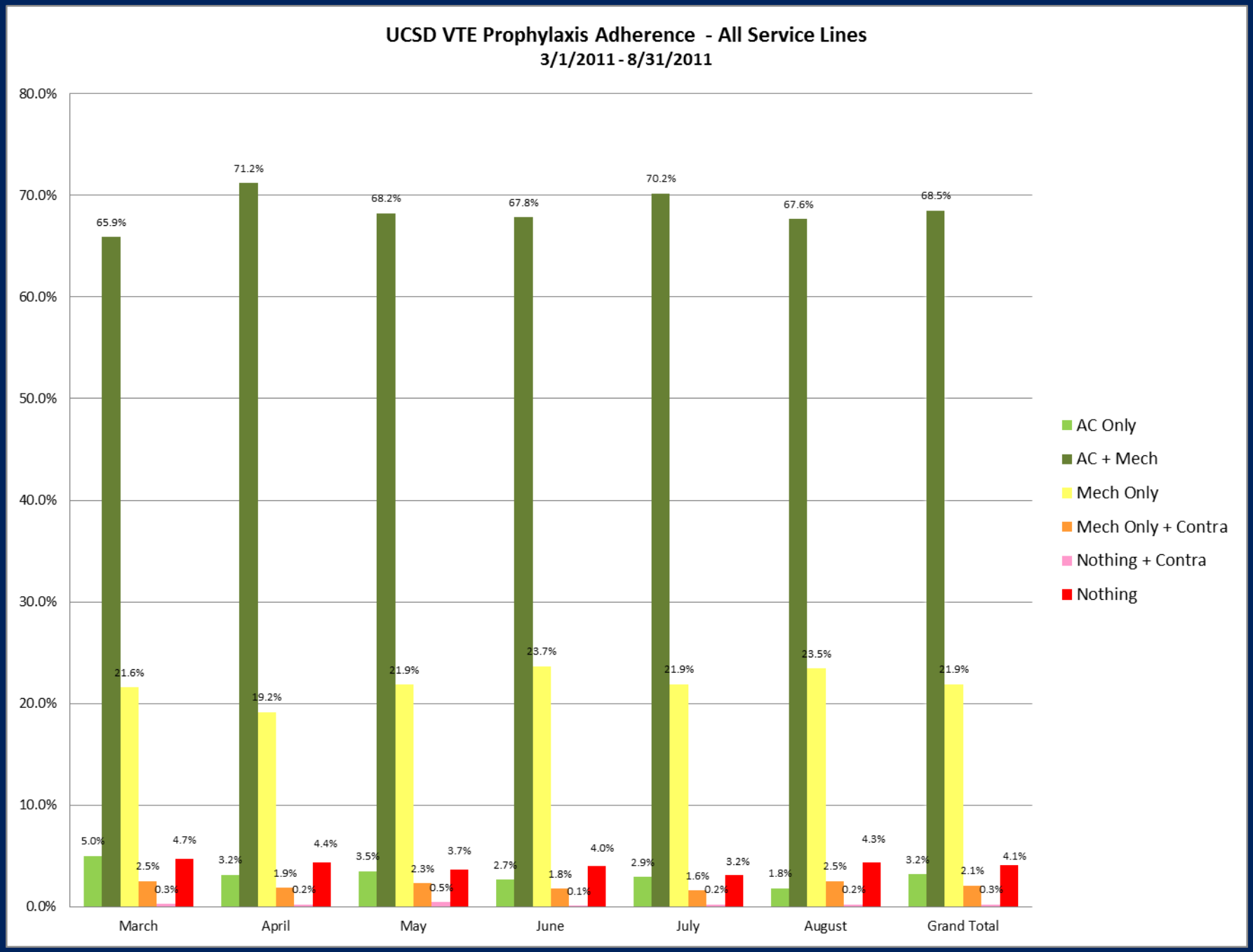
4 on mechanical prophylaxis with lab contraindication

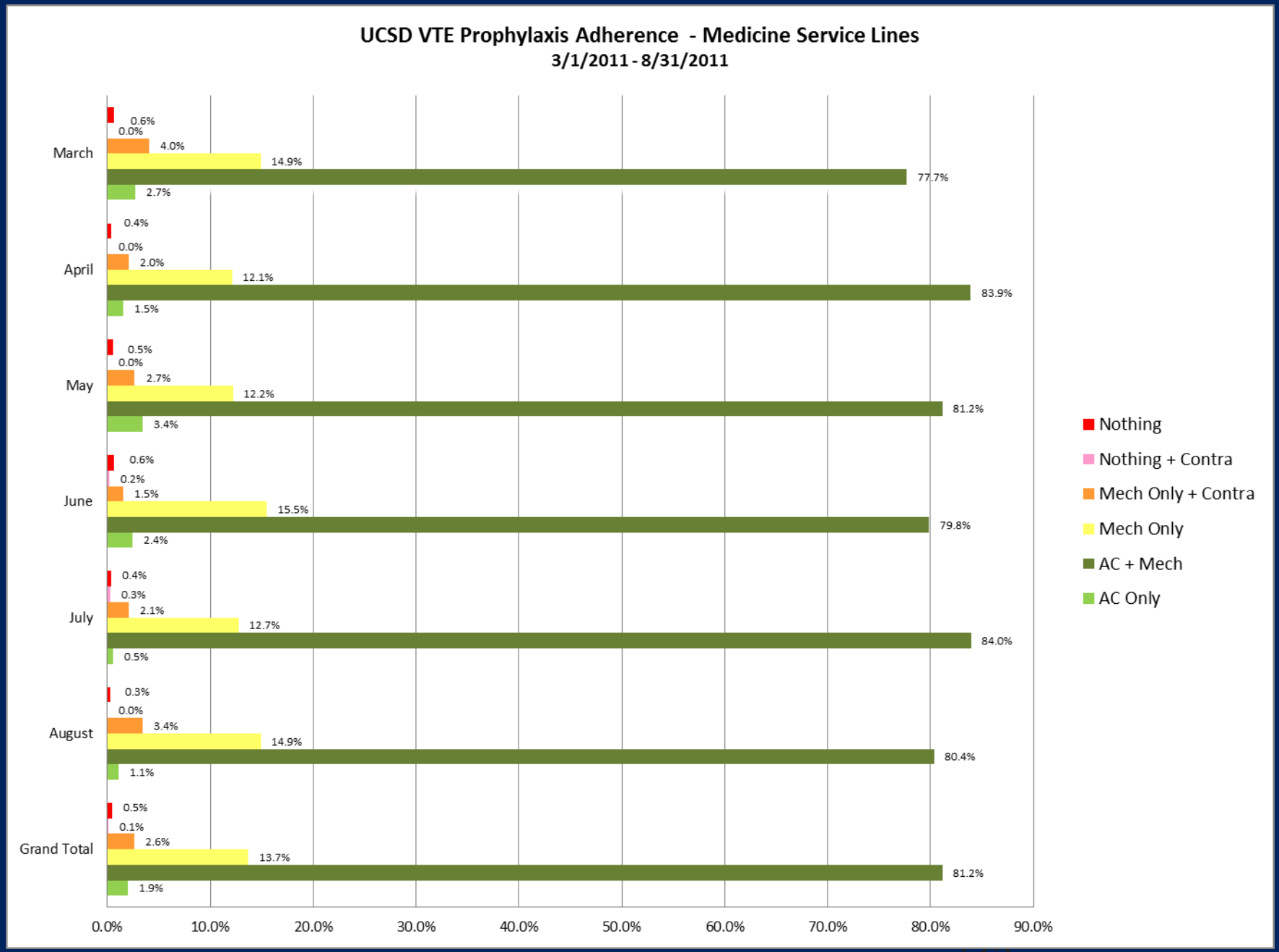
3 on Nothing (RED) 1 mechanical

BED_LABEL	Service	VTE Risk Category	Medication	Dose	SCD	Lab Contra	Orders state contra	Orders state LOW VTE Risk
2250A	Medicine Thornton	LOW	warfarin (COUMADIN) tablet 3 mg	3 mg EVERY EVENING Oral	Y	N	N	Y
2250B	Medicine Thornton	MODERATE	enoxaparin (LOVENOX) injection 30 mg	30 mg DAILY Subcutaneous	Y	N	N	N
2251	Medicine Thornton	MODERATE	heparin injection 5,000 Units	5000 Units EVERY 12 HOURS Su	Y	N	N	N
2252	Cardiothoracic Surgery	MODERATE/HIGH	No Anticoag Med	No Anticoag Dose	Y	Y	N	Y
2253	Medicine Thornton	MODERATE	enoxaparin (LOVENOX) injection 40 mg	40 mg DAILY Subcutaneous	Y	Y	N	N
2254	Medicine Thornton	MODERATE	heparin injection 5,000 Units	5000 Units EVERY 8 HOURS Sub	Y	N	N	N
2255	Medicine Thornton	MODERATE	heparin injection 5,000 Units	5000 Units EVERY 12 HOURS Su	Y	N	N	N
2256A	Medicine Thornton	MODERATE	enoxaparin (LOVENOX) injection 40 mg	40 mg DAILY Subcutaneous	Y	N	N	N
2256B	Pulmonary Vascular Medicine	MODERATE/HIGH	enoxaparin (LOVENOX) injection 50 mg	50 mg EVERY 12 HOURS Subcut	Y	Y	N	N
2257A	Medicine Thornton	MODERATE	enoxaparin (LOVENOX) injection 40 mg	40 mg DAILY Subcutaneous	Y	N	N	N
2257B	Gynecology	MODERATE/HIGH	No Anticoag Med	No Anticoag Dose	Y	Y	N	N
2258	Medicine Thornton	MODERATE	enoxaparin (LOVENOX) injection 30 mg	30 mg DAILY Subcutaneous	Y	N	N	Y
2259	Medicine Thornton	MODERATE	No Anticoag Med	No Anticoag Dose	Y	N	N	N
2260	Pulmonary/Critical Care	LOW	No Anticoag Med	No Anticoag Dose	N	N	N	Y
2261	Medicine Thornton	MODERATE/HIGH	No Anticoag Med	No Anticoag Dose	Y	Y	N	N
2262A	Medicine Thornton	LOW	enoxaparin (LOVENOX) injection 40 mg	40 mg DAILY Subcutaneous	Y	N	N	Y
2262B	Medicine Thornton	MODERATE	enoxaparin (LOVENOX) injection 40 mg	40 mg DAILY Subcutaneous	Y	N	N	N
2263	Medicine Thornton	MODERATE/HIGH	No Anticoag Med	No Anticoag Dose	Y	Y	N	N
2264	Pulmonary Vascular Medicine	MODERATE	warfarin (COUMADIN) tablet 5 mg	5 mg EVERY EVENING Oral	Y	Y	N	Y
2265	Pulmonary Vascular Medicine	LOW	heparin injection 5,000 Units	5000 Units EVERY 8 HOURS Sub	Y	N	N	Y
2265	Pulmonary Vascular Medicine	LOW	warfarin (COUMADIN) tablet 10 mg	10 mg EVERY EVENING Oral	Y	N	N	Y
2266	Medicine Thornton	MODERATE	heparin injection 5,000 Units	5000 Units EVERY 8 HOURS Sub	Y	N	N	N
2267	Pulmonary Vascular Medicine	HIGH	enoxaparin (LOVENOX) injection 100 mg	100 mg EVERY 12 HOURS Subcu	Y	Y	N	Y
2268	Cardiothoracic Surgery	LOW	enoxaparin (LOVENOX) injection 40 mg	40 mg DAILY Subcutaneous	Y	N	N	Y
2269	Cardiothoracic Surgery	No Risk Category	No Anticoag Med	No Anticoag Dose	N	N	N	N
2270	Cardiothoracic Surgery	No Risk Category	No Anticoag Med	No Anticoag Dose	N	N	N	N
2271	Medicine Thornton	MODERATE	heparin injection 5,000 Units	5000 Units EVERY 12 HOURS Su	Y	N	N	N
2272	Pulmonary Vascular Medicine	HIGH	fondaparinux (ARIXTRA) injection 7.5 mg	7.5 mg DAILY Subcutaneous	Y	Y	N	Y

AC + Mech	186
AC + Mech %	54.2%
AC Only	2
AC Only %	0.6%
Mech Only + Contra	30
Mech Only + Contra %	8.7%
Mech Only	113
Mech Only %	32.9%
Nothing + Contra	0
Nothing + Contra %	0.0%
Nothing	12
Nothing %	3.5%
Contra	30
Contra %	8.7%
Non-Compliant + INR >= 2.0	12
Non-Compliant + INR >= 2.0 %	7.7%
Non-Compliant + Plt Count < 50,000	18
Non-Compliant + Plt Count < 50,000 %	11.6%
Non-Compliant + HgB < 8.0	2
Non-Compliant + HgB < 8.0 %	1.3%
Low	53
Low %	15.5%
Moderate	275
Moderate %	80.2%
High	11
High %	3.2%
No Risk Category	4
No Risk Category %	1.2%
Denominator	343

Summary Report from one day


UCSD VTE Prophylaxis Adherence - All Service Lines
3/1/2011 - 8/31/2011
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
65.9%
71.2%
68.2%
67.8%
70.2%
67.6%
68.5%
21.6%
19.2%
21.9%
23.7%
21.9%
23.5%
21.9%
5.0%
2.5%
0.3%
4.7%
3.2%
1.9%
0.2%
4.4%
3.5%
2.3%
0.5%
3.7%
2.7%
1.8%
0.1%
4.0%
2.9%
1.6%
0.2%
3.2%
1.8%
2.5%
0.2%
4.3%
3.2%
2.1%
0.3%
4.1%
March
April
May
June
July
August
Grand Total
AC Only
AC + Mech
Mech Only
Mech Only + Contra
Nothing + Contra
Nothing


UCSD VTE Prophylaxis Adherence - Medicine Service Lines
3/1/2011 - 8/31/2011
March
0.6%
0.0%
4.0%
14.9%
77.7%
2.7%
April
0.4%
0.0%
2.0%
12.1%
83.9%
1.5%
May
0.5%
0.0%
2.7%
12.2%
81.2%
3.4%
June
0.6%
0.2%
1.5%
15.5%
79.8%
2.4%
July
0.4%
0.3%
2.1%
12.7%
84.0%
0.5%
August
0.3%
0.0%
3.4%
14.9%
80.4%
1.1%
Grand Total
0.5%
0.1%
2.6%
13.7%
81.2%
1.9%
0.0%
10.0%
20.0%
30.0%
40.0%
50.0%
60.0%
70.0%
80.0%
90.0%
Nothing
Nothing + Contra
Mech Only + Contra
Mech Only
AC + Mech
AC Only

Digging Deeper on “Yellow” Patients

Is patient low risk?

- Ambulating Independently with 0-1 VTE Risk Factors
- Expected LOS <48 hours
- Minor Surgery with NO VTE Risk Factors

✓ *If yes, prophylaxis adequate, if no…..*

Obvious contraindication to pharmacologic prophylaxis?

- Active hemorrhage now or within last 3 days
- Post operative bleeding concerns
- Platelet count < 50,000 Units
- INR > 1.8
- Known bleeding disorder, post op bleeding high risk
- Hgb < 8.0 g/dL
- Concern over CNS bleeding (brain or spinal cord surgery in last week, recent intracranial hemorrhage, proximity in time to epidural insertion or removal, for example)
- Hypertensive urgency / emergency
- Comfort care only patient

✓ *If yes, mechanical prophylaxis alone adequate, if no, prophylaxis inadequate*

UC San Diego
HEALTH SCIENCES

Add Third Query for “Red” Patients

Does patient have any obvious contraindication to mechanical prophylaxis?

- Documented refusal
- Peripheral arterial disease / ischemia of the legs / feet
- Open wounds / ulcerations of both legs
- Other

If no, lack of mechanical prophylaxis inadequate

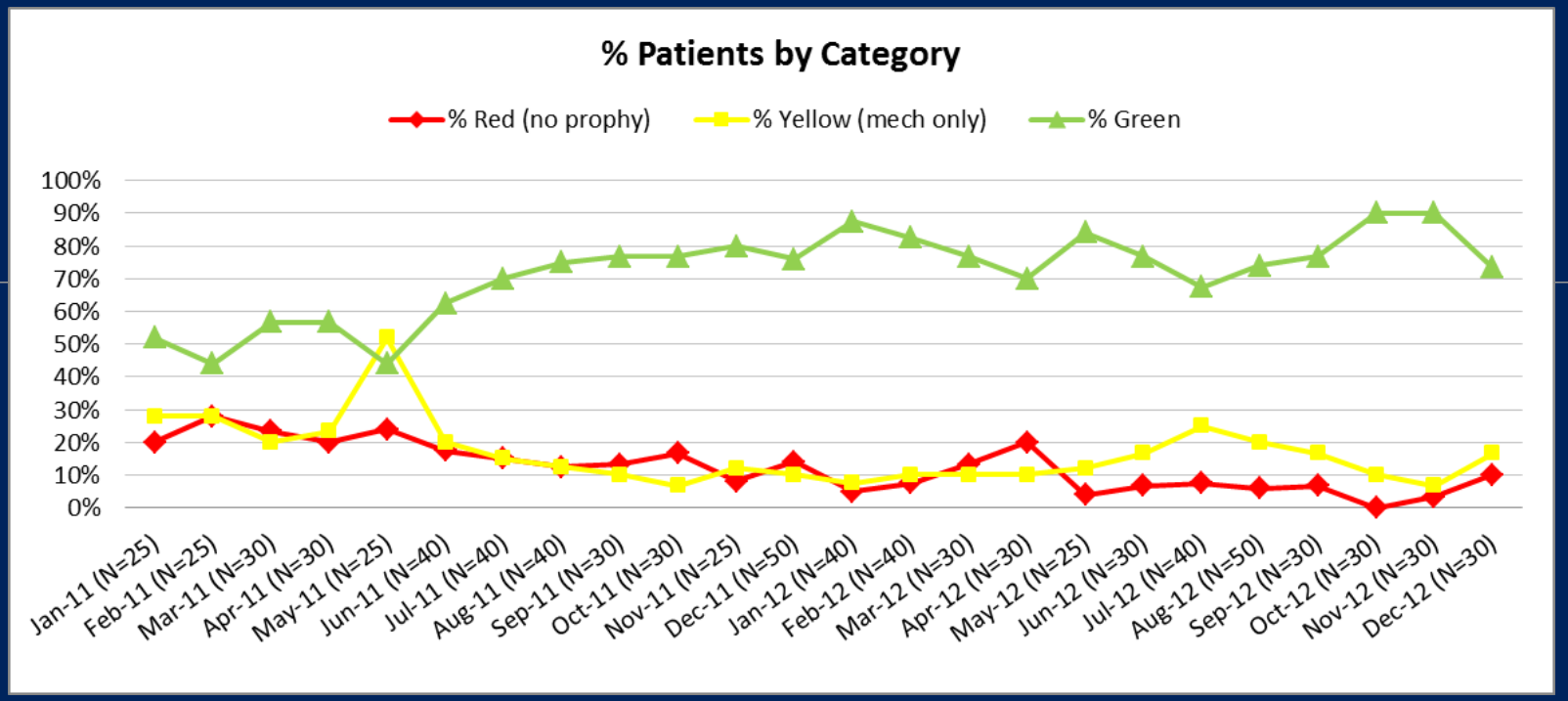
UC San Diego
Health Sciences

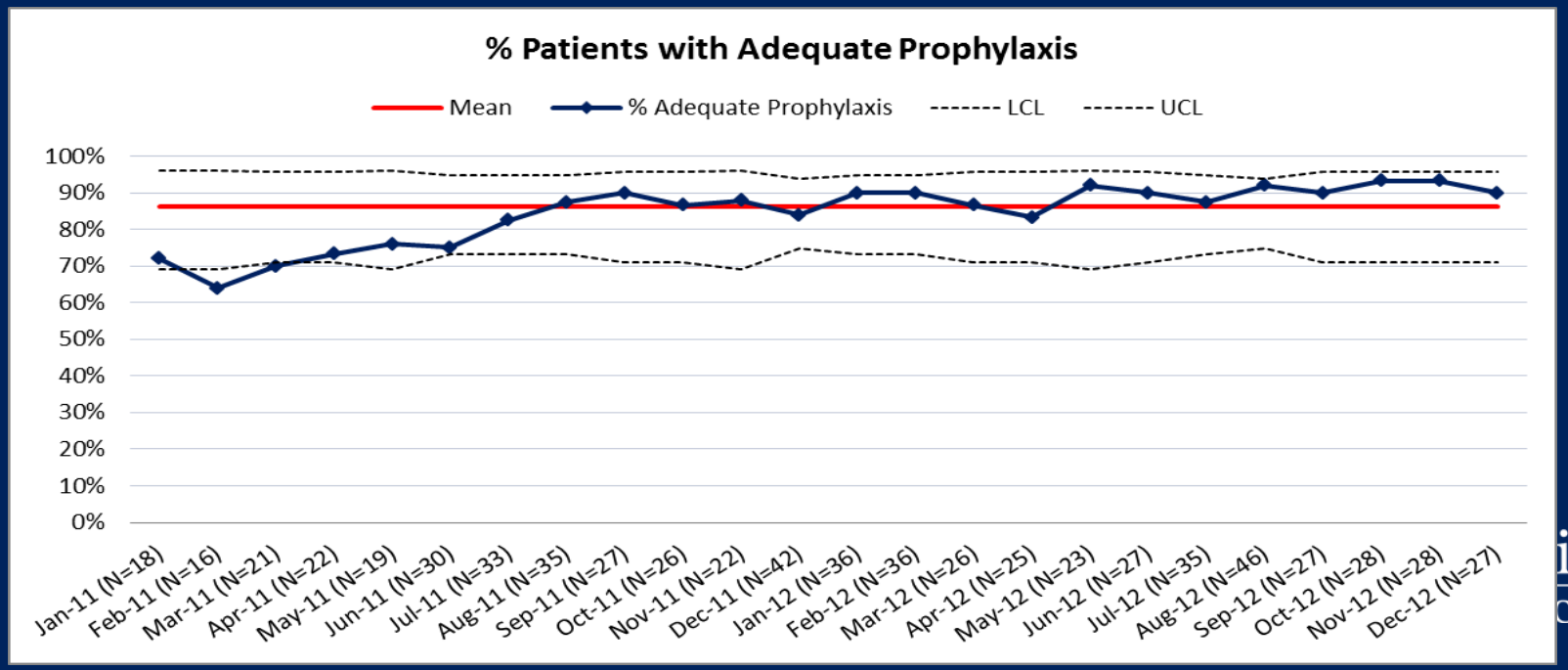
A Different University Med Center - Medicine Audits

