

**Hospital Pharmacists and DVT Prevention
During Hospitalization and at the Time of
Hospital Discharge:**

Patient Safety Issues

February 15, 2007

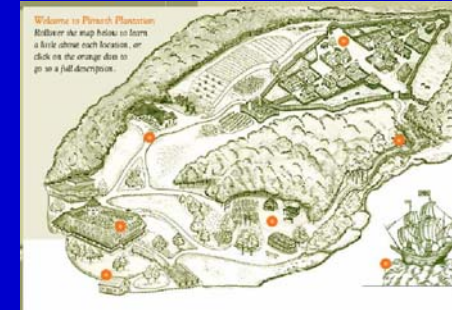
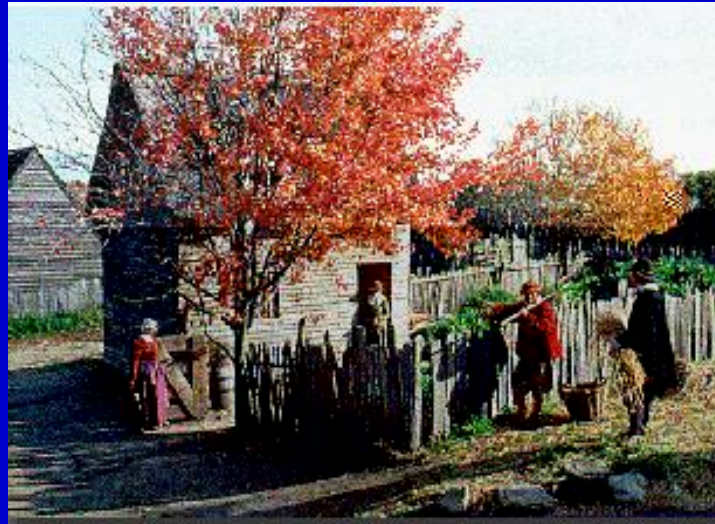
John Fanikos, R.Ph., M.B.A.

Assistant Director of Pharmacy

Outline

- **Past and Current performance**
- **Effective Interventions**
- **In-Hospital safety issues**
- **Prophylaxis at Discharge**
 - **Populations at Risk**
- **Ongoing trials and future work**
- **Conclusions**

Field Trip 2006 Plymouth Plantation



Looking in the Mirror

“Mr. Fanikos, you sure have a lot of hair in your nose”

“When you get older, you’ll probably have hair growing too.”

“Yup, I know.”

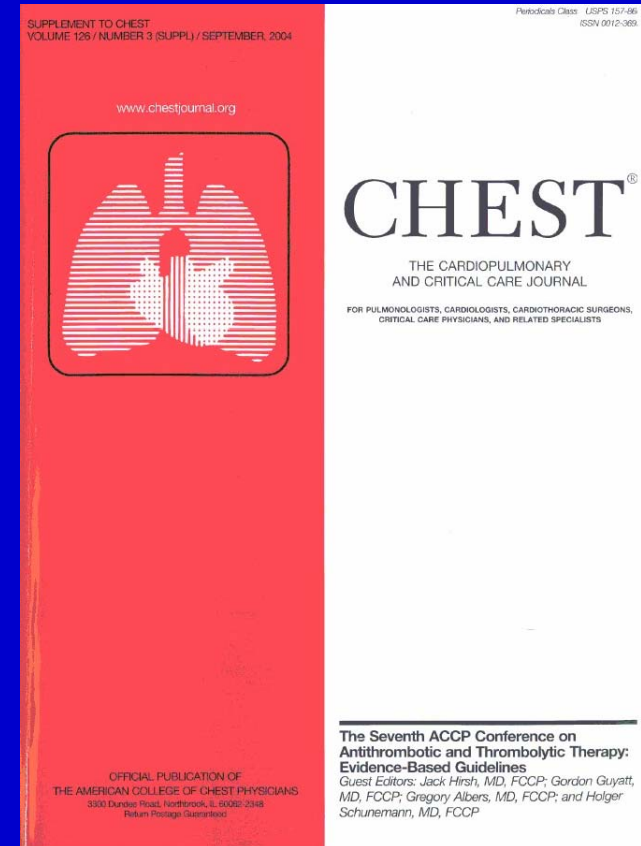
“My Mom has a mustache.”

“Yup, I know.”



ACCP Recommendations

- **Clinical evidence supporting the benefit of VTE prophylaxis in patients at risk**
- **Graded options for thromboprophylaxis**
 - General surgical patients
 - Orthopedic patients
 - Medical patients
 - Others



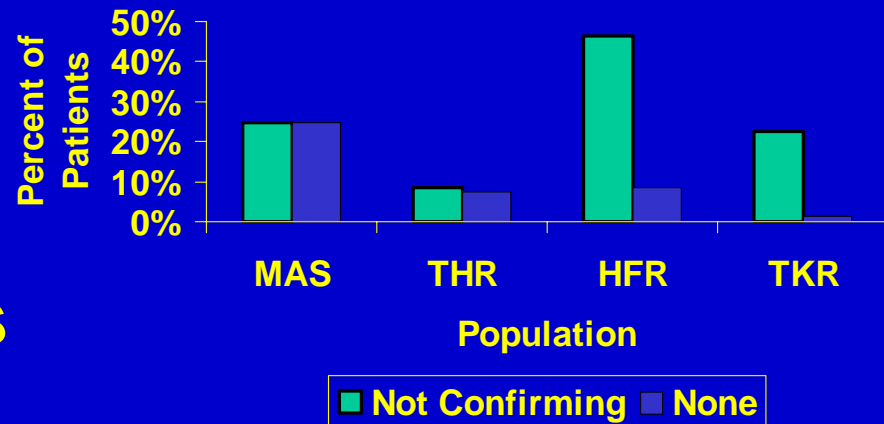
Geerts WH, et al. Chest 2004;126:338S-400S.

ACCP = American College of Chest Physicians; HFS = hip fracture surgery; THK = total knee replacement; THR = total hip replacement.