VTE Risk Assessment	Mechanical prophylaxis initially administered	Chemical Prophylaxis initially administered	Contraindication: Is there documentation why prophylaxis was not administered	Date of initial VTE prophylaxis administered after hospital admission	Was the patient admitted or transferred to ICU	Date of ICU admit or transfer	Date patient was discharged from ICU, left AMA or expired	ICU Mechanical prophylaxis initially administered	ICU Chemical Prophylaxis initially administered	Category	Adequate Prophylaxis	Was a surgical procedure performed	Anesthesia Start date	Anesthesia End date	Was Surgical procedure performed the day of or the day after ICU admit or transfer
Moderate	4. None of above/UTD	4. None of above/UTD	No		2. No					D	No	2. No			
Moderate	4. None of above/UTD	4. None of above/UTD	No		2. No					D	No	2. No			
Moderate	1. Seq Comp device	4. None of above/UTD	Yes	1/16/2011	2. No					E	Yes	2. No			
Moderate	4. None of above/UTD	1. Low dose unfrac heparin		4/16/2011	2. No					E	Yes	2. No			
None	4. None of above/UTD	4. None of above/UTD	No		2. No					D	No	2. No			
Moderate	4. None of above/UTD	4. None of above/UTD	No		2. No					D	No	2. No			
Moderate	4. None of above/UTD	4. None of above/UTD	No		2. No					D	No	2. No			
Moderate	4. None of above/UTD	1. Low dose unfrac heparin		4/23/2011	2. No					E	Yes	1. Yes	4/28/2011	4/28/2011	
Moderate	1. Seq Comp device	1. Low dose unfrac heparin		4/19/2011	2. No					E	Yes	2. No			
None	4. None of above/UTD	4. None of above/UTD	No		2. No					D	No	2. No			
None	1. Seq Comp device	4. None of above/UTD	No	1/8/2011	2. No					E	No (High risk)	2. No			
Moderate	1. Seq Comp device	4. None of above/UTD	No	1/27/2011	2. No					E	No	2. No			
Moderate	1. Seq Comp device	4. None of above/UTD	pt refused		2. No					D	No	1. Yes	6/6/2011	6/6/2011	
None	4. None of above/UTD	4. None of above/UTD	No		2. No					D	No	2. No			
Moderate	4. None of above/UTD	2. Low molecular wgt heparin		4/21/2011	2. No					E	Yes	2. No			
Moderate	1. Seq Comp device	4. None of above/UTD	No	2/21/2011	2. No					E	No	2. No			
Low	4. None of above/UTD	4. None of above/UTD	No		2. No					D	No	2. No			
Moderate	1. Seq Comp device	4. None of above/UTD	Yes	1/24/2011	2. No					E	Yes	2. No			
Moderate	4. None of above/UTD	4. None of above/UTD	Yes		2. No					D	Yes	2. No			
Moderate	1. Seq Comp device	4. None of above/UTD	Yes	4/25/2011	2. No					E	Yes	2. No			
Moderate	1. Seq Comp device	4. None of Above/UTD	Yes	2/3/2011	1. Yes	2/3/2011	2/24/2011	1. Seq Comp device	4. None of Above/UTD	E	Yes	2. No			
None	1. Seq Comp device	4. None of Above/UTD		1/1/2011	1. Yes	1/1/2011	1/4/2011	1. Seq Comp device	4. None of Above/UTD	E	No	2. No			
Moderate	4. None of above/UTD	4. None of above/UTD	pt refused		1. Yes	3/23/2011	3/24/2011	4. None of above/UTD	4. None of above/UTD	D	No	2. No			
None	1. Seq Comp device	2. Low molecular wgt heparin + Warfarin		1/5/2011	1. Yes	1/5/2011	1/6/2011	1. Seq Comp device	2. Low molecular wgt heparin + warf	E	Yes	2. No			
Moderate	4. None of above/UTD	4. None of Above/UTD	No		1. Yes	5/15/2011	5/17/2011	4. None of above/UTD	4. None of Above/UTD	E	No	2. No			
Low	1. Seq Comp device	2. Low molecular wgt heparin		6/26/2011	1. Yes	6/29/2011	7/2/2011	1. Seq Comp device	2. Low molecular wgt heparin	E	Yes	2. No			
Moderate	1. Seq Comp device	4. None of Above/UTD	Yes	6/15/2011	1. Yes	6/15/2011	6/16/2011	1. Seq Comp device	4. None of Above/UTD	E	Yes	2. No			
Moderate	1. Seq Comp device	1. Low dose unfrac heparin	No	5/8/2011	1. Yes	5/8/2011	5/9/2011	1. Seq Comp device	1. Low dose unfrac heparin	E	Yes	2. No			
Low	1. Seq Comp device	1. Low dose unfrac heparin	MD enter no risk	2/1/2011	1. Yes	2/1/2011	3/3/2011	1. Seq Comp device	1. Low dose unfrac heparin	E	Yes	2. No			
Moderate	1. Seq Comp device	2. Low molecular wgt heparin		1/24/2011	1. Yes	1/23/2011	1/27/2011	1. Seq Comp device	2. Low molecular wgt heparin	E	Yes	1. Yes	6/17/2011	6/17/2011	1. Yes
Moderate	1. Seq Comp device	1. Low dose unfrac heparin		3/12/2011	1. Yes	3/12/2011	3/14/2011	1. Seq Comp device	1. Low dose unfrac heparin	E	Yes	2. No			
Moderate	1. Seq Comp device	4. None of Above/UTD		4/3/2011	1. Yes	4/7/2011	4/11/2011	1. Seq Comp device	4. None of Above/UTD	E	No	2. No			
None	1. Seq Comp device	4. None of Above/UTD	Yes	1/6/2011	1. Yes	1/6/2011	1/7/2011	1. Seq Comp device	4. None of Above/UTD	E	Yes	2. No			
None	1. Seq Comp device	4. None of Above/UTD	Yes	5/21/2011	1. Yes	5/22/2011	5/24/2011	1. Seq Comp device	4. None of Above/UTD	E	Yes	1. Yes	6/8/2011	6/8/2011	1. Yes
High	1. Seq Comp device	4. None of Above/UTD	Yes	5/12/2011	1. Yes	5/12/2011	5/15/2011	1. Seq Comp device	4. None of Above/UTD	E	Yes	2. No			
Moderate	1. Seq Comp device	4. None of Above/UTD	No	6/4/2011	1. Yes	6/4/2011	6/11/2011	1. Seq Comp device	4. None of Above/UTD	E	No	2. No			
Moderate	1. Seq Comp device	1. Low dose unfrac heparin		1/5/2011	1. Yes	1/5/2011	1/12/2011	1. Seq Comp device	1. Low dose unfrac heparin	E	Yes	2. No			
Moderate	1. Seq Comp device	1. Low dose unfrac heparin		5/14/2011	1. Yes	5/14/2011	5/15/2011	1. Seq Comp device	1. Low dose unfrac heparin	E	Yes	2. No			
Moderate	1. Seq Comp device	1. Low dose unfrac heparin		6/25/2011	1. Yes	6/25/2011	6/29/2011	1. Seq Comp device	1. Low dose unfrac heparin	E	Yes	2. No			
Moderate	1. Seq Comp device	4. None of Above/UTD	Yes	6/18/2011	1. Yes	6/17/2011	6/18/2011	1. Seq Comp device	4. None of Above/UTD	E	Yes	2. No			

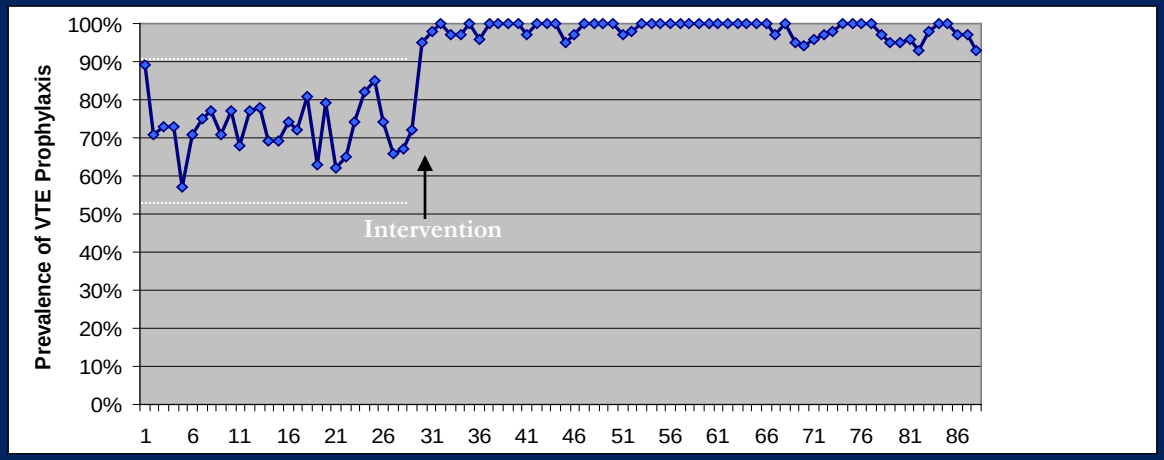
A Different University Center Surgical Audit - More informative than SCIP / TJC!

VTE Risk Assessment	Mechanical prophylaxis initially administered	Chemical Prophylaxis initially administered	Contraindication: Is there documentation why prophylaxis was not administered at hospital admission	Date of initial VTE prophylaxis administered after hospital admission	Was the patient admitted or transferred to ICU	Date of ICU admit or transfer	Date patient was discharged from ICU, left AMA or expired	ICU Mechanical prophylaxis initially administered	ICU Chemical Prophylaxis initially administered	Category	Adequate Prophylaxis	Was a surgical procedure performed	Anesthesia Start date	Anesthesia End date	Was Surgical procedure performed the day of or the day after ICU admit or transfer
Moderate	4. None of above/UTD	4. None of above/UTD	No		2. No					D	No	2. No			
Moderate	1. Seq Comp device	4. None of above/UTD	No	5/31/2011	2. No					E	No	1. Yes	5/31/2011	5/31/2011	
None	1. Seq Comp device	4. None of above/UTD	Yes	5/23/2011	2. No					E	Yes	2. No			
Moderate	1. Seq Comp device	4. None of above/UTD	No	1/4/2011	2. No					E	Yes	1. Yes	1/4/2011	1/4/2011	Spine
Moderate	1. Seq Comp device	4. None of above/UTD	No	1/18/2011	2. No					E	Yes	1. Yes	1/18/2011	1/18/2011	Spine
Moderate	1. Seq Comp device	4. None of above/UTD	No	4/26/2011	2. No					E	Yes	1. Yes	4/26/2011	4/26/2011	Spine
Moderate	1. Seq Comp device	4. None of above/UTD	No	5/12/2011	2. No					E	No	2. No			
Low	4. None of above/UTD	4. None of above/UTD	No		2. No					D	No	1. Yes	4/1/2011	4/1/2011	
Moderate	1. Seq Comp device	4. None of above/UTD	No	6/27/2011	2. No					E	Yes	1. Yes	6/27/2011	6/27/2011	Spine
Low	1. Seq Comp device	4. None of above/UTD	No	3/14/2011	2. No					E	Yes	1. Yes	3/14/2011	3/14/2011	Spine
Moderate	1. Seq Comp device	4. None of above/UTD	No	4/13/2011	2. No					E	No	1. Yes	4/13/2011	4/13/2011	
High	1. Seq Comp device	2. Low molecular wgt heparin		6/9/2011	2. No					E	Yes	1. Yes	6/14/2011	6/14/2011	
High	1. Seq Comp device	4. None of above/UTD	Yes - Surgery	2/19/2011 AM	2. No					E		1. Yes	2/23/2011	2/23/2011	
None	1. Seq Comp device	2. Low molecular wgt heparin		6/8/2011	2. No					E	Yes	1. Yes	6/9/2011	6/9/2011	
Low	1. Seq Comp device	4. None of above/UTD		6/13/2011	2. No					E	Yes				
None	1. Seq Comp device	4. None of above/UTD	No	3/17/2011	2. No					E	No	2. No			
None	1. Seq Comp device	heparin drip + coumadin		4/2/2011	2. No					E	Yes	1. Yes	3/2/2011	3/2/2011	
Moderate	1. Seq Comp device	1. Low dose unfrac heparin		2/16/2011	2. No					E	Yes	2. No			
Low	4. None of above/UTD	4. None of above/UTD	No		2. No					D		2. No			
Moderate	1. Seq Comp device	4. None of above/UTD	No	3/2/2011	1. Yes	3/12/2011	3/18/2011	1. Seq Comp device	4. None of above/UTD	E	No	2. No			
Moderate	4. None of above/UTD	1. Low dose unfrac heparin		5/12/2011	1. Yes	5/11/2011	5/16/2011	4. None of above/UTD	1. Low dose unfrac heparin	E	Yes	2. No			
Moderate	1. Seq Comp device	4. None of above/UTD	No	2/23/2011	1. Yes	2/23/2011	2/27/2011	1. Seq Comp device	4. None of above/UTD	E		1. Yes	2/23/2011	2/23/2011	1. Yes
Moderate	1. Seq Comp device	1. Low dose unfrac heparin		5/25/2011	1. Yes	5/25/2011	5/27/2011	1. Seq Comp device	1. Low dose unfrac heparin	E	Yes	2. No			
Moderate	1. Seq Comp device	2. Low molecular wgt heparin		3/8/2011	1. Yes	3/16/2011	3/19/2011	1. Seq Comp device	2. Low molecular wgt heparin	E	Yes	2. No			
None	1. Seq Comp device	2. Low molecular wgt heparin		6/17/2011	1. Yes	6/17/2011	6/19/2011	1. Seq Comp device	2. Low molecular wgt heparin	E	Yes	1. Yes	6/17/2011	6/17/2011	1. Yes
Moderate	1. Seq Comp device	2. Low molecular wgt heparin		3/3/2011	1. Yes	3/2/2011	3/4/2011	1. Seq Comp device	2. Low molecular wgt heparin	E	Yes	1. Yes	3/2/2011	3/2/2011	1. Yes
Moderate	1. Seq Comp device	4. None of Above/UTD		5/17/2011	1. Yes	5/22/2011	5/27/2011	1. Seq Comp device	1. Low dose unfrac heparin	E	Yes	2. No			
Moderate	1. Seq Comp device	4. None of Above/UTD	No	1/21/2011	1. Yes	1/21/2011	1/30/2011	1. Seq Comp device	4. None of Above/UTD	E	Yes	1. Yes	1/22/2011	1/22/2011	1. Yes
Moderate	1. Seq Comp device	4. None of Above/UTD	No	6/3/2011	1. Yes	6/3/2011	6/7/2011	1. Seq Comp device	4. None of Above/UTD	E	No	2. No			
Moderate	1. Seq Comp device	4. None of Above/UTD	No	5/8/2011	1. Yes	5/8/2011	5/9/2011	1. Seq Comp device	4. None of Above/UTD	E	No	2. No			
Moderate	1. Seq Comp device	4. None of Above/UTD	No	6/20/2011	1. Yes	6/20/2011	6/22/2011	1. Seq Comp device	4. None of Above/UTD	E	Yes	1. Yes	6/20/2011	6/20/2011	1. Yes
Moderate	1. Seq Comp device	4. None of Above/UTD	No	5/26/2011	1. Yes	5/26/2011	5/29/2011	1. Seq Comp device	4. None of Above/UTD	E	No	1. Yes	5/27/2011	5/27/2011	1. Yes
Moderate	1. Seq Comp device	4. None of Above/UTD	No	2/11/2011	1. Yes	2/11/2011	2/12/2011	1. Seq Comp device	4. None of Above/UTD	E	No	1. Yes	2/10/2011	2/11/2011	1. Yes
None	1. Seq Comp device	4. None of Above/UTD	Yes - PRBC	4/9/2011	1. Yes	4/9/2011	4/10/2011	1. Seq Comp device	4. None of Above/UTD	E	No	2. No			
Moderate	1. Seq Comp device	4. None of Above/UTD	No	6/13/2011	1. Yes	6/13/2011	6/14/2011	1. Seq Comp device	4. None of Above/UTD	E	No	1. Yes	6/13/2011	6/13/2011	1. Yes
Moderate	1. Seq Comp device	1. Low dose unfrac heparin		1/17/2011	1. Yes	2/15/2011	2/16/2011	1. Seq Comp device	4. None of Above/UTD	E	Yes	2. No			2. No
None	1. Seq Comp device	4. None of Above/UTD	No	2/5/2011	1. Yes	2/4/2011	2/8/2011	1. Seq Comp device	4. None of Above/UTD	E	No	1. Yes	2/4/2011	2/4/2011	1. Yes
Moderate	1. Seq Comp device	4. None of Above/UTD	No	4/7/2011	1. Yes	4/7/2011	4/13/2011	1. Seq Comp device	4. None of Above/UTD	E	No	1. Yes	4/7/2011	4/7/2011	1. Yes
Moderate	1. Seq Comp device	4. None of Above/UTD	No	4/22/2011	1. Yes	4/22/2011	4/25/2011	1. Seq Comp device	4. None of Above/UTD	E	No	1. Yes	4/22/2011	4/22/2011	1. Yes
Moderate	1. Seq Comp device	4. None of Above/UTD	No	2/28/2011	1. Yes	2/28/2011	3/6/2011	1. Seq Comp device	4. None of Above/UTD	E	No	1. Yes	2/28/2011	2/28/2011	1. Yes


% Patients by Category
% Red (no prophy)
% Yellow (mech only)
% Green
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Jan-11 (N=25)
Feb-11 (N=25)
Mar-11 (N=30)
Apr-11 (N=30)
May-11 (N=25)
Jun-11 (N=40)
Jul-11 (N=40)
Aug-11 (N=40)
Sep-11 (N=30)
Oct-11 (N=30)
Nov-11 (N=25)
Dec-11 (N=50)
Jan-12 (N=40)
Feb-12 (N=40)
Mar-12 (N=30)
Apr-12 (N=30)
May-12 (N=25)
Jun-12 (N=30)
Jul-12 (N=40)
Aug-12 (N=50)
Sep-12 (N=30)
Oct-12 (N=30)
Nov-12 (N=30)
Dec-12 (N=30)

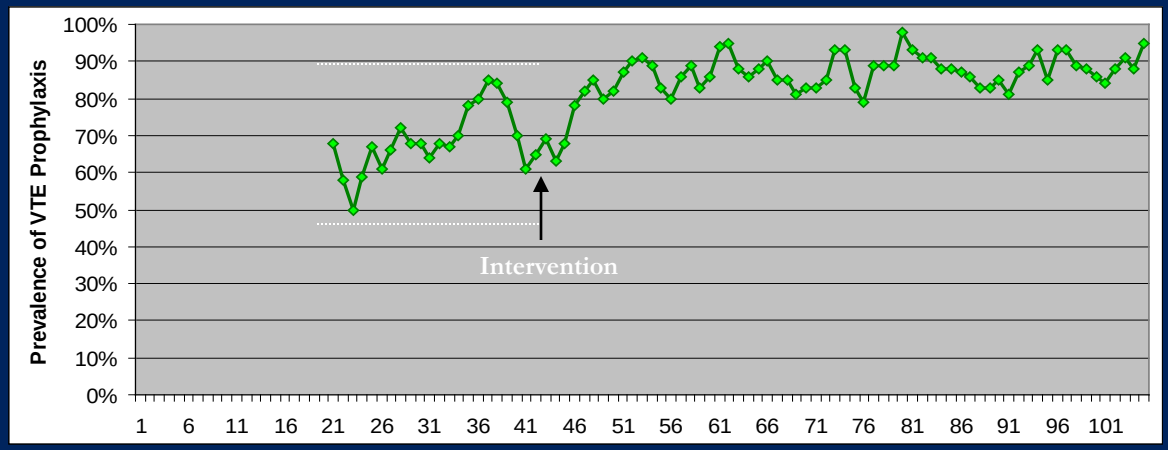

% Patients with Adequate Prophylaxis
Mean
% Adequate Prophylaxis
LCL
UCL
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Jan-11 (N=18)
Feb-11 (N=16)
Mar-11 (N=21)
Apr-11 (N=22)
May-11 (N=19)
Jun-11 (N=30)
Jul-11 (N=33)
Aug-11 (N=35)
Sep-11 (N=27)
Oct-11 (N=26)
Nov-11 (N=22)
Dec-11 (N=42)
Jan-12 (N=36)
Feb-12 (N=36)
Mar-12 (N=26)
Apr-12 (N=25)
May-12 (N=23)
Jun-12 (N=27)
Jul-12 (N=35)
Aug-12 (N=46)
Sep-12 (N=27)
Oct-12 (N=28)
Nov-12 (N=28)
Dec-12 (N=27)