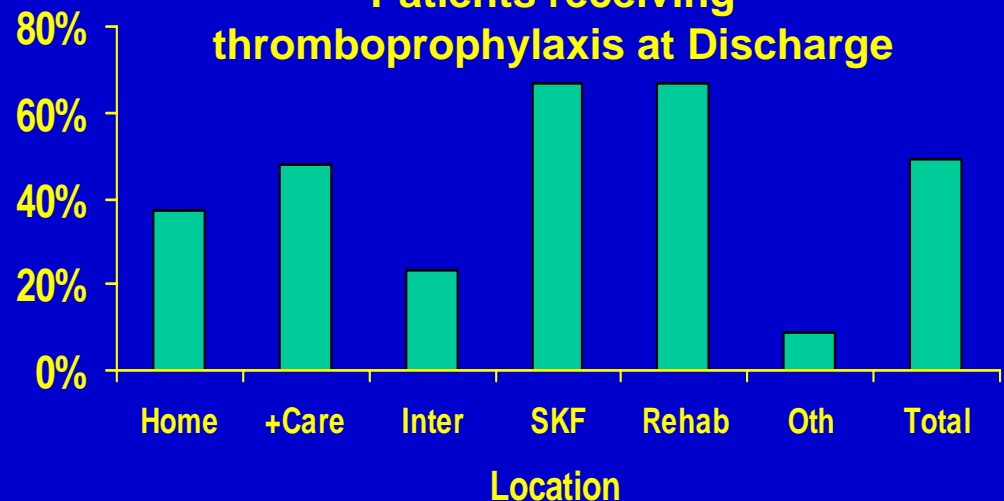
Adherence to ACCP 1995 Guidelines

- 10 hospitals
- 1907 patients
- Only 49.8% of patients were receiving prophylaxis at discharge
- Use of prophylaxis related to:
 - Clinical site
 - Physician group

Patients Receiving VTE Prophylaxis



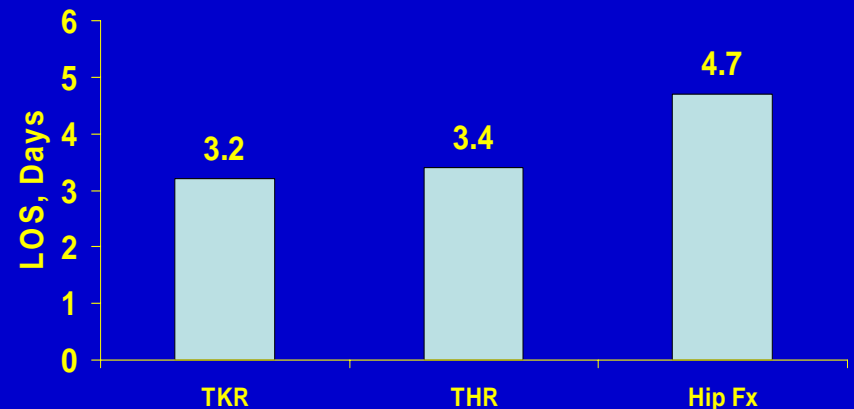
Patients receiving thromboprophylaxis at Discharge



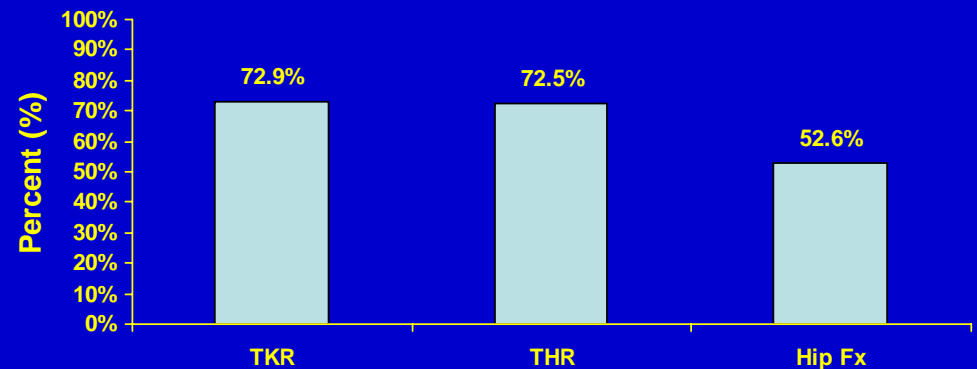
Antithrombotic therapy in US Hospitals

Therapy	TKR n (%)	THR n (%)	Hip Fx n (%)
Warfarin	182 (50.8)	138 (48.6)	74 (25.4)
LMWH	163 (45.5)	129 (45.4)	132 (45.4)
UFH	24 (6.7)	14 (4.9)	60 (20.6)
Aspirin	28 (7.8)	24 (8.5)	26 (8.9)
Nothing	10 (2.8)	9 (3.2)	39 (13.4)

Inpatient Duration of Anticoagulation



Patients Receiving Discharge Anticoagulation



Compliance with ACCP Guidelines 2004

	Compliant	Non Recommended	Inadequate Duration	None
Orthopedic (n=2,324)	52.4 %	7.0 %	36.8%	56.1%
Medical Conditions (n=60,012)	15.3%	1.8 %	11.4%	86.8%
Gynecologic (n=9,175)	6.7%	0.1%	1.9%	98.0
Urologic (n=1,388)	9.9%	0.2%	12.6%	87.1%

HT Yu et al. Am J Health Syst Pharm 2007;64:69-76

Inadequate Duration of VTE Prophylaxis

	Started Late	Started Late & Ended early	Ended Early
Orthopedic	22.1 %	62.9%	15.0%
Medical Conditions	22.5%	49.4%	28.1%
Gynecologic	8.0%	26.4%	65.6%
Urologic	11.4%	46.2%	42.4%

Pharmacist Education Program Improves Thromboprophylaxis

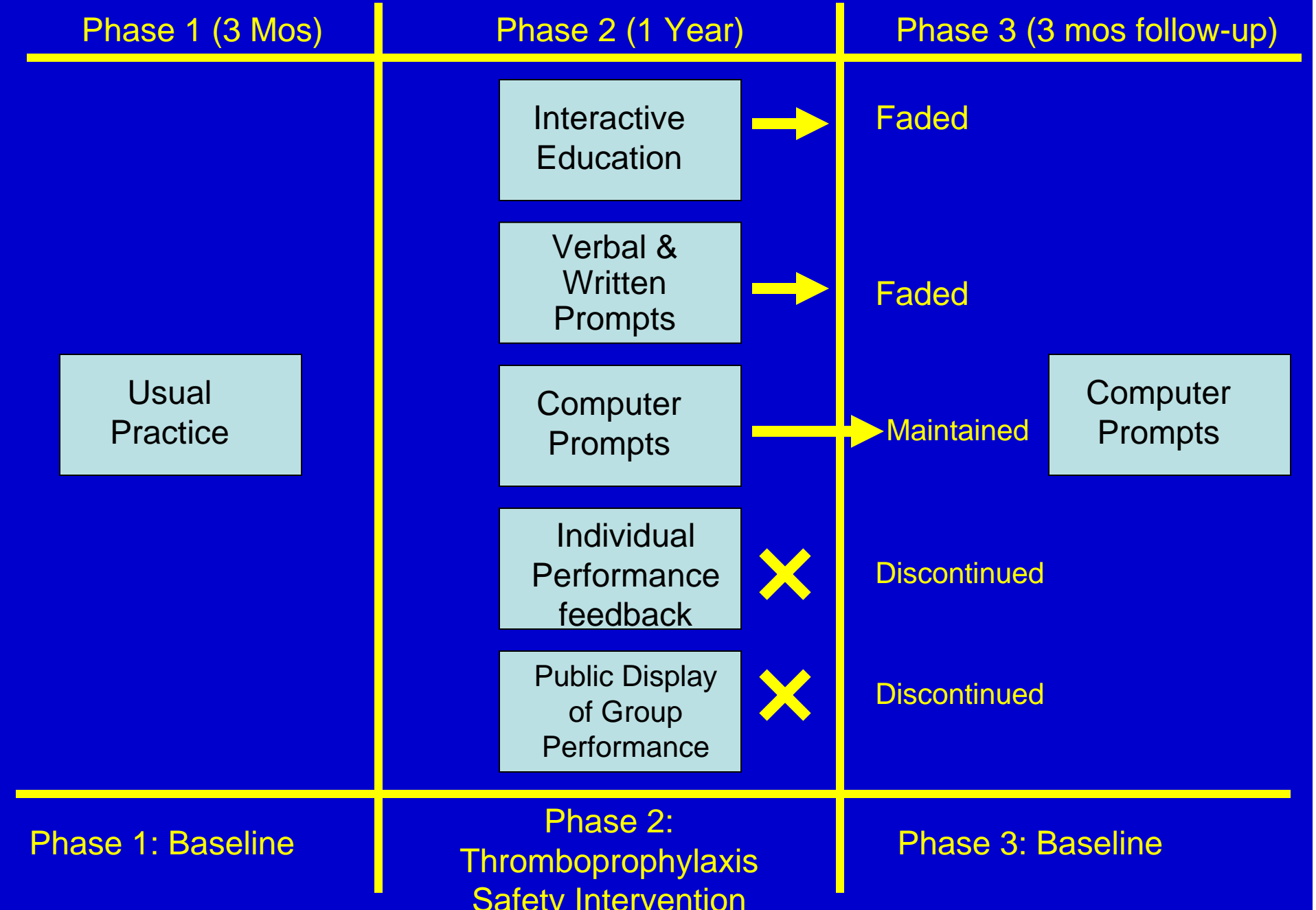
- 493 bed hospital
- Education program with 4 points:
 - Medical patients are at risk
 - Prophylaxis underused
 - Identify at risk patients
 - Optimum pharmacologic prophylaxis

Type of Prophylaxis	Pre-education (n=344)	Post-Education (n=297)	p Value
Any	43%	58%	<0.001
Suitable	38%	49%	0.006
Optimal	38%	44%	<0.001

- Global education
 - Didactic
 - Roundtable
 - Newsletters and flyers
 - Clinical Rounds

Type of Prophylaxis	Pre-education (n=131)	Post-Education (n=146)	p Value
UFH BID	74%	10%	<0.001
UFH 3 Times daily	18%	20%	0.863
Optimal	8%	70%	<0.001

Behavioral Reinforcement of Heparin to Avert Venous Emboli

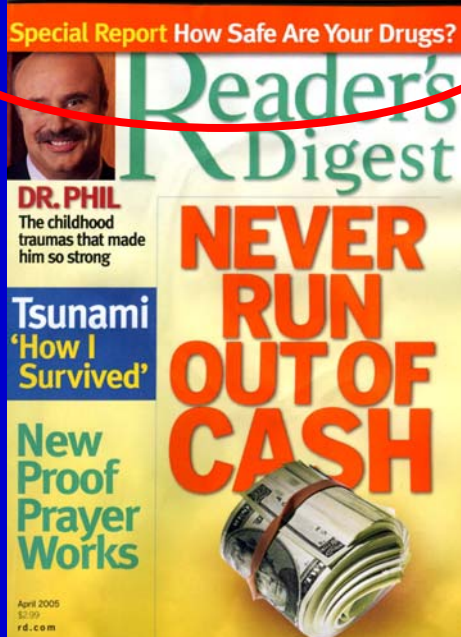


Behavioral Reinforcement of Heparin to Avert Venous Emboli

Proportion of ICU Days	Phase 1 (65 Patients, 674 Days)	Phase 2 (252 Patients, 2819 Days)	Phase 3 (95 Patients, 1026 Days)	p value
Heparin Prophylaxis	60 %	90 %	100 %	0.01
Prophylactic or therapeutic anticoagulation	63.6 %	93.9 %	100 %	0.001
Mechanical Prophylaxis	0	50 %	0	<.001
Errors of Omission (no anticoagulation)	20 %	0	0	<.001