Effect of Situational Awareness on Prevalence of VTE Prophylaxis by Nursing Unit



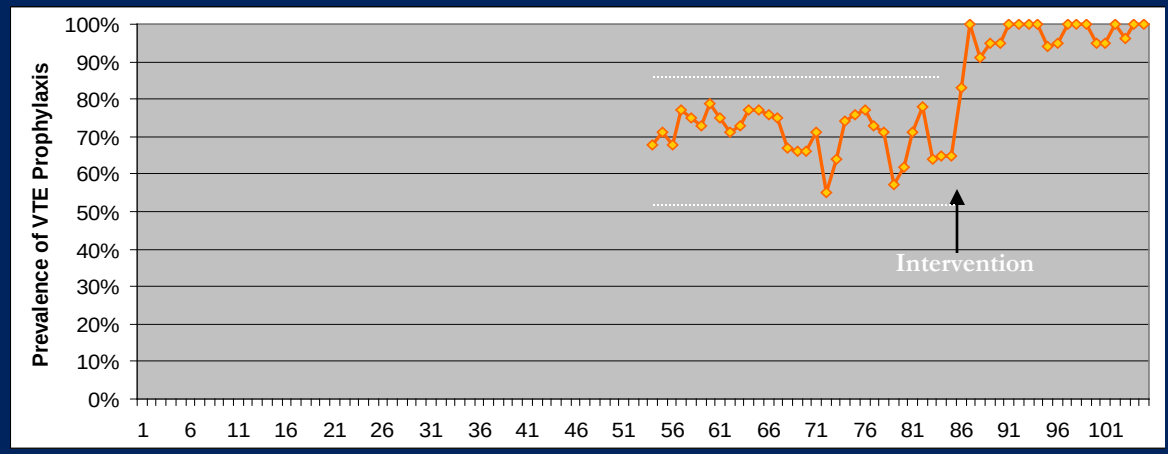
Hospital A, 1st Nursing Unit

	Baseline	Post-Intervention	
UCL:	93%	104%	
Mean:	**73%**	**99%**	**(p < 0.01)**
LCL:	53%	93%	



Hospital A, 2nd Nursing Unit

	Baseline	Post-Intervention	
UCL:	90%	102%	
Mean:	**68%**	**87%**	**(p < 0.01)**
LCL:	46%	72%	



Hospital B, 1st Nursing Unit

	Baseline	Post-Intervention	
UCL:	89%	108%	
Mean:	**71%**	**98%**	**(p < 0.01)**
LCL:	53%	88%	

UCL = Upper Control Limit
LCL = Lower Control Limit

UCSD Inpatient Discharges - 3/1/2011 - 8/31/2011

Anticoagulation Medications Ordered but Not Given

Month	NotGiven%
March	11.70%
April	9.80%
May	11.20%
June	10.50%
July	9.30%
August	9.50%

Breakdown of Anticoag Meds Not Given

NotGivenReason	NotGiven%
Continous IV infusing	0.6%
Contraindicated	2.0%
Duplicate Order	2.5%
Given at alternate time	3.1%
Loss of IV access	0.1%
Med DC'd	6.0%
Medication not available	0.3%
Not in room	0.8%
Order parameters not met	0.6%
Other	20.0%
Patient not available	0.7%
Patient sleeping	0.3%
Patient/family refused	61.5%
Pt. NPO	0.4%
Transfer to a Procedural area	1.1%

Prophylaxis with Anticoagulant prophylaxis

Reliability of delivery should be easy to track

Patient / family refusal is most common excuse

Measuring Adherence to VTE Prophylaxis Orders

- Pharmacologic Prophylaxis
  - % of doses ordered that are administered
  - Measurement can be automated
  - Educational efforts focused on nurses and patients can improve adherence

- Mechanical Prophylaxis
  - Hard to automate, we've used spot audits in the past
  - May be feasible if we can change documentation to discrete variable in Epic

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Mechanical Prophylaxis Compliance

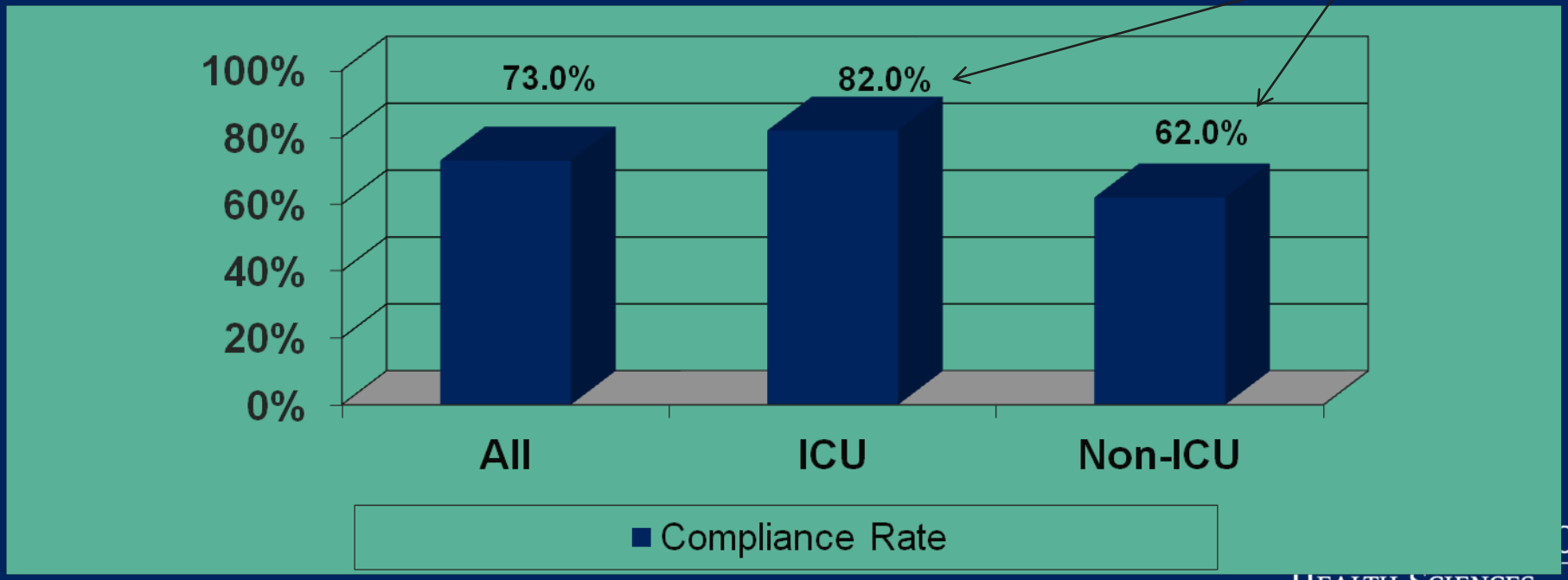
Setting: 722-bed acute care hospital

Method: Prospective observational trial of mechanical VTE prevention compliance

Interventions:

1. Consecutive patients (n=150) were observed twice daily Mon – Fri to ensure that sequential compression device (SCD) and venous foot pump (VFP) were used properly
2. Compliance Rate=compliant evaluations/total evaluations

p=<0.001



Piazza G et al. *Circulation.* 2009; 119:2196-201.

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Focus on Interventions:
Layer them on!

A. Which interventions to do

B. Who could do this in your institution?

Hierarchy of Reliability

Level		Predicted Prophylaxis rate
1	No protocol* (“State of Nature”)	40%
2	Decision support exists but not linked to order writing, or prompts within orders but no decision support	50%
3	**Protocol well-integrated** (into orders at point-of-care)	65-85%
4	Protocol enhanced (by other QI / high reliability strategies)	90%
5	**Oversights identified and addressed in real time**	95+%

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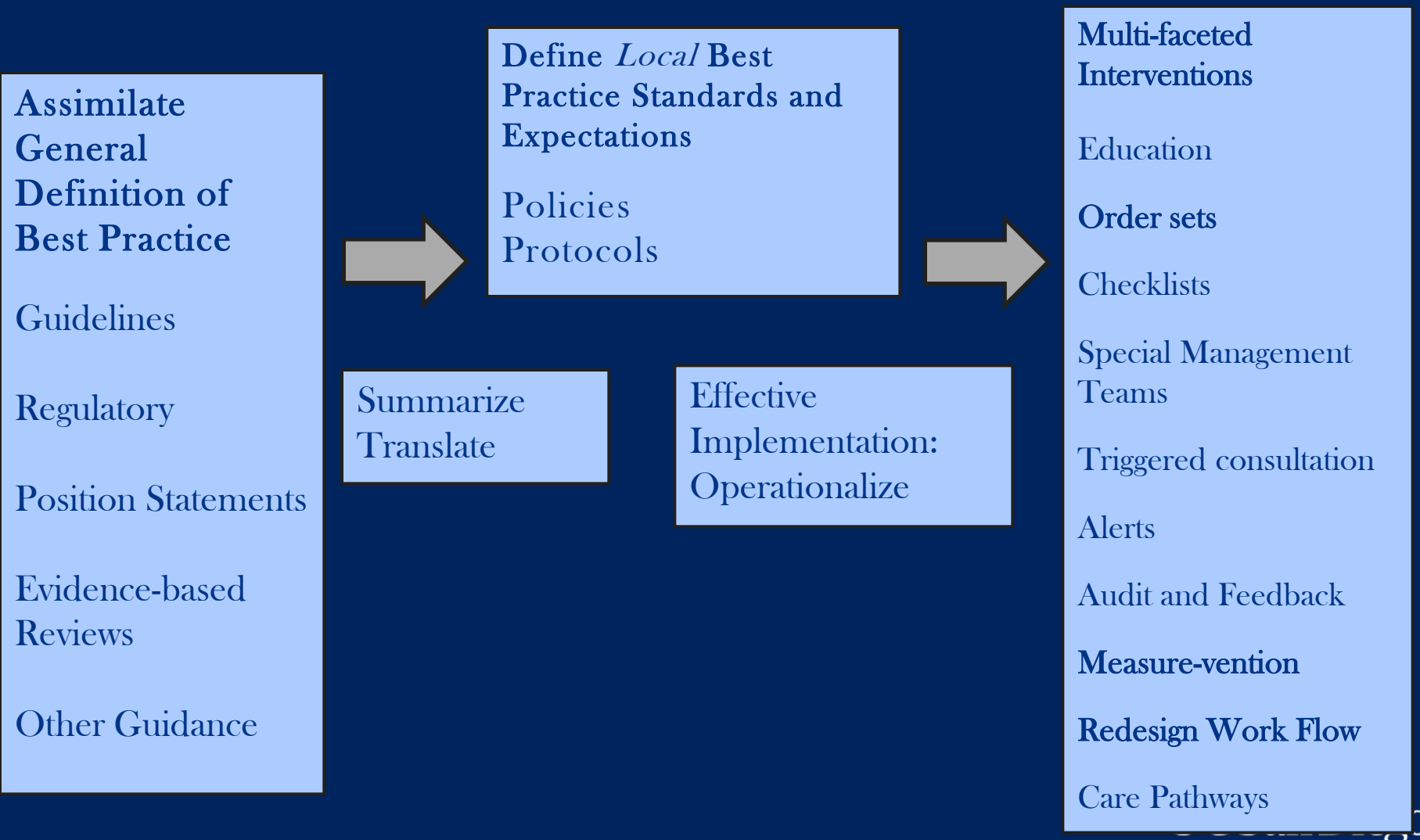
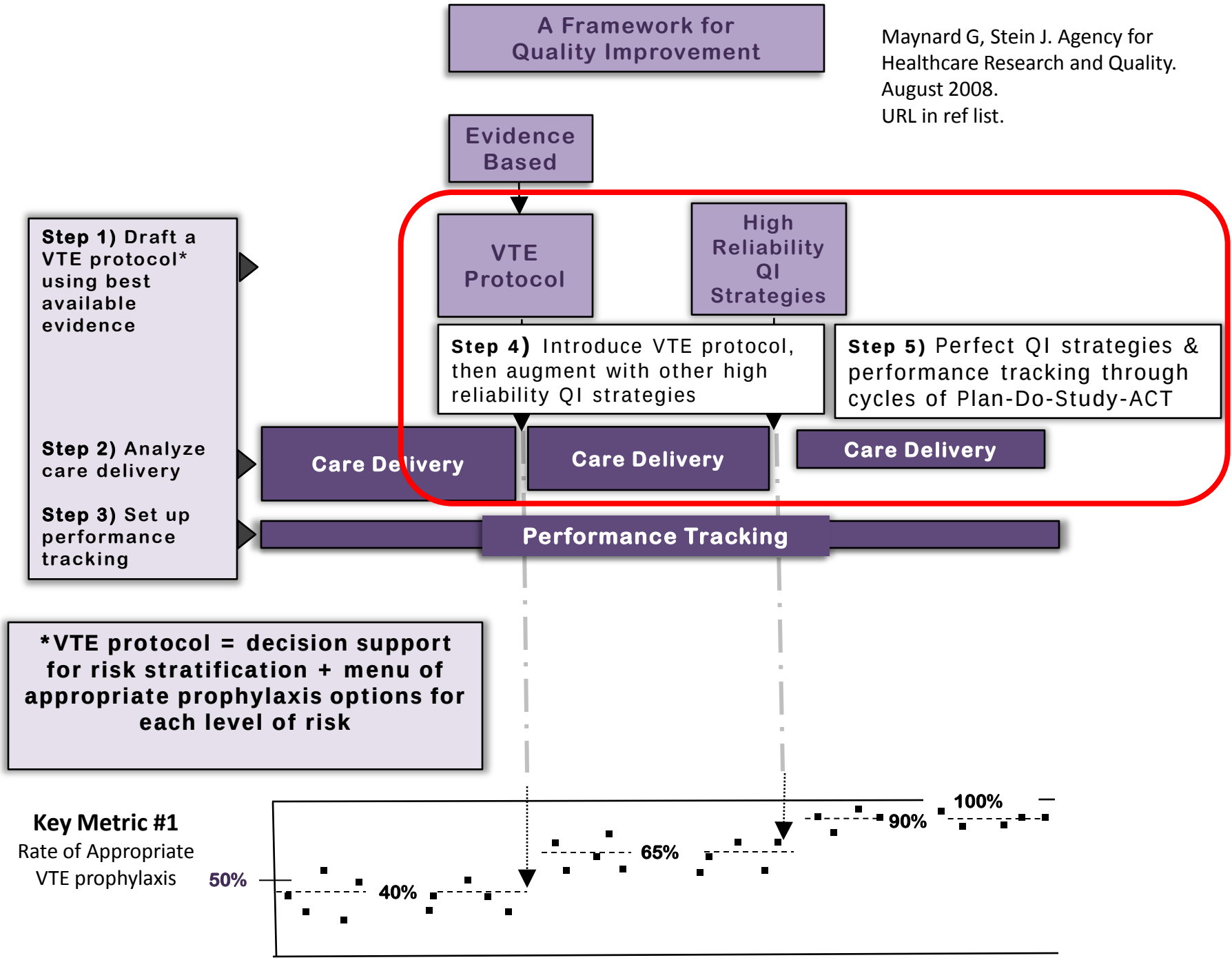
Framework for Effective Implementation- No Single Intervention Will Do It!




A Framework for Quality Improvement
Maynard G, Stein J. Agency for Healthcare Research and Quality. August 2008.
URL in ref list.
Evidence Based
VTE Protocol
High Reliability QI Strategies
Step 1) Draft a VTE protocol* using best available evidence
Step 2) Analyze care delivery
Step 3) Set up performance tracking
Step 4) Introduce VTE protocol, then augment with other high reliability QI strategies
Step 5) Perfect QI strategies & performance tracking through cycles of Plan-Do-Study-ACT
Care Delivery
Care Delivery
Care Delivery
Performance Tracking
*VTE protocol = decision support for risk stratification + menu of appropriate prophylaxis options for each level of risk
Key Metric #1
Rate of Appropriate VTE prophylaxis
50%
40%
65%
90%
100%

Quality Improvement Strategies

Specific Ideas for VTE Prevention

- Provider education
- Provider reminder systems
- Facilitated relay of clinical data to providers
- Audit and feedback of performance to providers
- Patient education
- Organizational or operational change
- Incentives, regulation, and policy
- Health system directed

Shojania et al. Closing the quality gap: a critical analysis of quality improvement strategies. Volume 1—Series overview and methodology. Agency for Healthcare Research and Quality publication 04-0051-1.

Adapted from Stein J. *J Hosp Med*. 2006; 1:327-30.

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Strategies to Improve Prophylaxis Rates

Setting: Community Teaching Hospital

- INTERVENTION
  - In-services
  - Newsletters
  - Quality improvement presentations

Dobesh PP et al. *J Manag Care Pharm.* 2005; 11:755-62.

Optimize Strategies for Effective VTE Prevention

- Alert Systems
  - Electronic alerts (E-alerts)
  - Human alerts
- Computerized decision support
- Raising situational awareness
- Audit and feedback
- Measure-vention

E-Alerts

Brigham and Women's Hospital 2005 Study

- 2506 hospitalized patients
- VTE risk score ≥ 4
- Randomized to intervention (E-alert) or control

Kucher N et al. *N Engl J Med.* 2005; 352:969-77.

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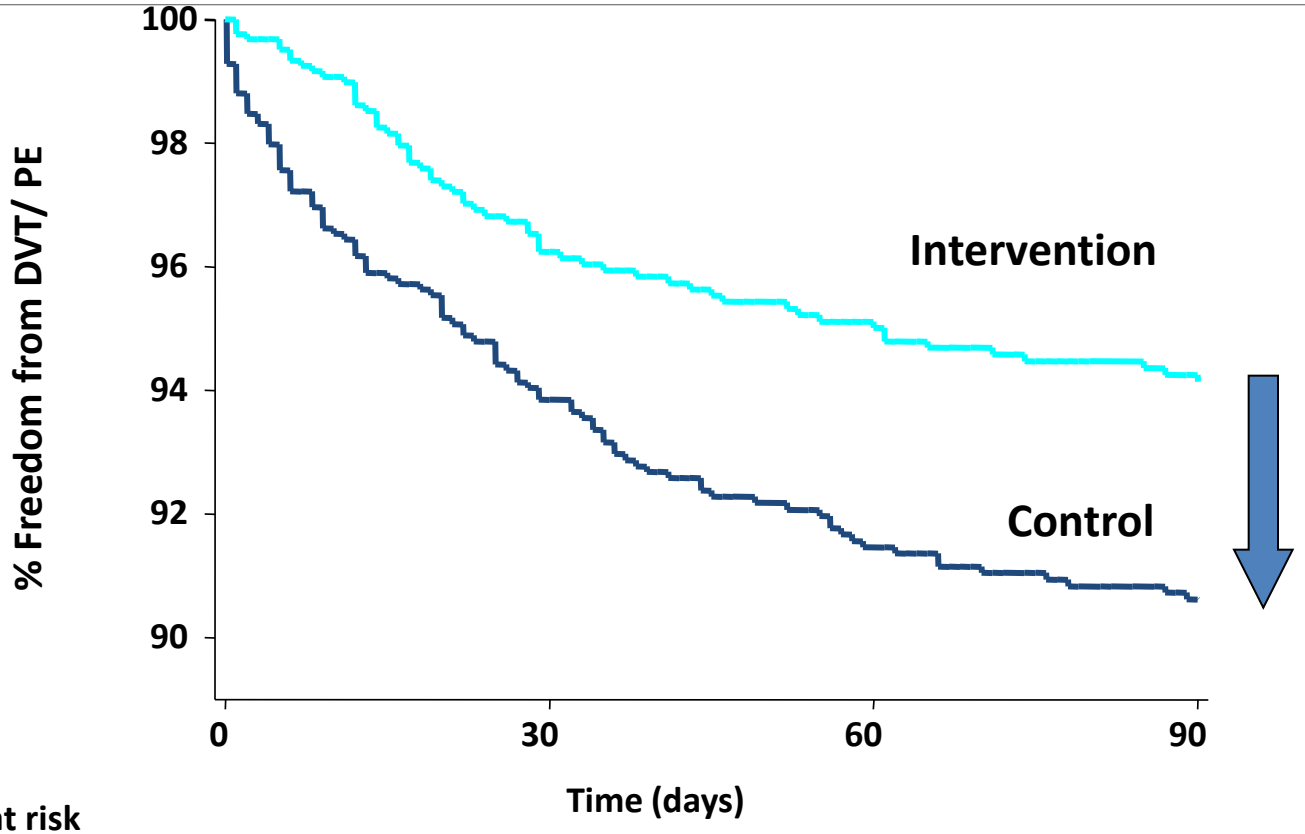
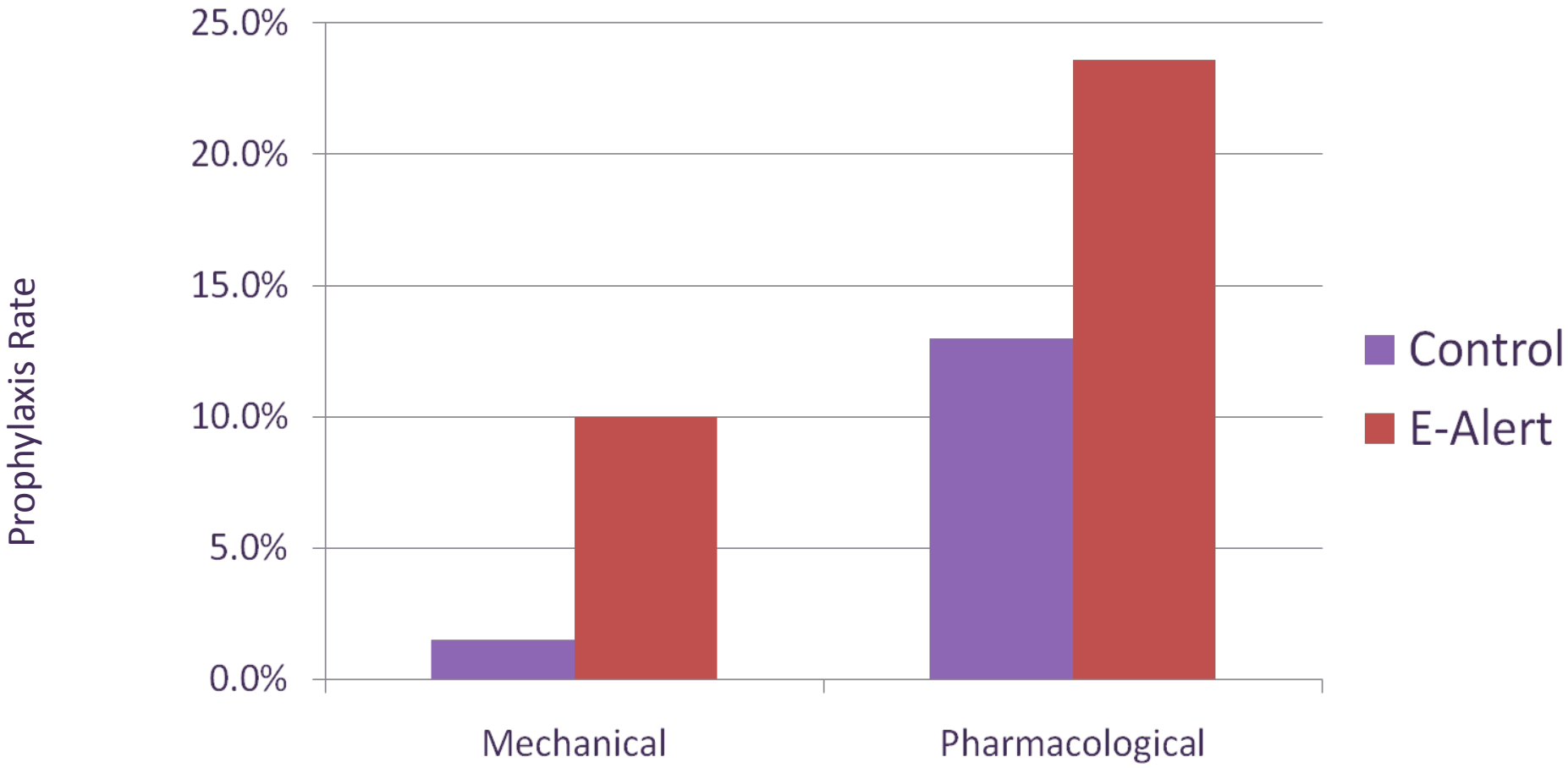
E-Alerts Decrease VTE



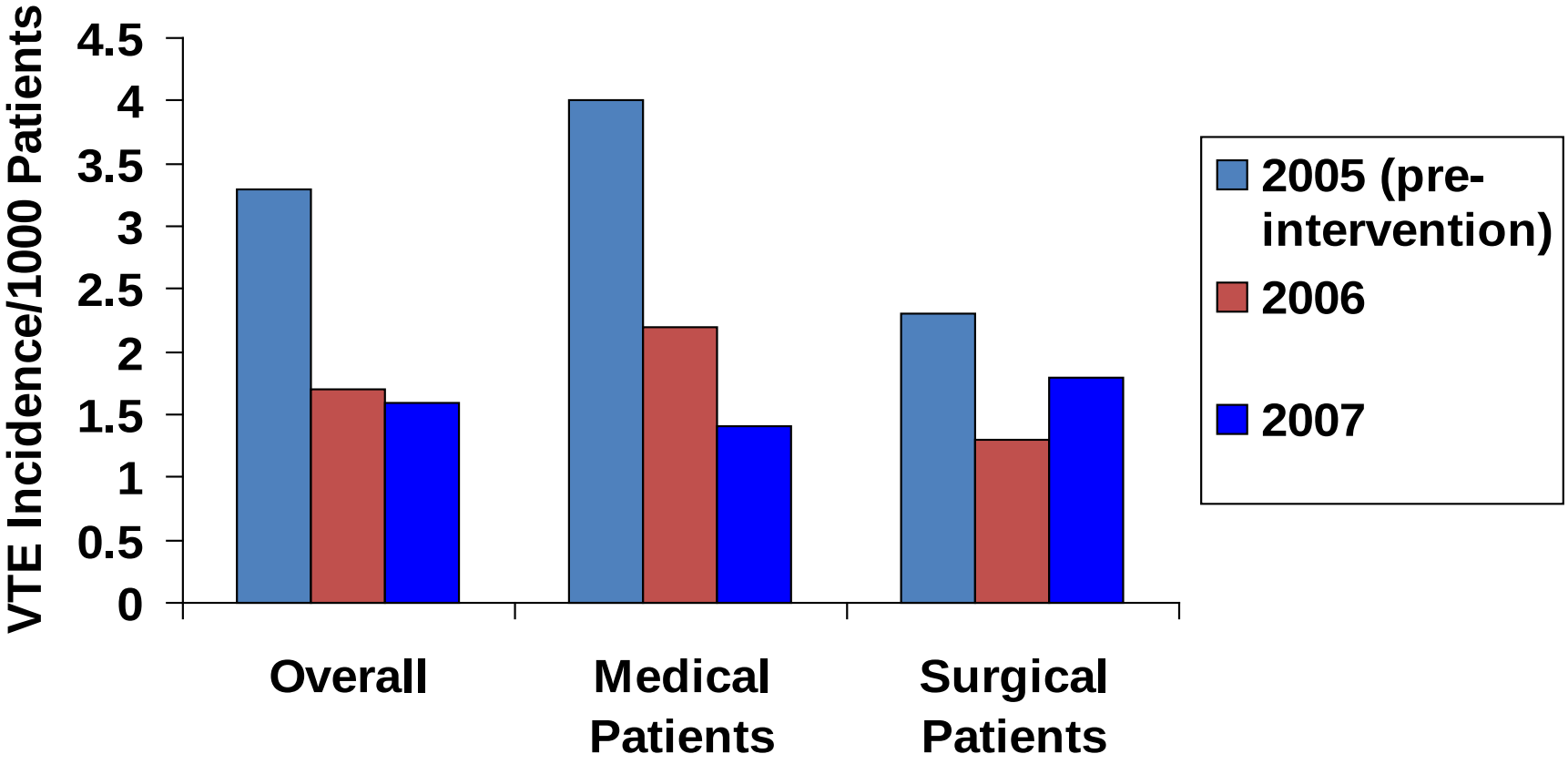
Number at risk				
Intervention	1255	977	900	853
Control	1251	976	893	839

Kucher N et al. *N Engl J Med*. 2005;352:969-77

E-Alerts


Prophylaxis Rate
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Mechanical
Pharmacological
Control
E-Alert

Effectiveness Can Wane Over Time



Lecumberri R et al. *Thromb Haemost.* 2008; 100:699-704.

Human Alerts Increase Prophylaxis

- 2493 hospitalized patients
- VTE risk score ≥ 4
- Randomized to intervention or control

Intervention	Treatment Received	
	Mechanical, %	Pharmacologic, %
Human Alert	21	28
Control	8	14
95% CI	10.6-16.0	10.5-16.8

Piazza G et al. *Circulation*. 2009; 119:2196-201.

Bottom Line - Alerts

- Useful strategy
- E-alerts and human alerts can work
- Be aware of alert fatigue
- Best if part of a multifaceted approach

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Educational Efforts - Always required

Never Sufficient as a sole intervention

- Include case based scenarios with nursing and physician education
- Don’t forget the patient! Educating the patient routinely on VTE improves adherence
- Examples included in handouts.

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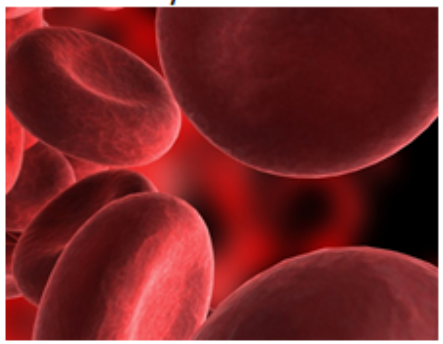
What is a blood clot?

- Clumps of thickened blood that blocks blood flow
- Blood clots most often form in your legs, arms, and groin but could move to your lungs, heart or brain
- Blood clots can be dangerous and deadly



Why am I at risk in the hospital?

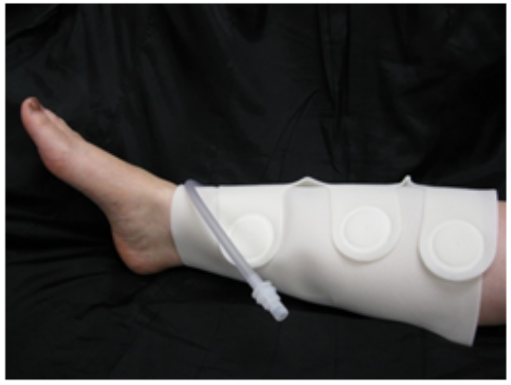
- You are not moving around well *
- You recently had surgery or an injury
- Your disease may increase your chance of getting a clot

*If you are able to walk, this may decrease your risk. Please ask your nurse for help before getting out of bed.

To prevent a blood clot from happening during your hospital stay, your doctor may ask you to take a medication or wear a leg device.

If your doctor asks you to take a medication….

- The medication is a blood thinner
- This medication is a small injection into fatty tissue just below the skin
- It may be given more than once a day
- You will likely not need the medication once you leave the hospital



If your doctor asks you to wear a leg device…

- Sleeves will be placed on your legs that will squeeze your legs off and on during the day
- This light squeeze will increase the flow of blood in your legs to prevent clots from forming
- These sleeves should be removed before you are out of bed and walking because they can cause you to trip and fall
- Be sure you to ask for the sleeves to be put back on when you are back in bed

What else should I know?

Does everyone get this treatment?

- Many patients admitted to the hospital need this blood clot protection

How will I know if I have a clot?

- New swelling your arm or leg
- New redness
- Soreness or pain in your arm or leg
- A warm spot on your leg

If you have additional questions, please ask your nurse, doctor or pharmacist.

Virginia Mason Medical Center
1100 Ninth Ave.
Seattle, WA 98101
(206) 223-6600

TEAM MEDICINE℠ VIRGINIA MASON

How to Prevent Blood Clots in the Hospital

ARS

Which of the Following is an Important Method Shown to Achieve up to 95% VTE Prophylaxis?

a. Pharmacy-generated MAR for every patient
b. VTE prevention protocol following ACCP guidelines in every chart
c. Educational program targeting providers and patients
d. Intervention in real time for patients not receiving prophylaxis
e. Intervention with E-alerts for every patient

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Health Sciences

MEASURE-VENTION

Daily measurement drives concurrent intervention

(i.e., same as Level 5 in Hierarchy of Reliability)

- Identify patients not receiving VTE prophylaxis **in real time**
  - Ongoing assessment
  - Use for real-time intervention

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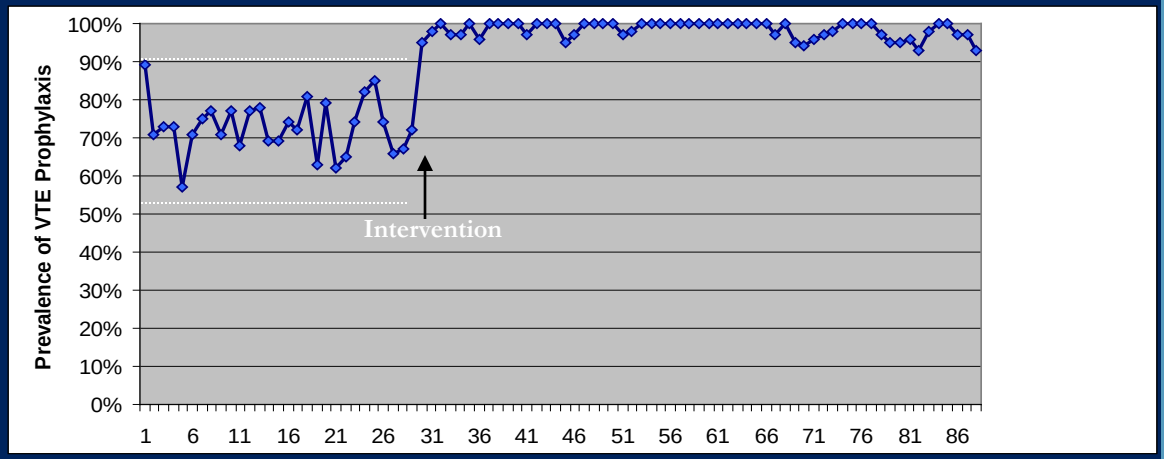
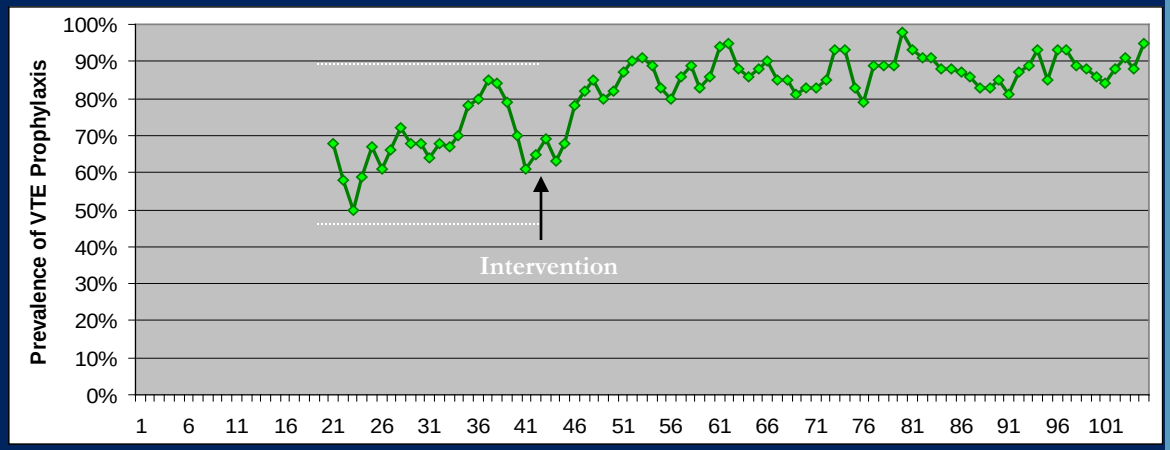
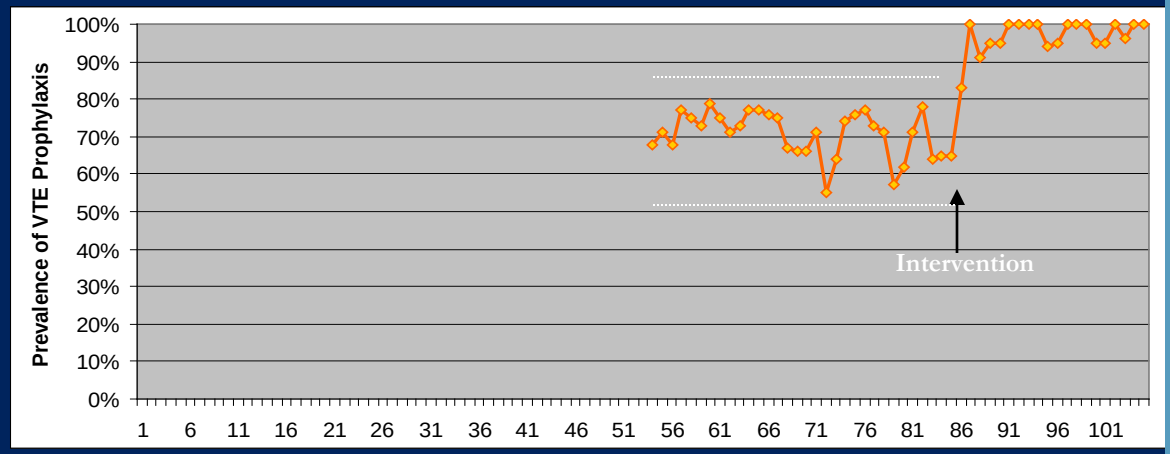






Effect of Situational Awareness on Prevalence of VTE Prophylaxis by Nursing Unit

Hospital A, 1st Nursing Unit

	Baseline	Post-Intervention	
UCL:	93%	104%	
Mean:	**73%**	**99%**	**(p < 0.01)**
LCL:	53%	93%	

Hospital A, 2nd Nursing Unit

	Baseline	Post-Intervention	
UCL:	90%	102%	
Mean:	**68%**	**87%**	**(p < 0.01)**
LCL:	46%	72%	

Hospital B, 1st Nursing Unit

	Baseline	Post-Intervention	
UCL:	89%	108%	
Mean:	**71%**	**98%**	**(p < 0.01)**
LCL:	53%	88%	

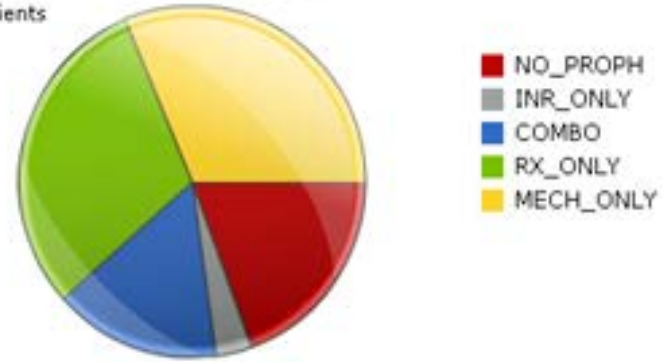
UCL = Upper Control Limit
LCL = Lower Control Limit

As of 09/21/2009 at 9 PM

Total Patients

BGSMC

DVT Prophylaxis

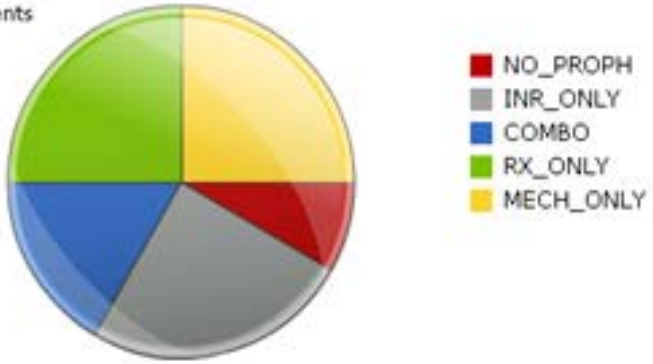


NO PROPH	INR ONLY	COMBO	RX ONLY	MECH ONLY
68	12	55	106	110
19.37%	3.42%	15.67%	30.20%	31.34%

PH: 283 (80.63%) - RX PROPH: 173 (49.29%) - ANY PROPH

Total Patients

01 01A

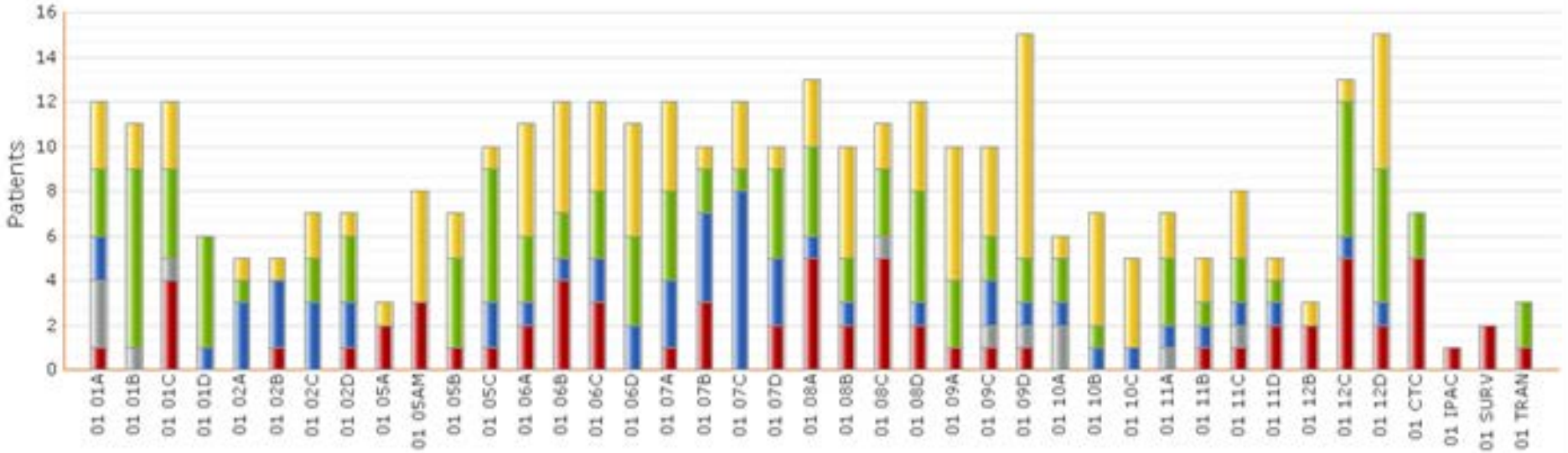


NO PROPH	INR ONLY	COMBO	RX ONLY	MECH ONLY
1	3	2	3	3
8.33%	25.00%	16.67%	25.00%	25.00%

%) - RX PROPH: 8 (66.67%) - ANY PROPH: 11 (91.67%) -

BGSMC Nursing Units

DVT Prophylaxis



Cerner VTE PowerPlans and Daily Reporting

Dignity Health.