McMullin J et al. Crit Care Med 2006;34:694-699

Public Awareness



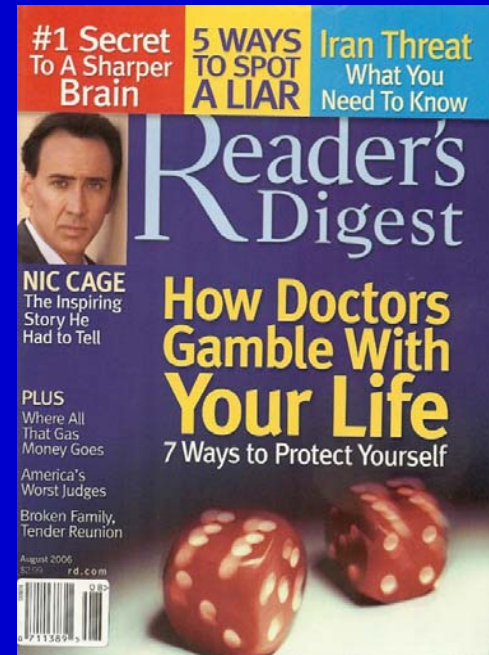
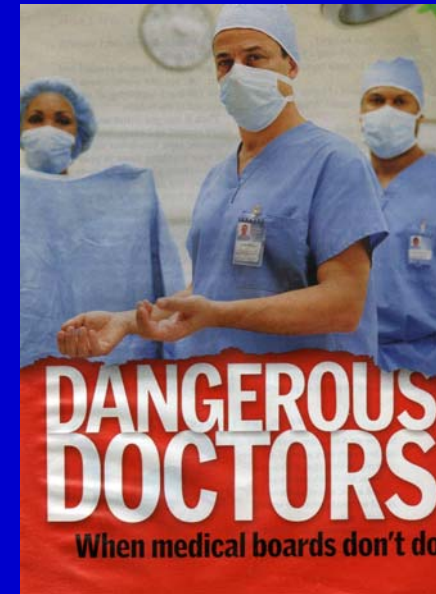
“How Safe Are your Drugs”

April 2005



“Doctors Deadly Mistakes”

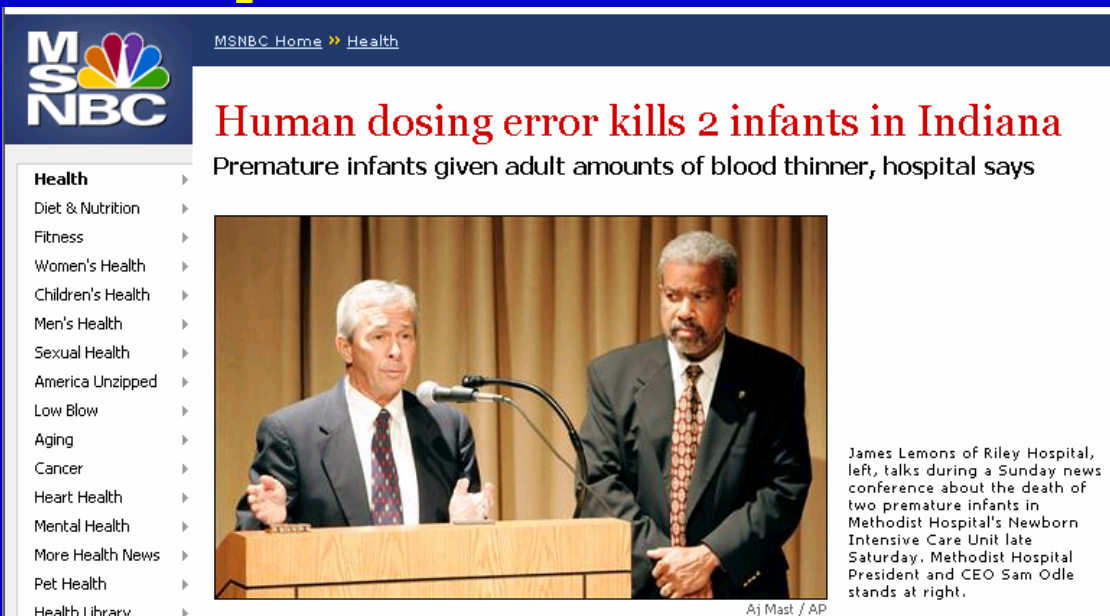
June 2004



“How Doctors gamble with your life” August 2006

Sept 17th, 2006

Institute of Medicine



MSNBC Home » Health

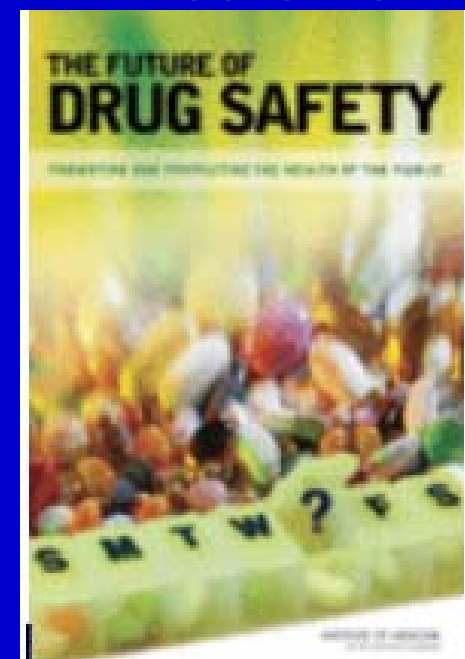
Human dosing error kills 2 infants in Indiana

Premature infants given adult amounts of blood thinner, hospital says

James Lemons of Riley Hospital, left, talks during a Sunday news conference about the death of two premature infants in Methodist Hospital's Newborn Intensive Care Unit late Saturday. Methodist Hospital President and CEO Sam Odle stands at right.