DVT/VTE Prophylaxis Workflow

- Powerplans have a section in them that includes all possible options for addressing DVT/VTE measures:

DVT/VTE Prophylaxis

- DVT/VTE Prophylaxis/Anticoagulation Already Ordered
- Do not give pharmacologic DVT/VTE prophylaxis
- Do not give mechanical DVT/VTE prophylaxis
- DVT/VTE Reference Text
- ****LOW RISK**** Ambulatory patient without additional risk of VTE. Minor surgery in a patient without additional VTE risk
  operating room time less than 30 minutes). For patients without specific thromboembolic risk (risk factors such as: CHF
  active cancer, previous VTE, Sepsis, acute neurological disease or inflammatory bowel disease). Encourage early ambu
  why pharmacologic and mechanical DVT/VTE prophylaxis were not given. Review ambulation orders.
- VTE Prophylaxis - Low Risk
- ****MODERATE RISK**** Patients who aren't in either the low or high risk group. This includes most medical and surgic
- VTE Prophylaxis - Moderate Risk
- ****HIGH RISK***** This order set for patients who meet High Risk Criteria: Critical Care Patients, Hip or Knee arthropla
  spinal cord injury or Stroke with paresis. Multiple major trauma. Abdominal or pelvic surgery for cancer, or multiple mode
- VTE Prophylaxis - High Risk

- At the top is an option to indicate if DVT/VTE Prophylaxis has "Already Been Ordere

DVT/VTE Prophylaxis

- DVT/VTE Prophylaxis/Anticoagulation Already Ordered
- Do not give pharmacologic DVT/VTE prophylaxis
- Do not give mechanical DVT/VTE prophylaxis
- DVT/VTE Reference Text
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  active cancer, previous VTE, Sepsis, acute neurological disease or inflammatory bowel disease). Encourage early ambu

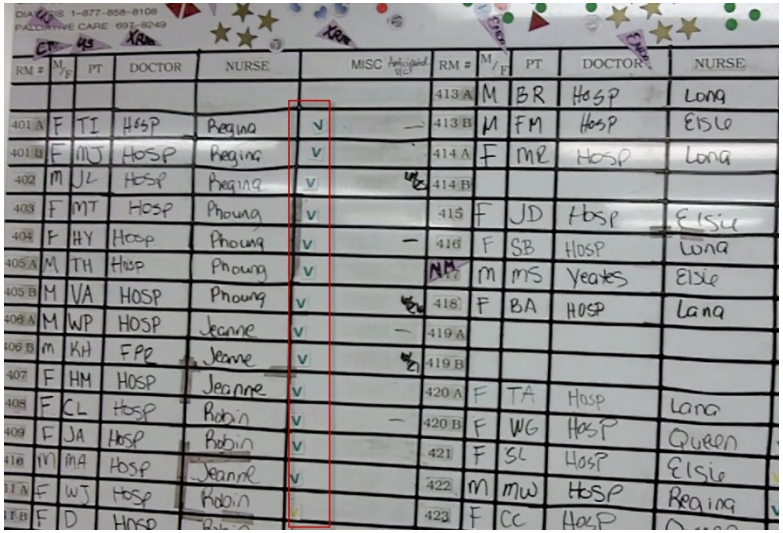
Methodist Hospital of Sacramento

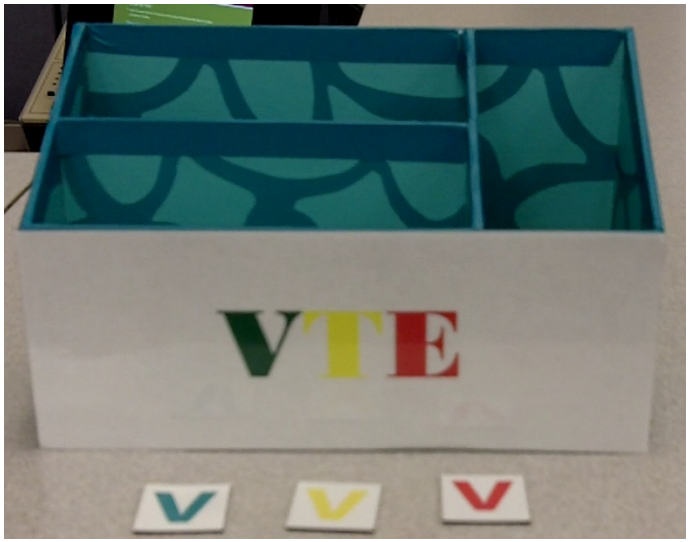
VTE Prophylaxis MET 3F

Room/Bed	Patient Name	MRN #	Pharmacological Prophylaxis	Compression Device Prophylaxis	INR	Order for No VTE Intervention
MET 3F/0301/A	[redacted]		heparin pf 5,000 unit/ 0.5 ml	N	1.2	N
MET 3F/0302/A			enoxaparin 40 mg / 0.4 ml subc	Y		N
MET 3F/0303/A			heparin pf 5,000 unit/ 0.5 ml	N		N
MET 3F/0305/A			enoxaparin 40 mg / 0.4 ml subc	N	1.2	N
MET 3F/0306/A			heparin pf 5,000 unit/ 0.5 ml	N	1.1	N
MET 3F/0306/B			heparin pf 5,000 unit/ 0.5 ml	N		N
MET 3F/0307/A			heparin pf 5,000 unit/ 0.5 ml	Y	1.0	N
MET 3F/0308/A			heparin pf 5,000 unit/ 0.5 ml	Y		N
MET 3F/0309/A			enoxaparin 40 mg / 0.4 ml subc	Y		N
MET 3F/0310/A				Y		N
MET 3F/0312/B				Y	1.2	N
MET 3F/0313/B			heparin pf 5,000 unit/ 0.5 ml	Y	1.2	N
MET 3F/0315/A				Y		N
MET 3F/0316/A			enoxaparin 40 mg / 0.4 ml subc	N		N
MET 3F/0317/A			heparin pf 5,000 unit / 0.5 ml	Y		N
MET 3F/0318/A			enoxaparin 40 mg / 0.4 ml subc	N		N
MET 3F/0319/A			heparin pf 5,000 unit/ 0.5 ml	Y		N
MET 3F/0319/B			enoxaparin 40 mg/ 0.4 ml subcu	N		N
MET 3F/0320/A				Y	1.3	N
MET 3F/0320/B			rivaroxaban 10 mg po daily	Y		N
MET 3F/0321/A				Y		N
MET 3F/0322/A				N		N
MET 3F/0323/A			heparin pf 5,000 unit / 0.5 ml	N		N
MET 3F/0324/A			enoxaparin 40 mg/ 0.4 ml subcu	N	1.0	N

Go Live – May 15, 2012

- Physicians educated to new VTE PowerPlans
- Nursing education in Skills Fair – April – May 2012
- VTE Magnets Ordered for Patient Boards

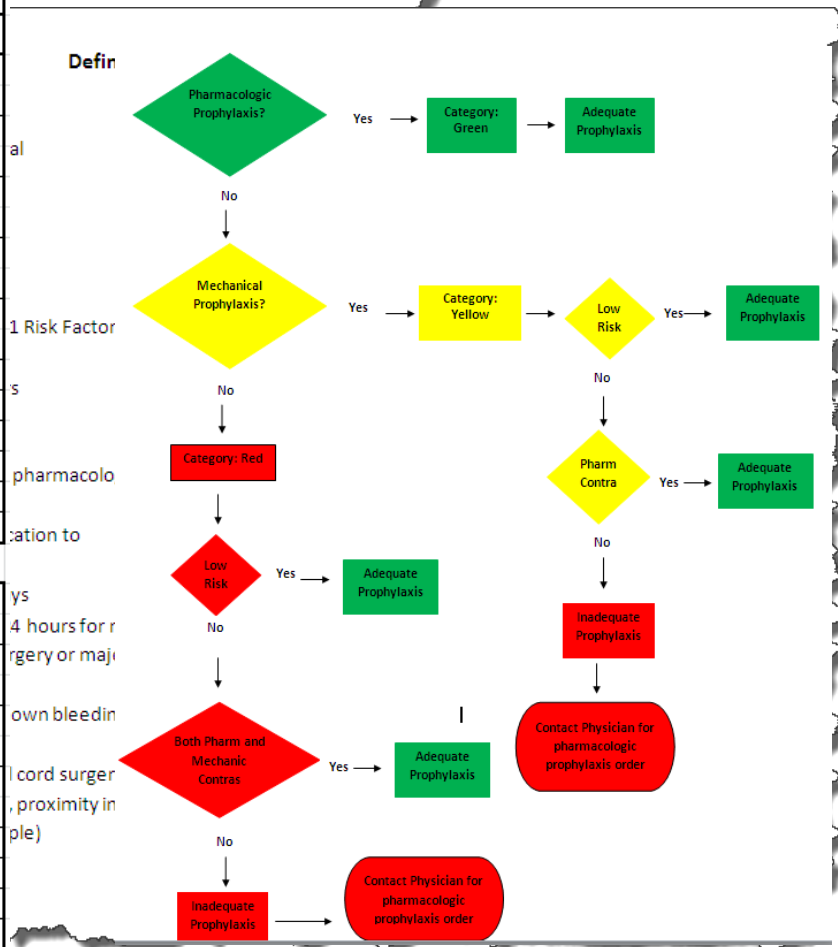




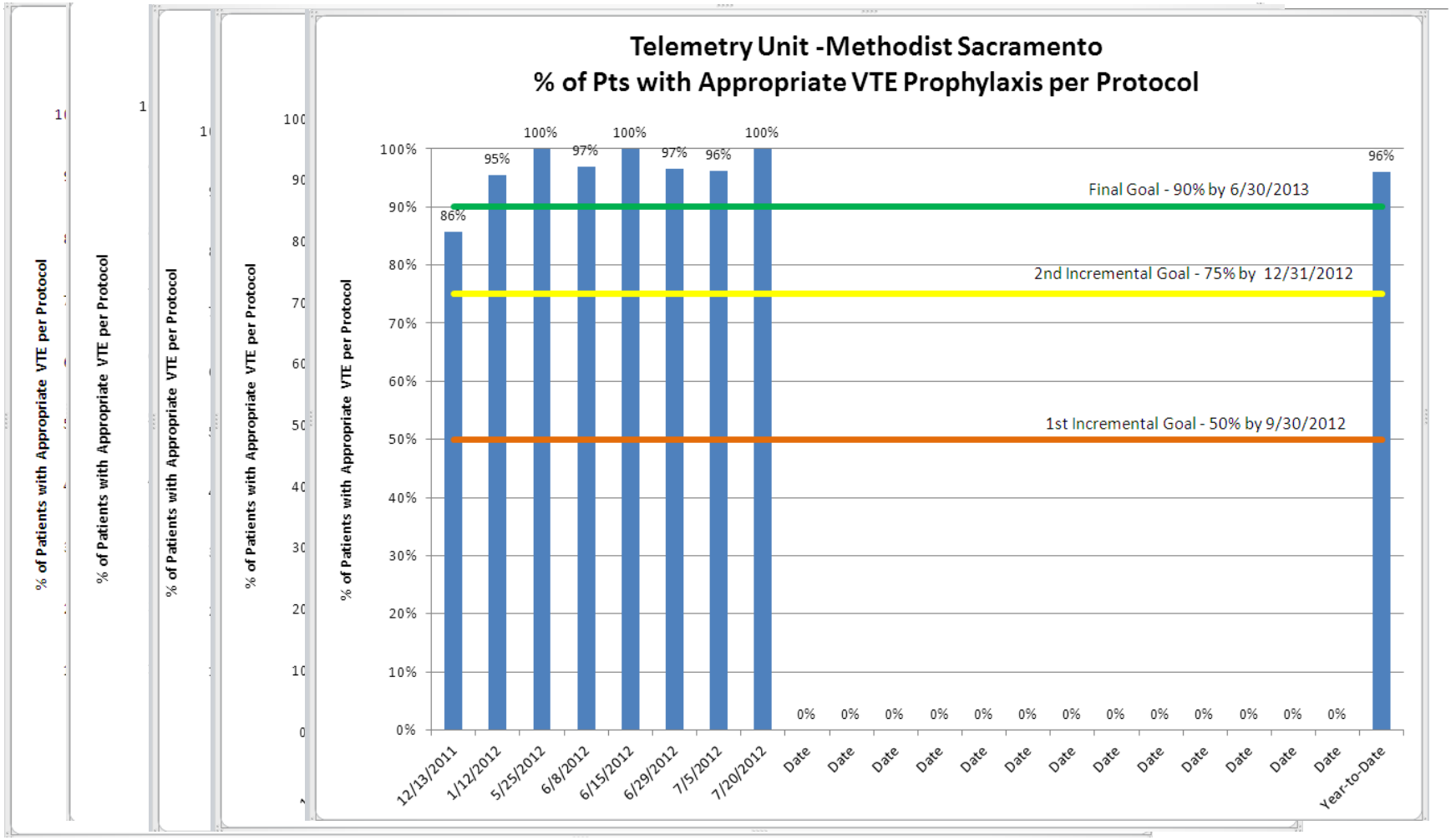
MeasureVention

VTE Prophylaxis Data Post Go Live

Date:	ICU	2nd	3rd	4th
Number of patients				
Number of Medical patients				
Pharmacologic prophylaxis				
Mechanical prophylaxis				
Both pharmacologic and and mechanical				
Not on prophylaxis				
No prophylaxis, appropriate				
No prophylaxis, not appropriate				
Total appropriate prophylaxis				
Order set used				
Percentage of order sets used				
Number of Surgical patients				
Pharmacologic prophylaxis				
Mechanical prophylaxis				
Pharmacologic and mechanical prophylaxis				
Not on prophylaxis				
No prophylaxis, appropriate				
No prophylaxis, not appropriate				
Total appropriate prophylaxis				



Results from MeasureVention



Cerner Format VTE *Paper* Plans

Sequoia Hospital
A Dignity Health Member

170 Alameda de las Pulgas, Redwood City, CA 94062-2799
(650) 369 5811

Patient Name_____
Date of Birth _____

VENOUS THROMBOEMBOLISM (VTE) PROPHYLAXIS REGIMEN

RISK LEVEL	CHOOSE ONE OPTION
LOW RISK • Ambulatory with no other risk factors • Same day or minor surgery (Length of Stay less than 48hrs) • Age less than 50 • Patient on therapeutic anticoagulation	❑ Early and frequent ambulation in hallway ❑ Continue therapeutic anticoagulation as ordered.
MODERATE RISK • All patients not in Low Risk or High Risk Categories • Most medical patients • Most general surgery patients • Age 50 or greater • Congestive Heart Failure • Dehydration • COPD, Pneumonia • Impaired mobility	CHOICE ONE: ❑ Enoxaparin (Lovenox) 40mg SQ daily START DATE / TIME: _____ CHOICE TWO: ❑ Heparin 5,000 units SQ every 12 hours START DATE / TIME: _____ OPTIONAL: (IN ADDITION TO PHARMACOLOGIC PROHYLAXIS) ❑ Sequential Compression Device (SCDs) Knee High
HIGH RISK • Elective hip/knee arthroplasty • Hip/Pelvic Fracture • Major abdominal or pelvic surgery • Systemic cancer • Acute spinal cord injury • Multiple major trauma • Critically ill with multiple risk factors	CHOICE ONE: ❑ Enoxaparin (Lovenox) 40mg SQ daily (Hips) PLUS Sequential Compression Device (SCDs) – Knee High START DATE / TIME: _____ CHOICE TWO: ❑ Enoxaparin (Lovenox) 30mg SQ twice daily (Knees) PLUS Sequential Compression Device (SCDs) – Knee High START DATE / TIME: _____ CHOICE THREE: (Excluding total hip & total knee arthroplasty) ❑ Heparin 5,000 units SQ every 12 hours PLUS Sequential Compression Device (SCDs) – Knee High START DATE / TIME: _____

NOTE: Pharmacy to adjust dosage of Enoxaparin for Clcr less than 30ml/min

CONTRAINDICATION

❑ The risk of adverse effects of pharmacological prophylaxis outweighs the risk of DVT/PE
Contraindication to pharmacologic prophylaxis: _____
(Post-Op Bleeding within 24hrs, Platelets less than 50,000, Hemoglobin less than 8, Hypertensive urgency, Comfort care)

❑ Mechanical prophylaxis with Sequential Compression Device
Contraindication to Knee High SCDs (Peripheral Vascular Disease or Wounds): _____

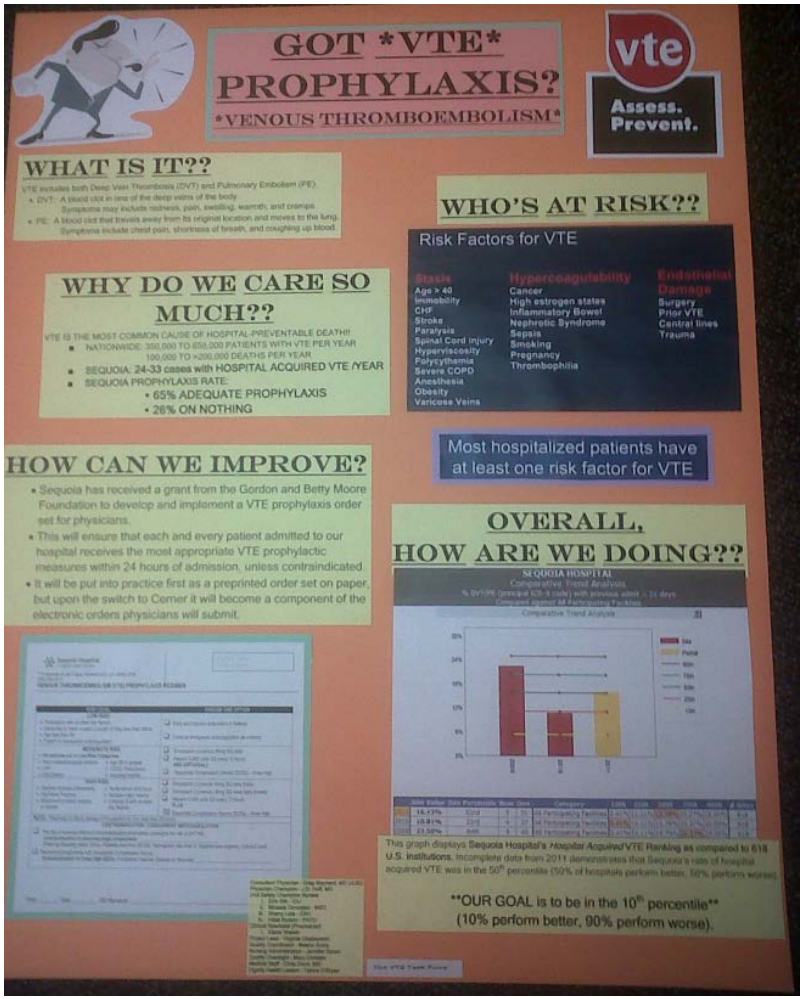
Time: _____ Date: _____ MD Signature: _____

Scanned to Pharmacy – Time:_____

Non-Medication Orders Noted
_____, RN_____Date_____Time
Med Orders Transcribed to MAR
_____, RN_____Date_____Time
24-Hour Chart Check
_____, RN_____Date_____Time

Go Live – May 8, 2012

- Physicians educated to VTE Assessment and Order Set 1:1 with Diane Shaieb
- Nurses educated by Unit Safety Coaches during Go Live
- Poster boards created
- VTE, Assess and Prevent buttons created and distributed during Go Live



Dignity Health

MeasureVention

VTE Prophylaxis Audit Data Collection Form

Site: _____
Unit: _____
Unit Description: _____
Primary Unit: _____
Month/Year of Audit: _____

*We recommend **NOT** using actual Patient*

Patient ID	Pharmacologic Prophylaxis?	Mechanica Prophylax
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Defin

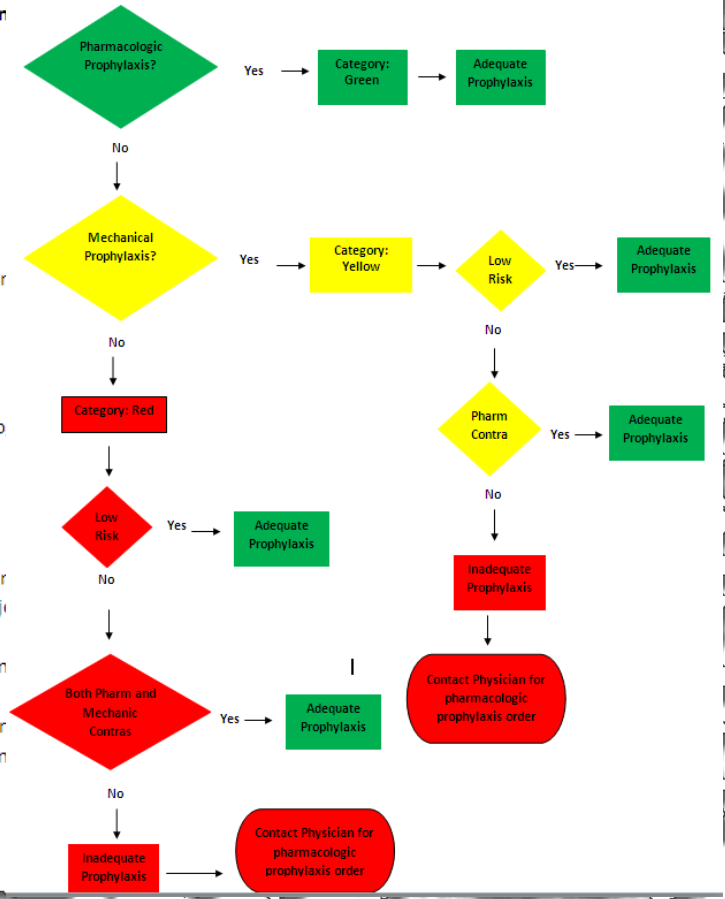
Categories:
Green = on pharmacologic alone or with mechanical
Yellow = on Mechanical only
Red = on nothing

Low risk:
Is the patient low risk?

- Ambulating Independently with 0-1 Risk Factor
- Expected LOS <48 hours
- Minor Surgery with NO Risk Factors

Pharmacologic Contraindicated:
Does patient have any obvious contraindication to pharmacolo prophylaxis?

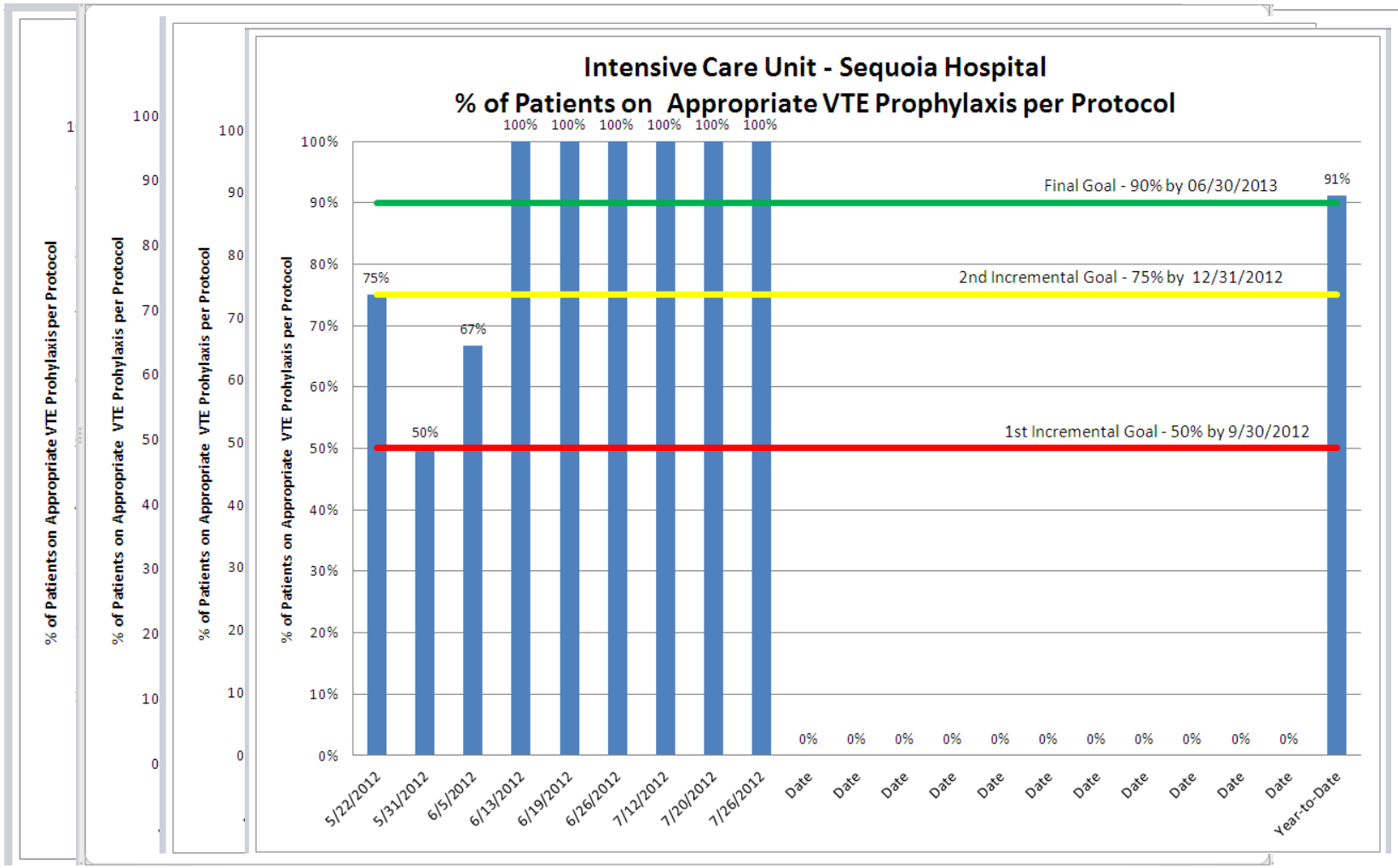
- Does patient have any obvious contraindication to pharmacologic prophylaxis?
- Active hemorrhage now or within last 3 days
- Post operative bleeding concerns (within 24 hours for r surgeries: within 48 hours of transplant surgery or maj trauma)
- Platelet count under 50,000: INR > 1.8 : Known bleedin disorder: Hgb < 8.0
- Concern over CNS bleeding (brain or spinal cord surger last week, recent intracranial hemorrhage, proximity in to epidural insertion or removal, for example)
- Hypertensive urgency / emergency
- Comfort care only patient



ClinStar Daily *Paper* Report

ADM DT	ACCT_NBR	MRN	PAT NAME	RM|BD	AGE	ADM PHY NM	SCD	GREEN	YELLOW	RED	C/I
2/27/2012	[redacted]			221-1			YES	1			
	FONDAPARINUX	2.5 MG	QD	28-Feb							
	FONDAPARINUX	2.5 MG	QD	28-Feb							
2/27/2012	[redacted]			222-1			YES		1		
2/27/2012				223-1				1			
2/27/2012				225-1				1			
	WARFARIN	3 MG	QDC	27-Feb							
	WARFARIN	2 MG	TIW	1-Mar							
	WARFARIN	3 MG	4XW	29-Feb							
3/1/2012	[redacted]			226-1				1			
2/25/2012				227-1			YES				1
2/27/2012				230-1			YES		1		
2/29/2012				232-1				1			
2/27/2012				232-2				1			
	ENOXAPARIN	40 MG	QD	27-Feb							
2/28/2012	[redacted]			234-1			YES	1			
	FONDAPARINUX	2.5 MG	QD	29-Feb							
	ENOXAPARIN	40 MG	Q24	29-Feb							
	HEPARIN	5000 UNITS	Q12	29-Feb							

Results from MeasureVention



Hierarchy of Reliability

Level		Predicted Prophylaxis rate
1	No protocol* (“State of Nature”)	40%
2	Decision support exists but not linked to order writing, or prompts within orders but no decision support	50%
3	**Protocol well-integrated** (into orders at point-of-care)	65-85%
4	Protocol enhanced (by other QI / high reliability strategies)	90%
5	**Oversights identified and addressed in real time**	95+%

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Exercise: Getting to Level 5

- Is your VTE prevention program at Level 1, 2, 3, 4, or 5 in the Hierarchy of Reliability?
- Who at the table is furthest along? What have they done to get there?
- Choose at least 2 ideas from the next two slides
- OR- other ideas that could work at your institution to achieve Level 4 and Level 5 in the Hierarchy of Reliability

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Complementary Strategies to Protocol-Driven Order Sets

- Checklists
- Audit and feedback (delayed)
- Real-time audit / feedback with alert
  - measure-vention
- Other E-alert or human alert
- Triggered consultation
- Care pathways

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Review - New Guidelines (ACP and AT-9 - ACCP) Context for Improvement Teams

NJHA P4P Meeting
Greg Maynard M.D., Clinical Professor of Medicine
Director, UCSD Center for Innovation and Improvement Science
Sr. VP, Society of Hospital Medicine Center for Hospital Innovation and Improvement
Monday, October 8th, 2012

Where discoveries are delivered.℠

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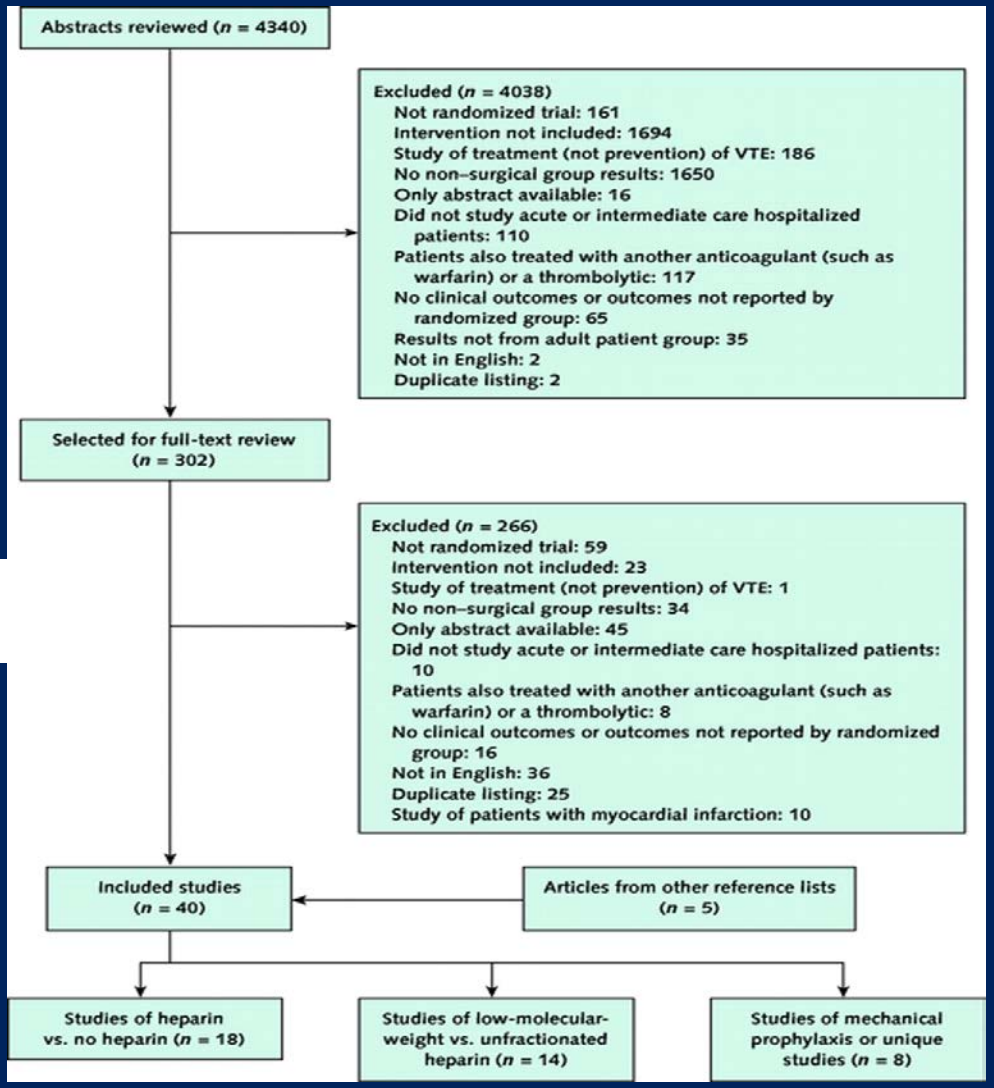
ACP VTEP Guidelines and Review

- Non-Surgical Patient Focus - Studies from 1950-2011
  - Medical
  - Stroke
- English language RCTs
- Excluded studies with therapeutic AC or lytics
- Focused on mortality up to 120 days post randomization, bleeds, SYMPTOMATIC and documented DVT / PE
  - (but used trials that had been using asymptomatic or symptomatic DVT / PE as an end point)
- Major Bleeding definitions as per original papers
- Symptomatic VTE definitions NOT as per original papers

Ann Intern Med. 2011:155;602-15. (review)
Ann Intern Med. 2011:155;625-32. (Clinical Guideline)

Summary of evidence search and selection.VTE = venous thromboembolism.



Annals of Internal Medicine

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Lederle F A et al. Ann Intern Med 2011;155:602-615

Key Outcomes in *Medical Inpatients*
Heparins vs No Heparins
Effect per 1,000 patients placed on heparin

Outcome	Point Estimate-Effect per 1,000 ---- Odds Ratio	Confidence Interval of Effect	Statistically Significant?
Death	-4 0.94	(-11 to 3)	NS
PE	-4 0.69	(-6 to -1)	Significant
DVT	-2 0.78	(-6 to 4)	NS
Major Bleed	1 1.49	(0 to 3)	NS

Lederle F A et al. Ann Intern Med 2011;155:602-615

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Critiques / Remarks on Lederle Review

re: Heparin Prophylaxis

- Population screened for *asymptomatic* DVT endpoint used to calculate incidence of *symptomatic* DVT.
- Systematically reduces any estimate of DVT incidence
- Per this paper, symptomatic PE occurs more frequently than symptomatic DVT - Face validity in question
- Estimate 30% reduction in PE but no significant decrease in DVT (huh?)
- Higher numbers of asymptomatic DVT in control arms – these patients become ineligible to fulfill symptomatic DVT criteria.
- Major bleeding definition in some high volume papers too inclusive (drop in Hb of 2)
- Results vary from prior meta-analysis

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VTE Prophylaxis Meta-Analysis

- 9 studies
- 19,958 medical patients
- Anticoagulant prophylaxis vs no treatment
- Results
  - 57% reduction in RR for symptomatic PE
  - 62% reduction in RR for fatal PE
  - 53% reduction in DVT
  - No significant increase in major bleeding

Mostly used same studies – Much different results due to different methods

NEITHER found increase in major bleeding in medical patients

Dentali F, et al. *Ann Intern Med*. 2007;146:278-288.

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Dentali et al (1) base their conclusion that anticoagulant prophylaxis is effective in hospitalized medical patients on two overlapping significant findings, namely reductions in any pulmonary emboli (PE) and in fatal PE. The two significant differences were largely driven by the results of three studies, by Cohen (2), Gårdlund (3), and Mahe (4). The devil is in the details, and closer examination of these data calls Dentali's conclusion into question.

First, the trial by Cohen reports no PE in the Fondaparinux group and 5 "fatal PE" in the control group at 15 days, but as Cohen et al state: "Two of the five were confirmed by autopsy, the others were assumed to be due to pulmonary emboli, as no other plausible cause was found". As Dentali et al state that "We only considered objectively documented and independently adjudicated outcomes", the three "assumed" PE should clearly not have been counted.

Second, for the Gårdlund study, which had fatal PE at 60 days as its primary outcome, Dentali et al list 3 fatal PE in the heparin group and 12 in the control group, numbers very different from the 15 and 16 reported by Gårdlund. Dentali et al appear to have taken events at 21 days from Gårdlund's figure, presumably out of desire to consider only events occurring "during anticoagulant prophylaxis". Prophylaxis was given for up to 21 days in the Gårdlund study though the mean duration was 8.2 days. However, Gårdlund's figure shows that the four-fold difference in fatal PE at 21 days had completely disappeared two weeks later. Heparin thus may have delayed some events by a few days in this study, but it did not prevent events, and selection of the 21-day timepoint dramatically distorts the study's overall findings. Dentali et al never mention their alteration of the original data.

Third, the study by Mahe reported 27 PE (10 heparin, 17 control) "discovered at autopsy" with no indication that any were clinically important. Dentali et al included these cases, which favor heparin, as "fatal" PE, but excluded identical cases from Gårdlund, which favor control (33 heparin, 26 control).

If the meta-analyses are re-calculated with the corrections described above, there are no significant findings in the article by Dentali et al. The value of anticoagulant prophylaxis in hospitalized medical patients remains uncertain.

Frank A. Lederle, MD Roderick MacDonald, MS, and Timothy J. Wilt, MD MPH
Minneapolis VA Center for Chronic Disease Outcomes Research

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Mark A. Crowther, MD, MSc Francesco Dentali, Wendy Lim and James Douketis
McMaster University

Dear Editor,

Lederle and associates question our conclusion that symptomatic venous thromboembolism (VTE) in medical patients is reduced during treatment with prophylactic anticoagulants. We acknowledge that a discussion of these matters is important as our findings could influence the care of a large number of patients.

First, they indicate that Cohen et al. (1) did not confirm, with autopsy, all fatal pulmonary emboli (PE). They propose this would overestimate the risk of such events. We included these events because, in accordance with our pre-specified criteria, they were independently adjudicated as fatal PE.

Secondly, they questioned our decision to only extract only data from the first 21 days of follow-up data in the study by Gardlund et al. (2). We did this because, in accordance with our analysis plan, we were assessing the impact of prophylaxis during anticoagulant treatment; in this study, prophylaxis was given for up to 21 days. Nonetheless, we agree with their questioning the efficacy of anticoagulant prophylaxis after treatment is stopped. Indeed, we state "the risk for VTE after prophylaxis is stopped remains to be clarified and should be evaluated in future studies" (3).

Thirdly, they criticized our extraction of data of the study by Mahe et al. (4) because we counted all fatal PE events whereas in the study by Gardlund we counted only 'clinically relevant fatal PE'. This was not done by choice, as Lederle et al. infer, but based on our pre-specified decision to extract primary outcome data as reported in each study. Though it would be ideal to have a standardized definition of 'clinically relevant' PE, this definition does not exist. To account for the differences across studies in their methods of outcome determination we compared outcomes within each study in an attempt to provide a consistent and non-biased assessment of the efficacy of anticoagulants to prevent symptomatic VTE.

Although Lederle and associates state that our findings would be rendered null by a more circumspect reporting of outcomes, we disagree. We stand by our conclusion that anticoagulant prophylaxis reduces symptomatic VTE based on the totality of evidence: across-study consistency of risk reduction for PE (3); risk reduction for symptomatic deep vein thrombosis (OR = 0.47; 95% CI: 0.22-1.00; P = 0.05) (3); and supportive evidence from other studies that anticoagulant prophylaxis reduces asymptomatic deep vein thrombosis in medical patients (5).

Key Outcomes in Combined Non-Surgical Inpatients Mechanical vs No Mechanical Prophylaxis Effect per 1,000 patients

Outcome	Point Estimate-Effect per 1,000 ---- Odds Ratio	Confidence Interval of Effect	Statistically Significant?
Death	11 1.13	(-10 to 37)	NS
PE	-5 0.65	(-10 to 5)	NS
DVT	-4 0.91	(-18 to 14)	NS
Skin Damage	39 4.02	(17 to 77)	Significant

No mortality impact, no impact on VTE – Significant impact on Skin complications

Lederle F A et al. Ann Intern Med 2011;155:602-615

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Critiques and comments on Review

-Mechanical prophylaxis

- Meta-analyses results driven almost entirely by one study
  - CLOTS 1 Trial in Stroke Patients
  - 2,518 of the 2,641 patients
  - Thigh high TEDS (GCS) in stroke patients vs avoid GCS

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Thigh High GCS Did Not Reduce DVT

CLOTS 1 Trial

- 2518 hospitalized immobile patients admitted within 1 week of acute stroke
- Randomized to routine care +/- graduated compression stocking (GCS)

	Thigh-length GCS (n=1256)	Avoid GCS (n=1262)	Odds ratio (95% CI)
Primary outcome			
Proximal DVT	126 (10·0%)	133 (10·5%)	..
Alive and free of primary outcome	974 (77·5%)	1000 (79·2%)	..
Dead before any primary outcome	115 (9·2%)	101 (8·0%)	..
Missing	41 (3·3%)	28 (2·2%)	..
Unadjusted (dead and missing excluded)	..	..	0·97 (0·75-1·26)
Adjusted* (dead and missing excluded)	..	..	0·98 (0·76-1·27)

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CLOTS Trials Collaboration, Dennis M, et al. *Lancet*. 2009;373(9679):1958-1965.

CLOTS 1 Trial: Thigh high GCS vs Regular Care

- RCT with > 2500 patients in over 60 centers

10% DVT with thigh high GCS vs 10.5% in “avoid GCS” NS

Skin problems 5% in GCS vs 1% in “avoid GCS” group

Caveats: TEDS were used. TEDS brand GCS do not meet UK standards for graduated compression.

Are Stroke patients = Medical patients?

How would we explain CLOTS 2 results?

CLOTS Trial 1: Lancet 2009 June 6: 373 (9679); 1958-65.

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CLOTS 2: RCT in immobile Stroke Patients

- Thigh high vs Below the Knee GCS
- 3114 patients at 112 centers
- Stockings until discharge or until independently mobile or until patient refuses or until skin ulceration concerns.

Annals of Internal Medicine, September 20, 2010

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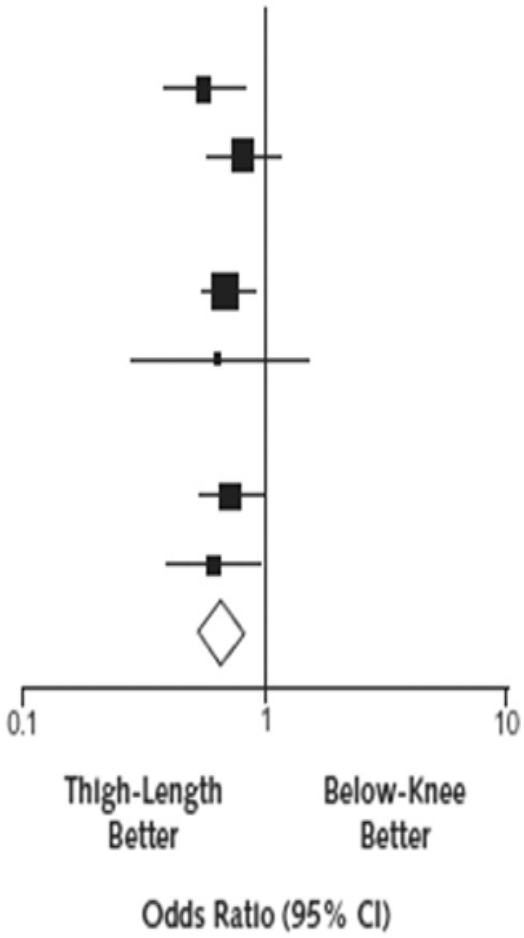
CLOTS 2:
Thigh length GCS superior to Below the Knee GCS

Prespecified Subgroup	Thigh-Length Stockings, *n/N (%)*	Below-Knee Stockings, *n/N (%)*	Odds Ratio (95% CI)	*P* Value
Delay from onset to randomization				
0–1 d	41/605 (6.8)	66/585 (11.3)	0.57 (0.38–0.85)	0.195
≥2 d	57/739 (7.7)	72/766 (9.4)	0.82 (0.57–1.17)	
Use of antithrombotics				
No	89/1169 (7.6)	124/1174 (10.6)	0.70 (0.52–0.93)	0.89
Yes	9/175 (5.1)	14/177 (7.9)	0.65 (0.27–1.56)	
Able to lift both legs				
No	67/774 (8.7)	91/780 (11.7)	0.73 (0.52–1.02)	0.63
Yes	31/570 (5.4)	47/571 (8.2)	0.62 (0.39–1.00)	
All	98/1344 (7.3)	138/1351 (10.2)	0.69 (0.53–0.91)	0.008



CLOTS 2 Trial Results: Thigh high vs Knee high

- DVT 6.3% vs 8.8% knee high
- Skin break down 3.9% vs 2.9% knee high

25 symptomatic DVT averted, 10 skin complications per 1000 patients treated

- Documented tolerance 74.6% vs 75.3% knee high
- So…..did we mess up on CLOTS 1 and miss benefit?

Or, do knee high TEDS actually *cause* clots in stroke patients, making thigh high TEDS look better?

- CLOTS 3 Trial (SCDs vs no mechanical method in stroke patients) coming.

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ACP VTEP Guidelines for Non-Surgical Inpatients

1. ACP recommends assessment of the risk for thromboembolism and bleeding in medical (including stroke) patients prior to initiation of prophylaxis of venous thromboembolism.
2. ACP recommends pharmacologic prophylaxis with heparin or a related drug for venous thromboembolism in medical (including stroke) patients unless the assessed risk for bleeding outweighs the likely benefits.
3. ACP recommends against the use of mechanical prophylaxis with Graduated Compression stockings for prevention of venous thromboembolism.