Aj Mast / AP

- Health
- Diet & Nutrition
- Fitness
- Women's Health
- Children's Health
- Men's Health
- Sexual Health
- America Unzipped
- Low Blow
- Aging
- Cancer
- Heart Health
- Mental Health
- More Health News
- Pet Health
- Health Library



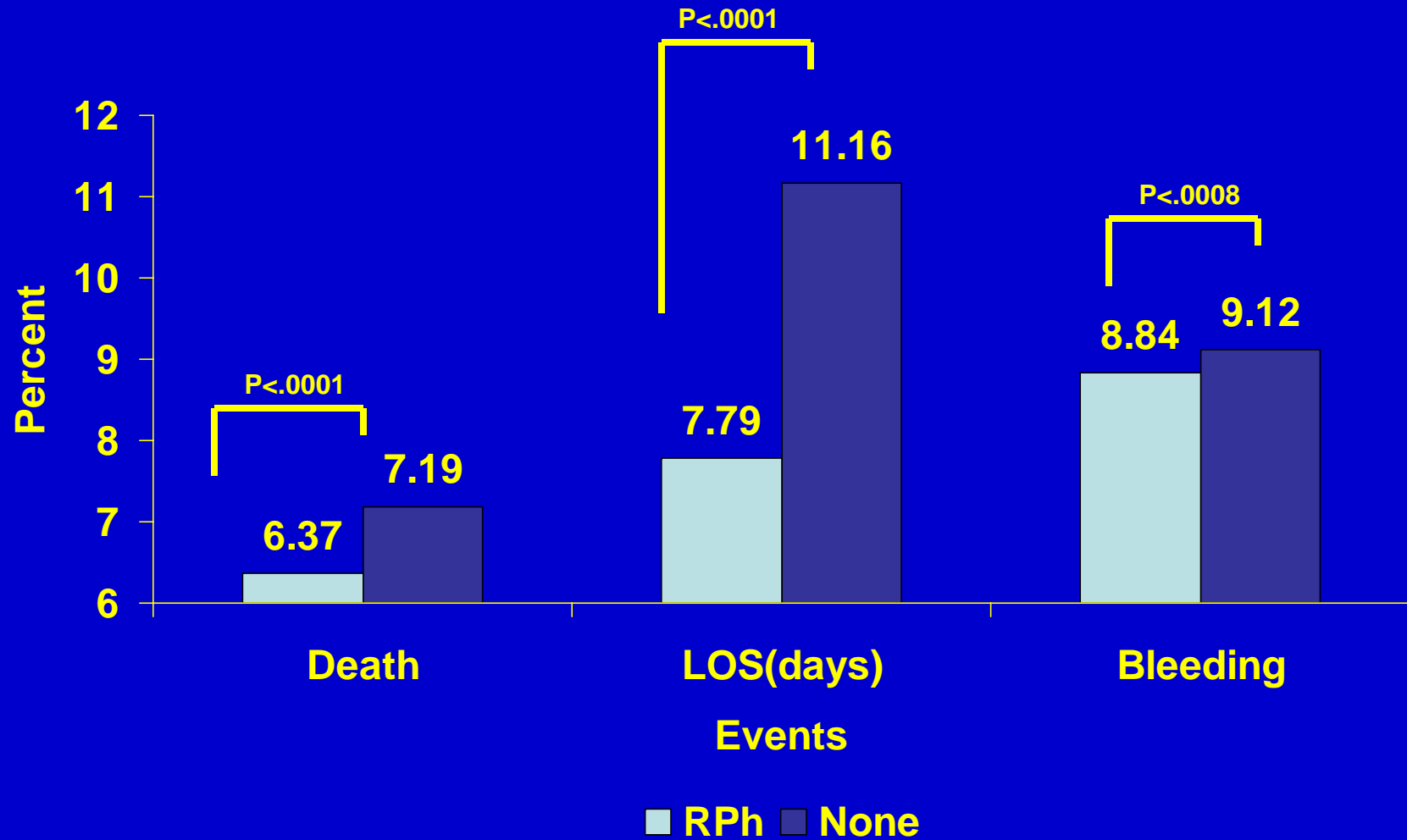
Sept 22nd, 2006

2008 National Patient Safety Goals

Requirement 3E

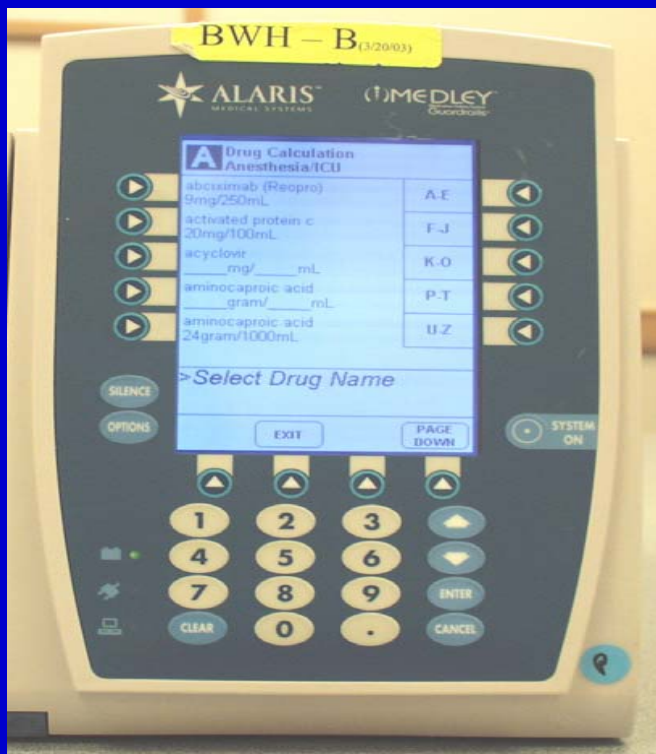
Reduce the likelihood of patient harm associated with the use of anticoagulation therapy involving heparin (unfractionated), low molecular weight heparin (LMWH), warfarin, fondaparinux, and direct thrombin inhibitors.