- *Guidance does not include SCDs*

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What's New in the ACCP Guidelines

- **Decrease in 1A recommendations**
- Ortho prophylaxis
- Mechanical Prophylaxis
- VTE prophylaxis in hospitalized medical patients
- Risk Assessment Models, endorsement and extrapolation

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Decrease in 1A recommendations

	1A	Pages
2004	123	540
2008	182	901
2012	29	801

Hirsh J, Guyatt G, Lewis SZ. Chest. 2008 Jun;133(6):1293-5. PMID: 18574282
Guyatt GH. Chest. 2012 Feb;141(2 Suppl):48S-52S. PMID: 22315255

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Decrease in 1A recommendations

- Readers of AT9 will find many weak recommendations replacing the strong recommendations of AT8.
- One major reason for this change is the more critical look at the evidence and the resulting inferences that some evidence is lower quality than previously believed.
- A second is the recognition of variability in values and preferences.
- Third, in the small number of controversial recommendations that came to a formal vote using anonymous electronic voting, we required the endorsement of > 80% of panelists to make a strong recommendation.
- Finally, the exclusion of conflicted experts, who often hold strong opinions about optimal management approaches, from final decisions regarding quality of evidence and strength of recommendations also may have contributed.

Guyatt GH. Chest. 2012 Feb;141(2 Suppl):48S-52S. PMID: 22315255

Table 4—*Strength of the Recommendations Grading System*

Grade of Recommendation	Benefit vs Risk and Burdens	Methodologic Strength of Supporting Evidence	Implications
Strong recommendation, high-quality evidence (1A)	Benefits clearly outweigh risk and burdens or vice versa.	Consistent evidence from randomized controlled trials without important limitations or exceptionally strong evidence from observational studies.	Recommendation can apply to most patients in most circumstances. Further research is very unlikely to change our confidence in the estimate of effect.
Strong recommendation, moderate-quality evidence (1B)	Benefits clearly outweigh risk and burdens or vice versa.	Evidence from randomized controlled trials with important limitations (inconsistent results, methodologic flaws, indirect or imprecise) or very strong evidence from observational studies.	Recommendation can apply to most patients in most circumstances. Higher-quality research may well have an important impact on our confidence in the estimate of effect and may change the estimate.
Strong recommendation, low- or very-low-quality evidence (1C)	Benefits clearly outweigh risk and burdens or vice versa.	Evidence for at least one critical outcome from observational studies, case series, or randomized controlled trials, with serious flaws or indirect evidence.	Recommendation can apply to most patients in many circumstances. Higher-quality research is likely to have an important impact on our confidence in the estimate of effect and may well change the estimate.
Weak recommendation, high-quality evidence (2A)	Benefits closely balanced with risks and burden.	Consistent evidence from randomized controlled trials without important limitations or exceptionally strong evidence from observational studies.	The best action may differ depending on circumstances or patient or societal values. Further research is very unlikely to change our confidence in the estimate of effect.
Weak recommendation, moderate-quality evidence (2B)	Benefits closely balanced with risks and burden.	Evidence from randomized controlled trials with important limitations (inconsistent results, methodologic flaws, indirect or imprecise) or very strong evidence from observational studies.	Best action may differ depending on circumstances or patient or societal values. Higher-quality research may well have an important impact on our confidence in the estimate of effect and may change the estimate.
Weak recommendation, low- or very-low-quality evidence (2C)	Uncertainty in the estimates of benefits, risks, and burden; benefits, risk, and burden may be closely balanced.	Evidence for at least one critical outcome from observational studies, case series, or randomized controlled trials, with serious flaws or indirect evidence.	Other alternatives may be equally reasonable. Higher-quality research is likely to have an important impact on our confidence in the estimate of effect and may well change the estimate.

Major Shift in Methodology for AT-9 VTEP Guidelines

- Non-clinical, non-expert technicians do first pass analyses
- Exclusion of asymptomatic VTE end points
- Included all the RCTs that had originally included asymptomatic VTE as an endpoint.
- Accepted study definitions of major bleeding, but not definitions of symptomatic VTE.
- Mathematical models based on series of assumptions and extrapolations

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What's New in the ACCP Guidelines

- Decrease in 1A recommendations
- **Ortho prophylaxis**
- Mechanical Prophylaxis
- VTE prophylaxis in hospitalized medical patients
- Risk Assessment Models, endorsement and extrapolation

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2012 ACCP Guideline

2.3.1. In patients undergoing THA or TKA, irrespective of the concomitant use of an IPCD or length of treatment, we suggest the use of LMWH in preference to the other agents we have recommended as alternatives: fondaparinux, apixaban, dabigatran, rivaroxaban, LDUH (all Grade 2B) , adjusted-dose VKA, or aspirin (all Grade 2C)

Allow ASA as a choice (split decision)

Allows IPC as stand alone option (with caveats)

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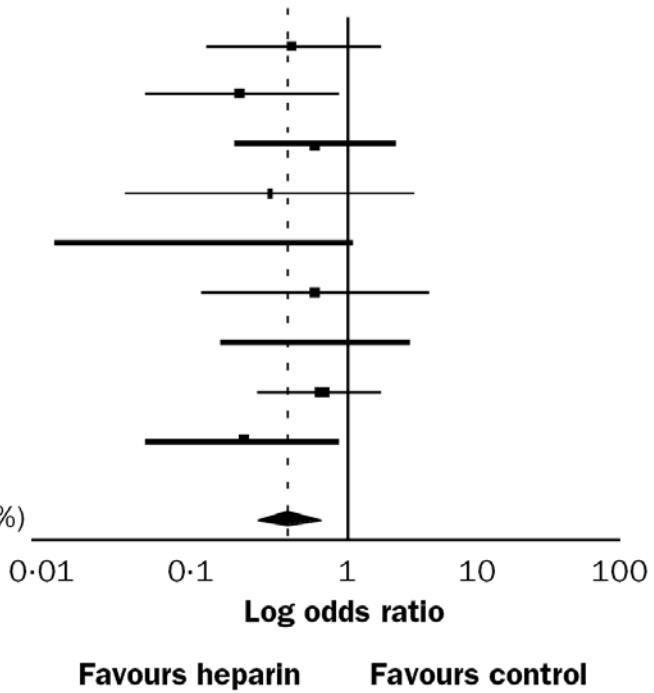
Extended LMWH vs. Placebo in Orthopedic Surgery

Study	Heparin	Control	OR	95% CI
Planes et al, 1996	3/85 (3·5%)	7/88 (8·0%)	0·42	0·11–1·69
Bergqvist et al, 1996	2/117 (1·7%)	10/116 (8·6%)	0·18	0·04–0·86
Dahl et al, 1997	4/114 (3·5%)	6/106 (5·7%)	0·61	0·17–2·21
NPHDO, 1998	1/115 (0·6%)	3/141 (2·1%)	0·30	0·03–2·90
Manganelli et al, 1998	0/41 (0%)	6/38 (1·6%)	0·06	0·01–1·11
Lassen et al, 1998	2/113 (1·8%)	3/102 (2·9%)	0·59	0·10–3·63
Hull et al, 2000	4/291 (1·4%)	3/133 (2·3%)	0·60	0·13–2·74
Hull et al, 2000	7/607 (1·2%)	10/588 (1·7%)	0·67	0·26–1·78
Comp et al, 2001	2/441 (0·4%)	10/432 (2·3%)	0·19	0·04–0·88
Total	25/1964 (1·3%)	58/1744 (3·3%)	0·38	0·24–0·61



Hip NNT 34

Knee NNT 250 with wide

Eikelboom JW. Lancet. 2001 Jul 7;358(9275):9-15. PMID: 11454370

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Evidence for Warfarin INR Target in VTE Prophylaxis after Elective TKR/THR

14 comparative trials with warfarin arms

INR Target	Number of Trials
1.5 - 3	1
1.8 – 2.8	1
1.8 – 3	3
2 - 3	9

No trials 1.5 to 2.0

Treatment Duration: 4-14 days (1 trial to 35 days)

Data courtesy of WE Dager.

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What's New in the ACCP / ACP Guidelines

- Decrease in 1A recommendations
- Ortho prophylaxis
- **Mechanical Prophylaxis**
- VTE prophylaxis in hospitalized medical patients
- Risk Assessment Models, endorsement and extrapolation

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Mechanical VTE Prophylaxis: 2008

- Mechanical methods of VTE prophylaxis should be used in patients who are at high risk of bleeding [1C+], or
- As an adjunct to anticoagulant-based prophylaxis [2A]
  - Surgery patients with multiple risk factors
- Careful attention should be directed toward ensuring the proper fit and optimal compliance when using mechanical devices

There is no difference in the prevention of VTE between calf/thigh length or single chamber/sequential Mechanical Prophylaxis Modalities

Or is there?

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

Mechanical Prophylaxis

- GCS vs SCDs
  - ACCP guidelines kind of silent on this
  - Caution in non-surgical patients with GCS
- Thigh High vs Calf High
  - SCDs --- Thigh high may be better then knee high in Stroke
  - Not a lot of evidence otherwise for SCDs or GCS
- Special SCDs that can go home with patients
- Fit, adherence, are issues with all
- Fall risk?

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ACCP endorses a specific SCD type as stand alone

(in joint arthroplasty)

Illuminating Evidence to Aid Decision Making – January 2012

ActiveCare+SFT® Portable Compression Device for Venous Thromboembolism Prevention After Joint Arthroplasty

Technology Overview and Status

The ActiveCare+SFT® (Medical Compression Systems, Inc., West Hills, Calif, www.mcsmed.com) is a portable, battery-powered intermittent pneumatic compression (IPC) device used for venous thromboembolism (VTE) prophylaxis following surgery. The system is intended to increase compliance in hospital by allowing use while ambulating; it may be prescribed for at-home use as well.

The ActiveCare device consists of a small (1.6 lb) controller unit, single- or multicelled disposable lower limb cuffs, and plastic hoses connecting the cuffs to the control unit. The controller unit can be worn on a shoulder strap during ambulation. Internal rechargeable batteries allow the device to be used for 5 to 7 hours without needing to be connected to an electrical outlet. Multiple-cuff designs allow various combinations of foot, calf, and/or thigh compression with single-cuff or sequential compression. Synchronized Flow Technology (SFT) uses an internal sensor to

The cuffs may be placed immediately after the induction of anesthesia during total hip arthroplasty (THA) or total knee arthroplasty (TKA) procedures. The device is intended to be used 24 hours a day, or as much as possible, after surgery; it is typically removed only during bathing. An internal timer in the controller measures and displays the total amount of time the device is functioning to inform caregivers about compliance. With instruction, the cuffs, which attach with hook-and-loop fasteners, can be reapplied by the patient at home or in a rehabilitation setting. Use of the device may be prescribed for 8 to 12 days after surgery. Daily low-dose (e.g., 81 mg) aspirin may also be prescribed for select patients.

The ActiveCare device has been under develop-

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Joe Cummings, PhD, manager UHC Technology Assessment Group

What's New in the ACCP / ACP Guidelines

- Decrease in 1A recommendations
- Ortho prophylaxis
- Mechanical Prophylaxis
- VTE prophylaxis in hospitalized medical patients
- Risk Assessment Models, endorsement and extrapolation

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Medical prophylaxis

2012 ACCP

2.3. For acutely ill hospitalized medical patients at increased risk of thrombosis, we recommend anticoagulant thromboprophylaxis with LMWH, UFH or fondaparinux (Grade 1B)

2.4. For acutely ill hospitalized medical patients at low risk of thrombosis, we recommend against the use of pharmacologic prophylaxis or mechanical prophylaxis (Grade 1B) .

2008 ACCP

6.0.1. For acutely ill medical patients admitted to hospital with congestive heart failure or severe respiratory disease, or who are confined to bed and have one or more additional risk factors, including active cancer, previous VTE, sepsis, acute neurologic disease, or inflammatory bowel disease, we recommend thromboprophylaxis with LMWH (Grade 1A), LDUH (Grade 1A), or fondaparinux (Grade 1A)

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Table 2—*Risk Factors for VTE in Hospitalized Medical Patients*[9]

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

PADUA RISK MODEL

- A Patients with local or distant metastases and/or in whom chemotherapy or radiotherapy had been performed in the previous 6 mo.
- B Anticipated bed rest with bathroom privileges (either because of patient's limitations or on physician's order) for at least 3 d.
- C Carriage of defects of antithrombin, protein C or S, factor V Leiden, G20210A prothrombin mutation, antiphospholipid syndrome.

Kahn SR. Chest. 2012 Feb;141(2 Suppl):e195S-226S. PMID: 22315261
Barbar S. J Thromb Haemost. 2010 Nov;8(11):2450-7. PMID: 20738765

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Padua VTE Risk Prediction Model

- In the Padua Prediction Score risk assessment model, high risk of VTE is defined by a cumulative score **4 points**.
- In a prospective observational study of 1,180 medical inpatients, **60.3% of patients were low risk** and 39.7% were high risk.
- Among patients who **did not receive prophylaxis**,
  - VTE occurred in **11.0% of high-risk** patients vs
  - **0.3% of low-risk patients** (HR, 32.0; 95% CI, 4.1-251.0).
- Among high-risk patients, the risk of DVT was 6.7%, nonfatal PE 3.9%, and fatal PE 0.4%.9 HR 5 hazard ratio.

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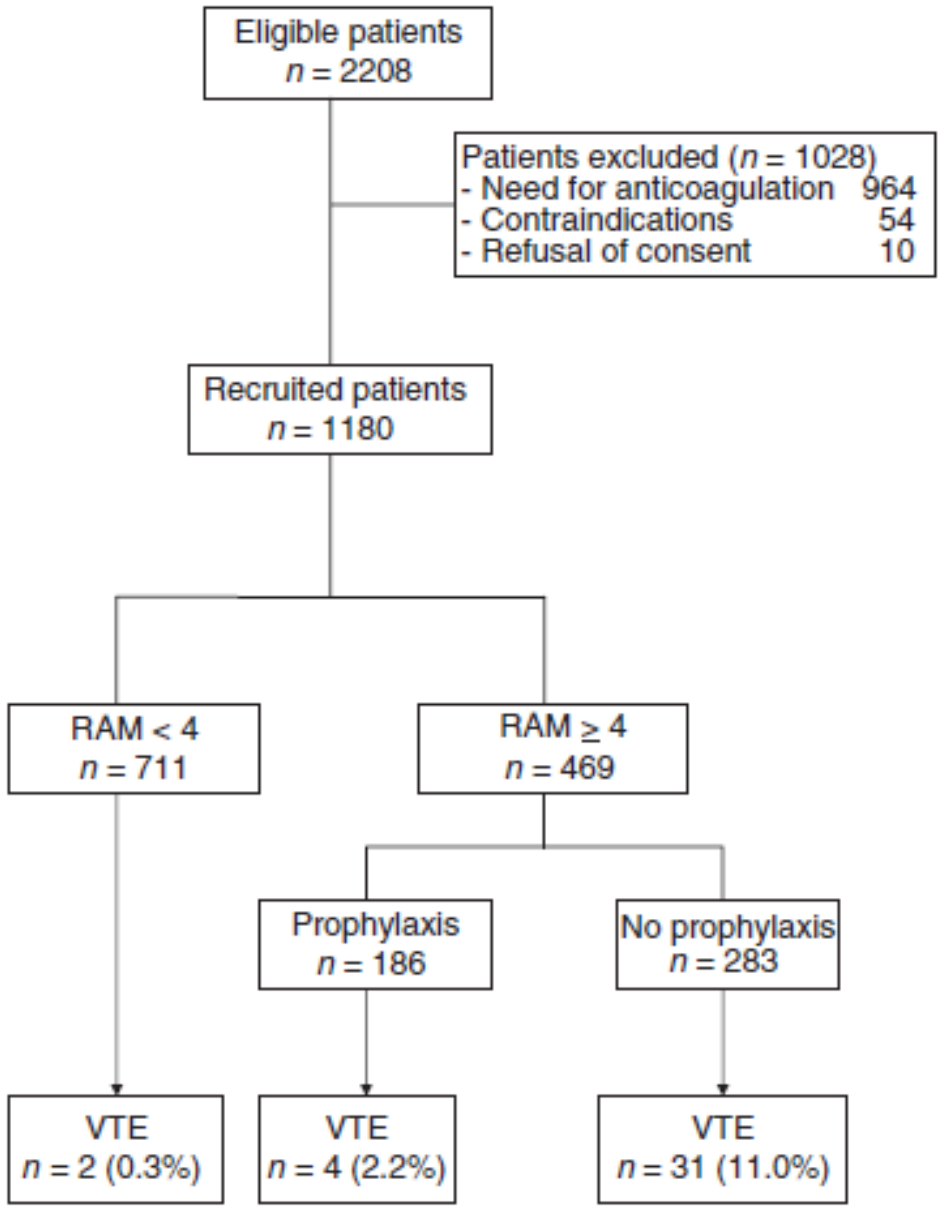

Fig. 1. Flow diagram of the study.

A Few Padua Caveats:
964 of 2208 already needed AC

65% of population with an indication to be GREEN

Two patients with scores of 3 developed VTE 1.04%
2 of 192 (info from authors)

RAM < 4 patients

- 12% had acute infxn / rheum
- 6% with CA
- 6% Obese
- < 1% immobile

Would these be inpatients in your hospital? Mean LOS 7.9 days! Maybe not so different from 3 bucket model after all…..

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Padua VTE Risk Assessment Model

- Do you really believe ANY risk assessment model can essentially rule of risk of VTE in 60% of medical inpatients?
- How do *you* define reduced mobility?
- Reduced mobility for > 2 days and any other risk factor is a 4
- Would 60% of your inpatients be a ‘3’ or less?
  - Or would these be outpatients in your hospital?
- If you use Padua – Consider cut point of 3, not 4

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Rogers and Caprini Models in Surgical Patients

- Endorsed by ACCP
- Acknowledged that Rogers method is not practical
- Caprini model said to be fairly easy to use
  - Collaborative improvement experience indicates otherwise!!!!
- No mention of “3 bucket model”
- Caprini model validation study ----only 10% at level very low, low risk that do not require AC

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Deep Vein Thrombosis (DVT)
Prophylaxis Orders
(For use in Elective General Surgery Patients)

BIRTHDATE

NAME

CPI No.

SEX M F VISIT No. _____

Thrombosis Risk Factor Assessment (Choose all that apply)

Each Risk Factor Represents 1 Point

- ❑ Age 41-60 years
- ❑ Swollen legs (current)
- ❑ Varicose veins
- ❑ Obesity (BMI >25)
- ❑ Minor surgery planned
- ❑ Sepsis (<1 month)
- ❑ Acute myocardial infarction
- ❑ Congestive heart failure (<1 month)
- ❑ Medical patient currently at bed rest
- ❑ History of inflammatory bowel disease
- ❑ History of prior major surgery (<1 month)
- ❑ Abnormal pulmonary function (COPD)
- ❑ Serious Lung disease including pneumonia (<1 month)
- ❑ Oral contraceptives or hormone replacement therapy
- ❑ Pregnancy or postpartum (<1 month)
- ❑ History of unexplained stillborn infant, recurrent spontaneous abortion (≥ 3), premature birth with toxemia or growth-restricted infant
- ❑ Other risk factors_____

Subtotal:

Each Risk Factor Represents 2 Points

- ❑ Age 61-74 years
- ❑ Arthroscopic surgery
- ❑ Malignancy (present or previous)
- ❑ Laparoscopic surgery (>45 minutes)
- ❑ Patient confined to bed (>72 hours)
- ❑ Immobilizing plaster cast (<1 month)
- ❑ Central venous access
- ❑ Major surgery (>45 minutes)

Subtotal:

Each Risk Factor Represents 3 Points

- ❑ Age 75 years or older
- ❑ History of DVT/PE
- ❑ Positive Factor V Leiden
- ❑ Elevated serum homocysteine
- ❑ Heparin-induced thrombocytopenia (HIT) (Do not use heparin or any low molecular weight heparin)
- ❑ Elevated anticardiolipin antibodies
- ❑ Other congenital or acquired thrombophilia

If yes: Type_____

* most frequently missed risk factor

- ❑ **Family History of thrombosis***
- ❑ Positive Prothrombin 20210A
- ❑ Positive Lupus anticoagulant

Subtotal:

Each Risk Factor Represents 5 Points

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

Subtotal:

TOTAL RISK FACTOR SCORE:

FACTORS ASSOCIATED WITH INCREASED BLEEDING

Patient may not be a candidate for anticoagulant therapy & SCDs should be considered.

Active Bleed, Ingestion of Oral Anticoagulants, Administration of glycoprotein IIb/IIIa inhibitors, History of heparin induced thrombocytopenia

CLINICAL CONSIDERATIONS FOR THE USE OF SEQUENTIAL COMPRESSION DEVICES (SCD)

Patient may not be a candidate for SCDs & alternative prophylactic measures should be considered.

Patients with Severe Peripheral Arterial Disease, CHF, Acute Superficial DVT

Total Risk Factor Score	Risk Level	Incidence of DVT	Prophylaxis Regimen
0-1	Low Risk	2%	❑ Early ambulation
2	Moderate Risk	10-20%	Choose the following medication OR compression devices: ❑ Sequential Compression Device (SCD) ❑ Heparin 5000 units SQ BID
3-4	Higher Risk	20-40%	Choose ONE of the following medications + / - compression devices: ❑ Sequential Compression Device (SCD) ❑ Heparin 5000 units SQ TID ❑ Enoxaparin/Lovenox: ❑ 40mg SQ daily (WT < 150kg, CrCl > 30mL/min) ❑ 30mg SQ daily (WT < 150kg, CrCl = 10-29mL/min) ❑ 30mg SQ BID (WT > 150kg, CrCl > 30mL/min) (Please refer to Dosing Guidelines on the back of this form)
5 or more	Highest Risk	40-80%	Choose ONE of the following medications PLUS compression devices: ❑ Sequential Compression Device (SCD) ❑ Heparin 5000 units SQ TID (Preferred with Epidurals) ❑ Enoxaparin/Lovenox (Preferred): ❑ 40mg SQ daily (WT < 150kg, CrCl > 30mL/min) ❑ 30mg SQ daily (WT < 150kg, CrCl = 10-29mL/min) ❑ 30mg SQ BID (WT > 150kg, CrCl > 30mL/min) (Please refer to Dosing Guidelines on the back of this form)

❑ Ambulatory Surgery - No orders for venous thromboembolic prophylaxis required

❑ VTE Prophylaxis Contraindicated, Reason: _____

Joseph A. Caprini, MD, MS, FACS, RVT
VTE Risk Factor Assessment Tool

Physician Signature	Dr. #	Date	Time
Processed By:		Date/Time:	

White-Medical Record
Yellow-MIS Pink-Pharmacy

University of Michigan Health System

DVT Prophylaxis Regimen

Ann Surg
2009Bahl et al

% of Surgical Patients in Each Risk Category

Low Risk - 0.9%

Moderate Risk - 10.4%

High Risk - 36.5%

Highest Risk - 52.1%

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New Guidelines: Comments / Insights / Implications

- Controversial guidelines notable for lack of *practical* guidance.
- In my opinion, one set of biased assumptions has been replaced by another, skewed in opposite direction.
- Recommended risk models cumbersome
- Recommended risk models relatively untested in terms of inter-observer agreement and efficacy.
- Dozens in collaboratives have replicated UCSD results….fewer VTE, no increase in bleeding.
- Valid points: Some inpatients not at significant risk, attention to possible over anticoagulation is warranted.
- Carve out of elective CV surgery / CABG patients reasonable
- Ortho-----depends on your local culture

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Questions and Comments

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Key Points - Recommendations

- VTE Risk Assessment embedded in order sets
- Simple risk stratification schema, based on VTE-risk groups (2-3 levels of risk should do it)
- Customization for some services is desirable.
- Simple measures for adequate VTE prophylaxis
  - More detail on selected patients
- Follow Outcomes (use UC script if using admin data)
- Work on adherence to ordered prophylaxis
- Use measure-vention to accelerate improvement
- Share information / comparing notes helps

Maynard G, Stein J. Designing and Implementing Effective VTE Prevention Protocols: Lessons from Collaboratives. J Thromb Thrombolysis 2010 Feb:29(2):159-166.

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Special Populations and Situations

Morbid Obesity, ESRD, OB / GYN, Endo of Life

Discharge Happens! When to prolong VTE prophylaxis

Where discoveries are delivered.℠

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Special Considerations for LMWH

- Starting dose and time
  - Guidelines: Begin 12-24 hr post-op
  - Renal impairment
    - Enoxaparin: ½ dose for CrCl <30 mL/min: chronic kidney disease stages 4 and 5 (?)
    - Dalteparin: no need to change dosing for CrCl >20 mL/min

Polkinghorne KR et al. *Am J Kidney Dis.* 2002;40:990-5.

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VTEP in Renal Failure

- ACCP: “follow package guidelines” and:
  - lower the dose,
  - use a drug that doesn’t accumulate, or
  - monitor the effect
- Enoxaparin: Reduce to 30mg/d if GFR <30
- Dalteparin: “use with caution” and anti-Xa levels.
  - Appeared not to accumulate at doses of 5000 units / day* provided not on dialysis
- Fondaparinux: contraindicated if CrCl <30
- UFH: not cleared by kidney, simple solution

*Douketis J Thromb Haemost 2007

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Elderly Patients: Few Data

- LMWH: some data link low weight/GFR to elevated anti-Xa levels, but hemorrhage was independent
- Tinzaparin / Dalteparin: did not accumulate in elderly (GFR 20-50, <30 respectively)
- Fondaparinux: VTEP is contraindicated below 50kg

Mahe, Thromb Haemost 2007; Tincani, Hematologica 2006

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VTE Prophylaxis in Obesity

Retrospective, multicenter, orthopedic surgery (n=817)

- Enoxaparin 40 mg/day subcutaneously, starting 12 hr before surgery
- Post-op day 7-10 bilateral venography VTE = 18.7%
- No relationship between weight or body surface area and thrombosis
- Strong relationship: BMI and thrombosis (p=0.0002)
  - BMI >32 kg/m^2 – 31.8% thrombosis
  - BMI <32 kg/m^2 – 16.7% thrombosis (p<0.001)
- No relationship between bleeding and BMI

Samama MM. *Thromb Haemost.* 1995; 73:977.

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Bariatric Surgery and Morbid Obesity

Bariatric Surgery

- UFH or LMWH and consider adding IPC
- Optimal dose
  - Not known, but small trials suggest enoxaparin 40 mg SC every 12 hr more effective than enoxaparin 30 mg SC every 12 hr or 40 mg/day

Morbid Obesity

- Many centers extrapolate dosing for morbidly obese inpatients - evidence is limited

Geerts WH et al. *Chest*. 2008; 133(6 suppl):381S-453S.

Risk for VTE in Patients Undergoing Gynecologic Surgery

Risk Level	GYN Surgery	VTE Prevention
Low	Surgery < 30 minutes in patients < 40 years with no additional risk factors	Ambulate
Moderate to High	Everyone not in Low or Highest Risk Category	Mechanical or UFH or LMWH
Highest	Major surgery in patients > 60 years plus prior VTE, cancer, or hypercoagulable state	Mechanical and UFH or LMWH

American College of Obstetricians and Gynecologists Committee on Practice Bulletins. *Obstet Gynecol.* 2007; 110(2 pt 1):429-40.

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VTE Prophylaxis in Pregnancy

ACOG 2011 Guidelines

- 4 – 5 x risk of VTE with pregnancy, 9% of maternal deaths
- Risk Post-partum > 3rd trimester > 1st and 2nd trimester
- All women admitted for delivery should receive VTE prophylaxis
- C-section- independent risk factor
- If AC used, resume no sooner than 4-6 hours after vaginal delivery, 6-12 hours after c-section. Withhold LMWH 24 hours before / after neuraxial blockade.
- Keep VTE prophylaxis going until patient up and walking post delivery.

Obstetrics & Gynecology:
September 2011 - Volume 118 - Issue 3 - ppg 718-729
doi: 10.1097/AOG.0b013e3182310c4c

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Special Populations; Single Tool

Perfect is the Enemy of Good

- Brief disclaimers?
  - “enoxaparin 40mg q day (do not use if CrCl <30)”
  - “UFH 5000 q12 H (weight <50kg or >75 yrs only)”
- Referral to detail elsewhere on tool?
- Recommendation for consultation?
- Pharmacy solutions?
  - e.g., review VTEP orders for BMI, CrCl
- Disclaimer limiting scope of tool?

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Further Reading

- Clark NP. LMWH use in the obese, elderly, and in renal insufficiency. Thrombosis Research 2008. 123(1): S58-S61.
- Lim W. Using LMWH heparin in special patient populations. J Thromb Thrombolysis. 2010;29(2):233-40.
- Nutescu EA. LMWH heparins in renal impairment and obesity. Ann Pharmacother 2009. 43(6):1064-83.

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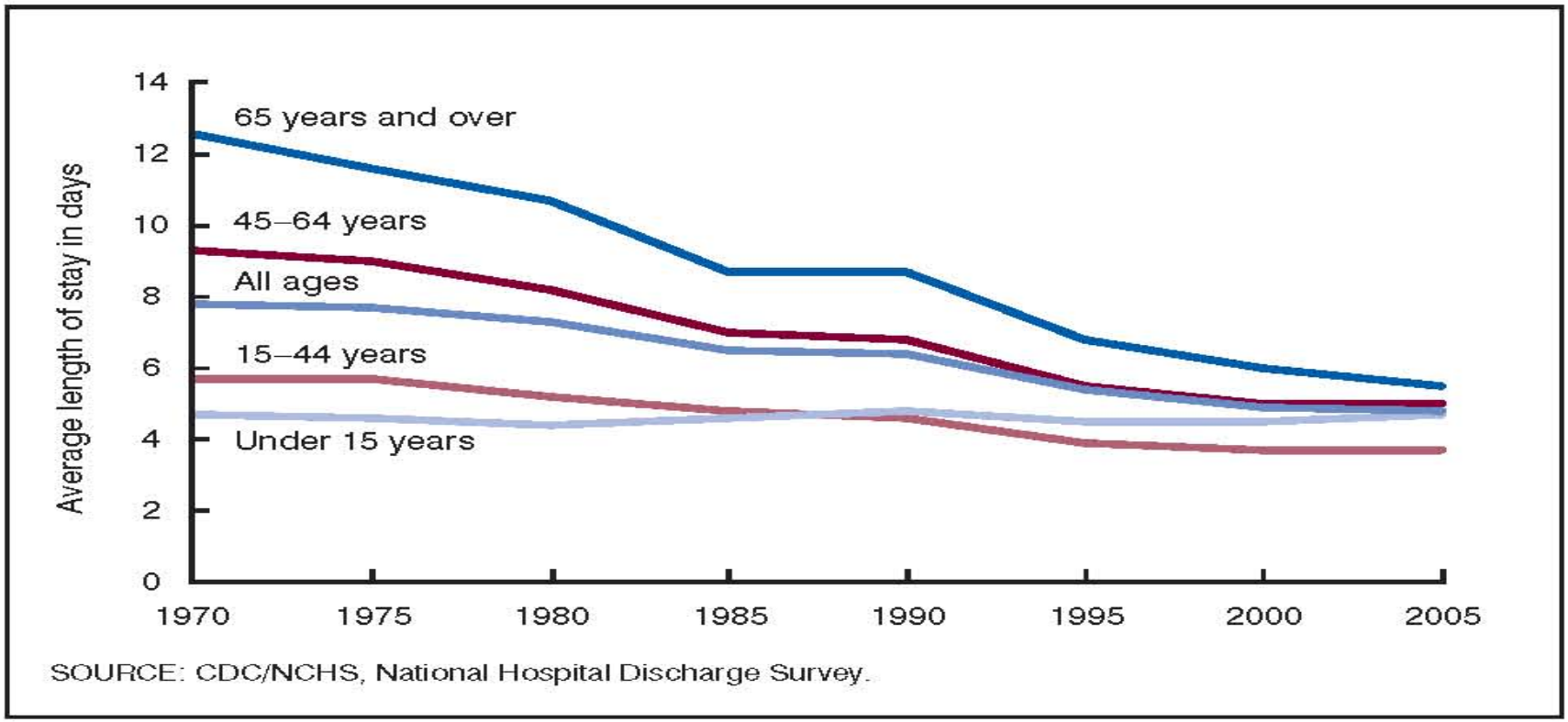
Average LOS in Days by Age: Selected Years 1970 to 2005

The average length of stay for all ages in the United States has declined and was significantly shorter in 2005 than in 1970 (4.8 days vs. 7.8 days)



Average length of stay in days by age: United States, selected years 1970–2005

DeFrances CJ et al. *Adv Data.* 2007; 385:1-19.

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Which patient (s) should received extended duration prophylaxis after their stay?

a. 70 yo man after hip fracture
b. 60 yo old obese man after TKR
c. 65 yo old with CHF exac. and pneumonia
d. 50 yo woman s/p colectomy for CR CA
e. All of the above
f. All of the above except ‘C’

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At the time of discharge, do you have a protocol in place to extend VTE prophylaxis beyond the hospital stay?

a. Yes
b. No
c. I don’t know

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Evidence Supporting Extended Prophylaxis after Hospital Discharge in Medical Patients - EXCLAIM Trial

- Medical patients randomized to extended post-hospital VTE prophylaxis for approx. 1 month using LMWH or placebo after initial ~10 day course
- Controversial - study design amended

- Results

(extended duration LMWH x 28 days vs. placebo)

  - Benefits restricted to patients >75 years of age, women, and acutely ill medical patients with level 1 immobility
  - Small but statistically significant increase in bleeding

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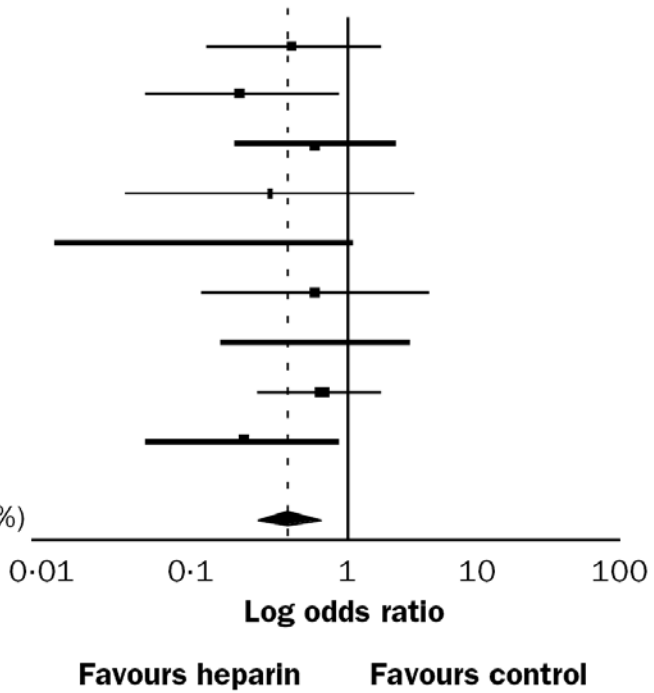
Hull RD. *Ann Intern Med*. 2010; 153:8-18.

Extended LMWH vs. Placebo in Orthopedic Surgery

Study	Heparin	Control	OR	95% CI
Planes et al, 1996	3/85 (3·5%)	7/88 (8·0%)	0·42	0·11–1·69
Bergqvist et al, 1996	2/117 (1·7%)	10/116 (8·6%)	0·18	0·04–0·86
Dahl et al, 1997	4/114 (3·5%)	6/106 (5·7%)	0·61	0·17–2·21
NPHDO, 1998	1/115 (0·6%)	3/141 (2·1%)	0·30	0·03–2·90
Manganelli et al, 1998	0/41 (0%)	6/38 (1·6%)	0·06	0·01–1·11
Lassen et al, 1998	2/113 (1·8%)	3/102 (2·9%)	0·59	0·10–3·63
Hull et al, 2000	4/291 (1·4%)	3/133 (2·3%)	0·60	0·13–2·74
Hull et al, 2000	7/607 (1·2%)	10/588 (1·7%)	0·67	0·26–1·78
Comp et al, 2001	2/441 (0·4%)	10/432 (2·3%)	0·19	0·04–0·88
Total	25/1964 (1·3%)	58/1744 (3·3%)	0·38	0·24–0·61



Hip NNT 34

Knee NNT 250 with wide

Eikelboom JW. Lancet. 2001 Jul 7;358(9275):9-15. PMID: 11454370

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ACCP AT9 Guidelines – Duration in Ortho Patients

- THA, TKA, HFS
  - MINIMUM of 10 – 14 days
  - "Suggest extending thromboprophylaxis in the outpatient period for up to 35 days from the day of surgery, rather than for only 10-14 days."
    - Grade 2B

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ACCP AT9 Guidelines –

Duration in abd / pelvic surgery for CA

" For high VTE-risk patients undergoing abdominal or pelvic surgery for cancer who are not otherwise at high risk for major bleeding complications, we recommend extended-duration pharmacologic prophylaxis (4 weeks) with LMWH over limited duration prophylaxis."

(Grade 1 B)

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ACCP AT-9 Guidelines

Outpatients with Cancer - Extended duration

"In outpatients with solid tumors who have additional risk factors* for VTE and who are at low risk of bleeding, we suggest LMWH or LDUH over no prophylaxis."

Grade 2 B

*Previous VTE, immobilization, hormonal therapy, angiogenesis inhibitors, thalidomide, lenalidomide

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Stronger Evidence Supports Extended Prophylaxis after Discharge in Surgical Patients

- Warfarin or LMWH prevented VTE in orthopedic procedures
- LMWH reduced risk of VTE in abdominal or pelvic surgery for malignancy
- Medical patients: individual decisions
- Cancer patients with additional risk factors
  - Patient goals and values must be taken into account!

Hull RD et al. *Ann Intern Med.* 2001; 135:858-69.
Eikelboom JW et al. *Lancet.* 2001; 358:9-15.
Bergqvist D et al. *N Engl J Med.* 2002; 346:975-80.

Preventing VTE in Long-Term Care

- Incidence and effective prophylaxis not well studied
- VTE risk is a growing concern; symptoms likely to be ‘silent’
- Risk of bleeding poses a significant barrier
- Economic burden and aging of Americans – not well studied
- Be more aggressive with acute illness, less aggressive if all conditions are chronic

Pai M et al. *Cleve Clin J Med*. 2010; 77:123-30.

After You Decide Who Needs Extended Prophylaxis……

- How will you make sure that it gets done?

- How will you monitor it?

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Summary - Wrap Up
What next?

NJHA P4P Meeting
Greg Maynard M.D., Clinical Professor of Medicine
Director, UCSD Center for Innovation and Improvement Science
Sr. VP, Society of Hospital Medicine Center for Hospital Innovation and Improvement
Monday, October 8th, 2012

Where discoveries are delivered.℠

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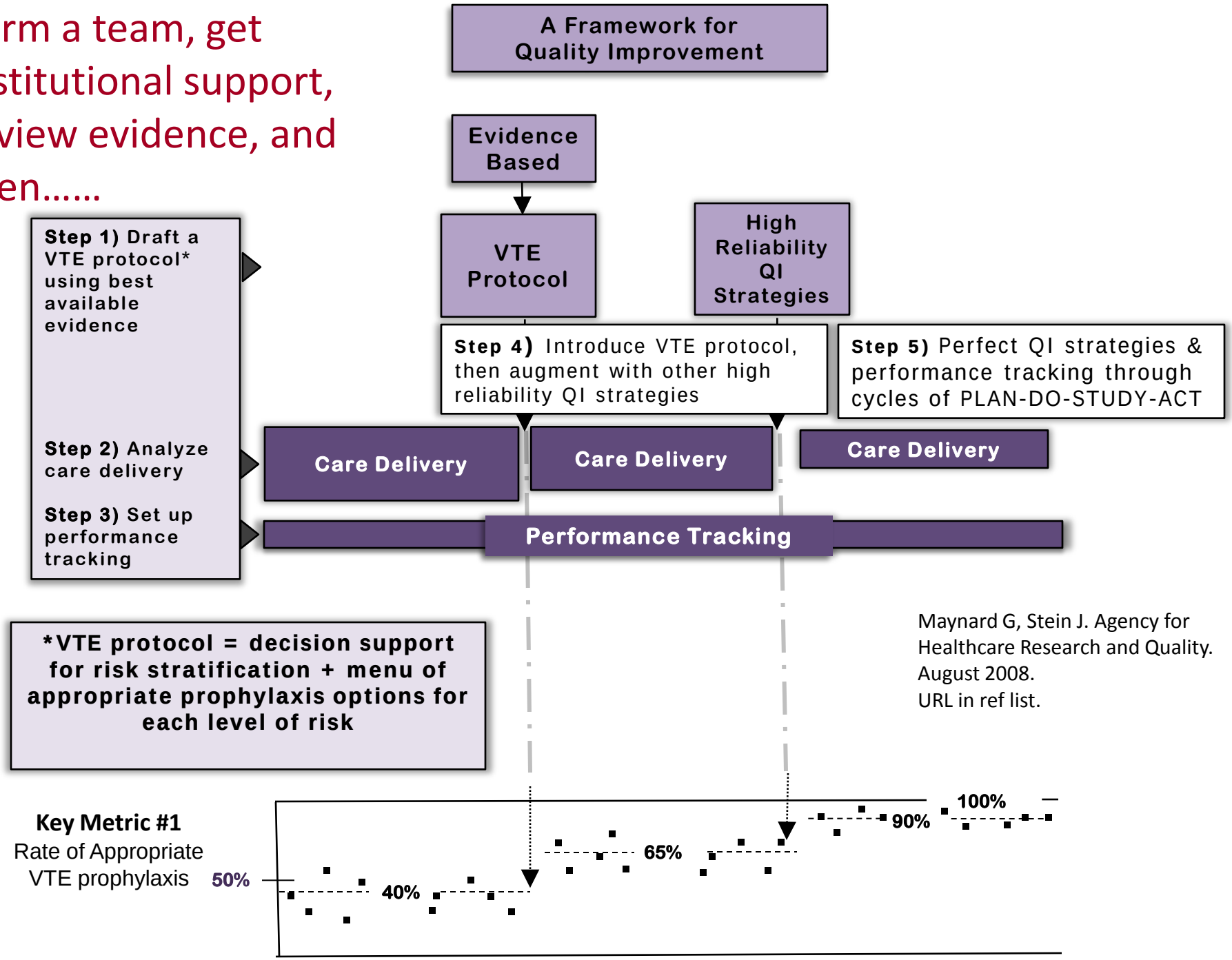
Form a team, get institutional support, review evidence, and then……



Hierarchy of Reliability

Level	Reliability Strategies	Predicted Prophylaxis Rate
1	No protocol* (“State of Nature”)	40%
2	Decision support exists but not linked to order writing, or prompts within orders but no decision support	50%
3	**Protocol well-integrated (into orders at point-of-care)**	65 – 85%
4	Protocol enhanced (by complementary QI and high reliability strategies)	90%
5	Oversights identified and addressed in real time	95+%

Maynard G, Stein J. Agency for Healthcare Research and Quality. August 2008.

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To Improve VTE Prophylaxis

- Institutional Support
- Team
- Survey past efforts, understand current process
- VTE Protocol
  - KISS, well situated, risk assessment, contraindications
- Multiple complimentary interventions
- Monitor results
  - HA VTE and VTE prophylaxis rates
  - R/Y/G
- Concurrent monitoring measurement and intervention
- Address Special situations and populations

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How Confident are you that you can improve VTE Prophylaxis in your hospital within 12 months?

a) VERY confident (this will be a slam dunk!)
b) Pretty confident (some barriers, but I think we'll do well)
c) A little bit confident?
d) I want to cry, I don't think we'll improve.

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Final Exercise!!

- Review your VTE Protocol improvement plans or next steps
- TEAM
- SUPPORT
- PROTOCOL (design and positioning)
- OTHER INTERVENTIONS
- MEASUREMENT and MEASURE-VENTION

Timeline?

Goal?

Barriers and overcoming them?

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