Pharmacist Provided Anticoagulation Management



Medication Safety

- 5 year review of Adverse Drug Events
- Cardiology and Cardiovascular Surgery patients
- Potential Solutions:



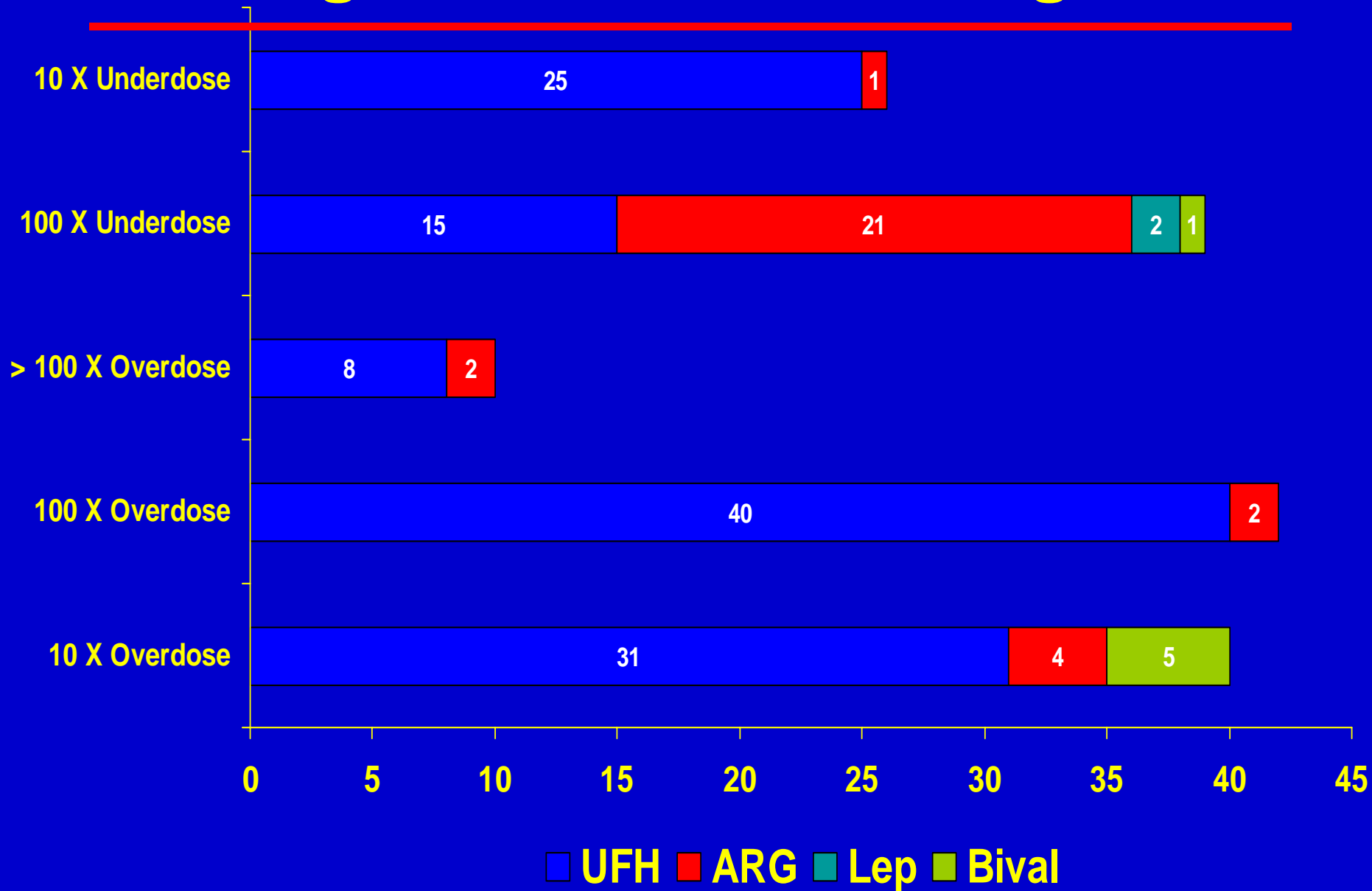
Guardrails Drug Library
heparin

Dose exceeds the
Guardrails Hard limit of
2800 unit/h.

Reprogram

> Press **REPROGRAM**

Dosing Errors and their Magnitude



Brigham to adopt barcodes to cut errors

By Liz Kowalczyk
GLOBE STAFF

Brigham and Women's Hospital this month is rolling out supermarket-style barcodes on medica-



GLOBE STAFF PHOTO/SUZANNE KREITER

Brigham and Women's nurse Lisa McCay scanned the wristband of Hilda Coyne.

tions and patients' wristbands, one of the first US hospitals to adopt this common food industry technology to reduce overdoses and other dangerous medical errors.

The Harvard Medical School teaching hospital plans to use barcodes on all of its medical and surgical floors by mid-July, and in the operating rooms, emergency department, and obstetrics units by the end of 2006. The system will cost the hospital about \$10 million on equipment and training for several thousand nurses.

"This absolutely can prevent certain types of errors," said Fran Griffin, a director at the Institute for Healthcare Improvement, a Cambridge nonprofit group that helps hospitals improve care. "When people are working in a high-stress, fast-paced environment, it's so easy to grab the wrong drug."

In its groundbreaking report

BARCODES, Page D7

WEDNESDAY, MARCH 16, 2005

THE BOSTON GLOBE

Business D7

Barcodes to help nurses cut errors

BARCODES
Continued from Page A1

"To Err is Human." The Institute of Medicine, a nonprofit Washington policy group, five years ago estimated that hospital mistakes kill 44,000 to 98,000 Americans annually, and that about 7,000 of those deaths are attributable to medication errors.

Barcodes are designed to prevent nurses from accidentally giving the wrong drug or dose. The system requires a nurse to scan a barcode printed on the patient's identification bracelet, which is encoded with the names of his or her medications, doses, and times of doses. The nurse then scans the barcode on the drug package to see if the information matches.

The system doesn't stop other errors, such as doctors prescribing the wrong drug. And, as hospitals are finding with other computerized error-prevention systems, technology sometimes introduces new mistakes into the system.

But healthcare specialists believe barcodes are one of a host of technologies hospitals are adopting to attack the problem of medical mistakes. The nation's Veterans Affairs hospitals began using barcodes three years ago, while Massachusetts General Hospital is experimenting with microchips that embed a patient's blood type in his or her wristband. The signal coming from the patient's wristband must match that of another chip attached to the blood bag.

Dr. Andy Whittemore, the Brigham's chief medical officer, said the Brigham expects barcodes

Dr. David Bates, who is chief of general medicine at the Brigham and who studies hospital errors, reviewed 10,070 medication orders for 379 patients and discovered the staff committed 530 medication errors. In another study he conducted, also published in 1995, Bates found that the earlier in the process an error occurs, the more likely someone will intercept it before it harms the patient. For instance, half of all errors committed by a doctor — a physician ordering a drug to which the patient has a known allergy, for example — were caught; none of the errors committed by nurses as they administered drugs were caught.

"That's why barcoding is so important," he said. "There really is no one between the nurse and the patient."

Whittemore said that barcodes could have prevented an error that occurred at the hospital last week when a nurse gave two newborn boys a tenfold overdose of liquid Tylenol. Whittemore said the nurse drew up 4 cubic centimeters of the painkiller into a syringe instead of 0.4 cc. Under the new barcoding system, which the hospital plans to install in the newborn nursery next year, the pharmacy will send syringes to patient floors already filled with specific doses of medicines, which will be encoded in each syringe's barcode. The nurse will then scan the barcode to make sure it matches the barcode on the baby's wristband.

Nancy Kruger, the Brigham's vice president of patient care services and chief nursing officer, said



Above: Brigham and Women's Hospital nurse Lisa McCay checks her computer after scanning the wristband of patient Hilda Coyne. Below: The barcodes are encoded with the names of a patient's medications, doses, and times of doses.



new errors. Doctors at the Hospital of the University of Pennsylvania

the painkiller Darvon. Holmes pulled out a tiny package from a pill cart and scanned the drug's barcode with a portable scanner that looked like a cellphone. The computer flashed a written warning that the pill was 100 milligrams. Holmes knew the pills came in doses of 100 milligrams and planned to cut it in half.

Next, Holmes walked into Dube's room, asked her name to confirm her identity, and scanned the plastic band on her left wrist. Dube, 59, who was in the hospital

a yellow check mark failed to appear next to Plagyl on the computer. When the nurse looked more closely at the large silver package, she discovered she had picked out Reglan, an anti-nausea medicine. The system had caught the error.

Until now, nurses have eyeballed medication labels to make sure they were giving patients what their doctor ordered, leaving room for human error.

Cost is a major obstacle for hospitals considering barcodes. Aside from the initial investment, Whit-

long to scan patients' wristbands. So the company that makes these scanners cut the time to one second from four to six. The hospital also found traditional barcodes took up too much room on patients' wristbands and compressed them into a one-inch square.

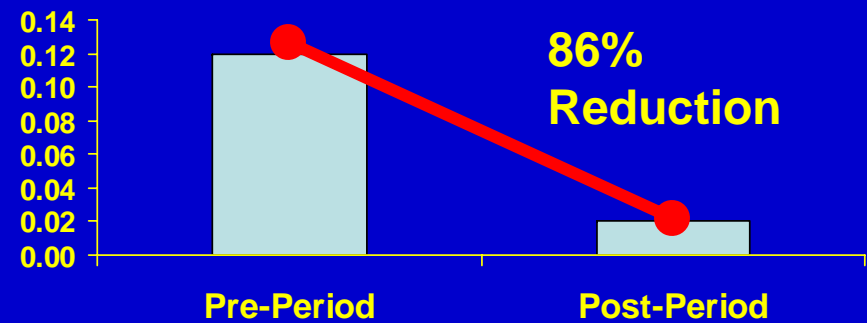
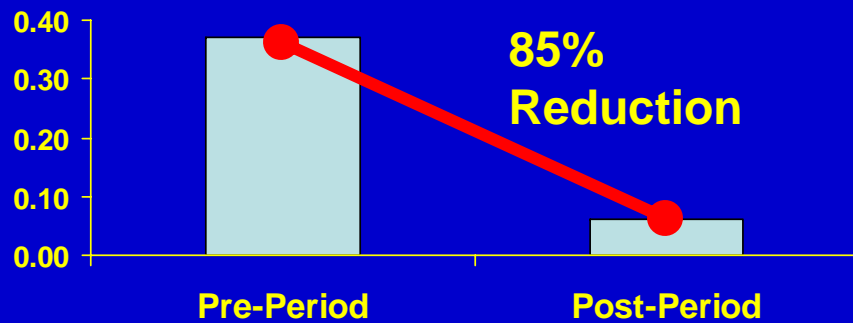
And, Bane said, the system will not prevent all errors. Hospital policy allows nurses to give medications without scanning in emergencies, when the patient needs medication immediately. But nurse could choose not to scan

NEJM SEEKS QUOTES FROM HOUSE STAFF April 2005, "New Errors"

Medication Dispensing Errors and Potential Adverse Drug Events before and after Implementing Bar Code Technology in the Pharmacy

Pharmacy Dispensing Errors

Potential Adverse Events



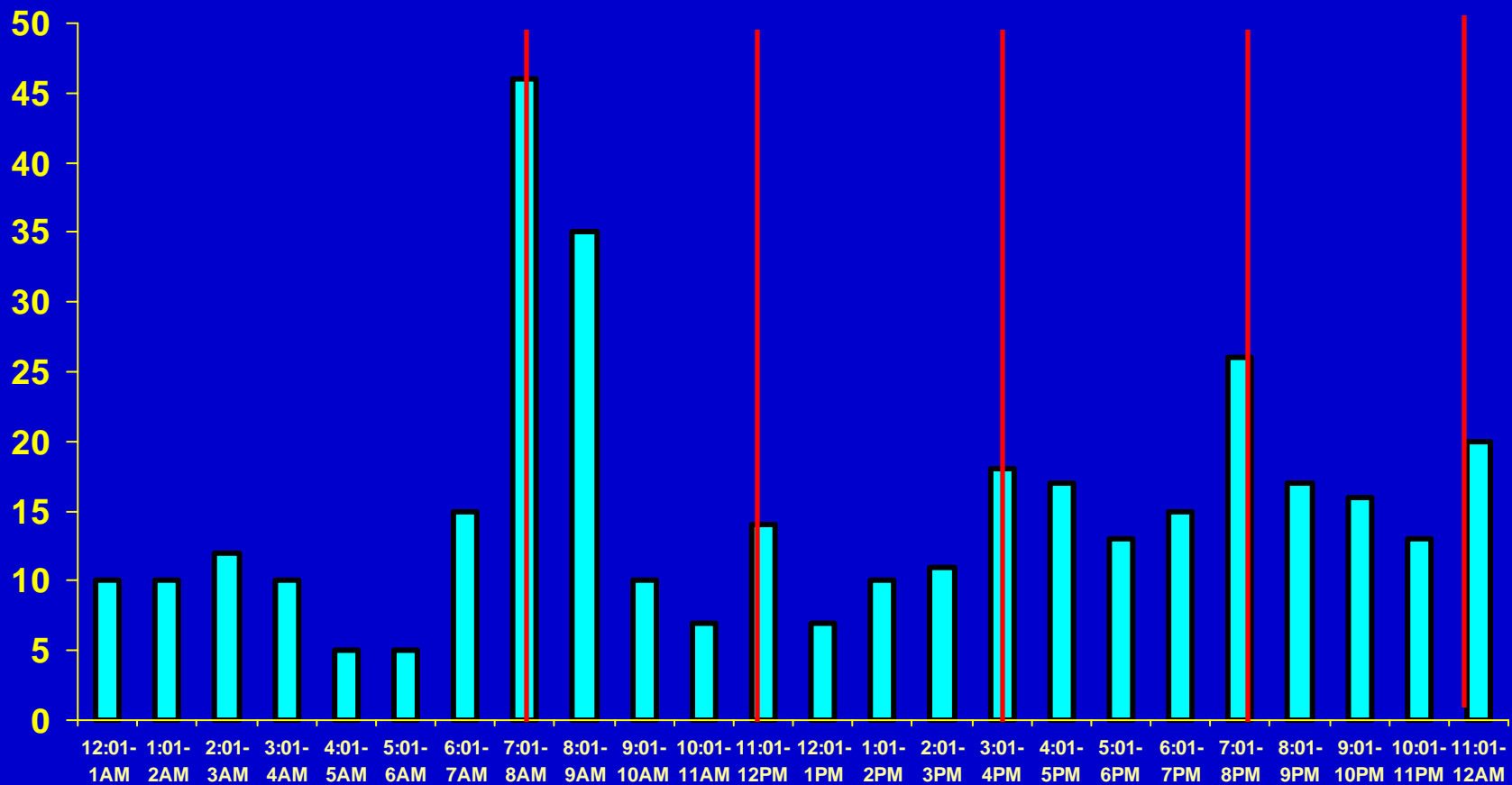
Bar Code Period

Bar Code Period



Time of Day of Preventable Adverse Drug Events (n=362)

7:30 A.M. 11:00 A.M. 3:30 P.M. 7:30 P.M. 11:00 P.M.



Medication Reconciliation

OETEST,WILHELMINA
11489929 (BWH) 05/01/1930 (75yrs) F

Last saved by: MCCORMACK,CHRISTINE on: 12/22/2005 at: 10:53
Not Reviewed

Meds from Electronic Sources

Source	Medication	Date
	Acetaminophen	
LMR	→Acetaminophen (Tylenol) PO 650 MG Q4H	08/22/00
	Acetylsalicylic Acid	
LMR	Acetylsalicylic Acid (Asa) PO 325 MG Q3H	07/05/00
	Acetylsalicylic Acid (Children'S)	
LMR	Acetylsalicylic Acid (Children'S) (Asa (Children'S)) PNGT 81 MG QD	07/05/00
	Amitriptyline Hcl	
LMR	Amitriptyline Hcl PO 25 MG QHS Take one tablet...	07/18/00
LMR	Amitriptyline Hcl PO 50 MG QHS Take one tablet...	07/18/00
	Amlodipine	
LMR	→Amlodipine PO 2.5 MG QD Take one tablet...	07/18/00
LMR	Amlodipine PO 5 MG QD Take one tablet...	07/18/00
	Atenolol	
LMR	→Atenolol PO 25 MG QD Take one tablet...	07/18/00
LMR	Atenolol PO 50 MG QD Take one tablet...	07/18/00
	Atorvastatin	
LMR	Atorvastatin (Lipitor) PO 10 MG QD	08/21/00
LMR	Atorvastatin (Lipitor) PO 10 MG QD	07/20/00

Add→

Modify
& Add→

Pre-Admission Medication List (PAML) **Ready for Review**

Medication	Date	Need to check	Medication Details	Planned action on admission
Acetaminophen (Tylenol) PO 650 MG Q4H	12/22/05	<input type="checkbox"/>		Continue at pre-adm Dose/Freq
Amlodipine PO 2.5 MG QD Take one tablet...	12/22/05	<input type="checkbox"/>		Continue at pre-adm Dose/Freq
Atenolol PO 50 MG QD	12/22/05	<input type="checkbox"/>		Continue at pre-adm Dose/Freq
Furosemide (Lasix) PO 10 MG QD	12/22/05	<input type="checkbox"/>		Discontinue

THIS IS NOT AN ORDER

Add new medication

Search

Dose: Freq:

prn: reason:

Instructions:

Last dose date:  time:

Accept

Cancel

Add med

Modify

Remove

PAML Comments

Sign

Print

Copy

Cancel

Print

Collapse all

View Notes

Items to Check

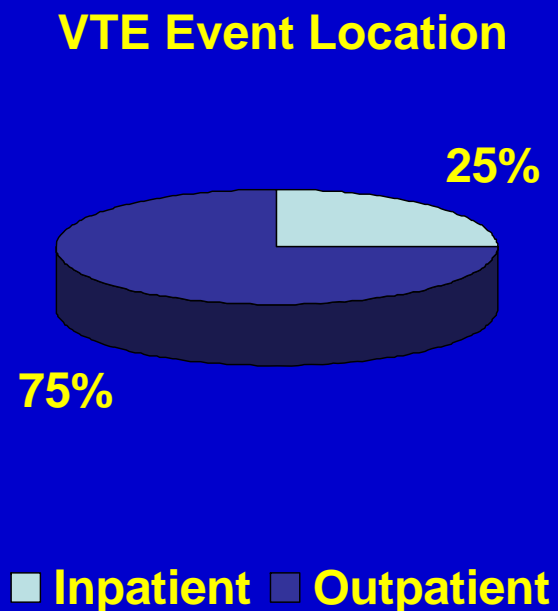
Action items

Pre-Admission Medication List (PAML) Ready for Review

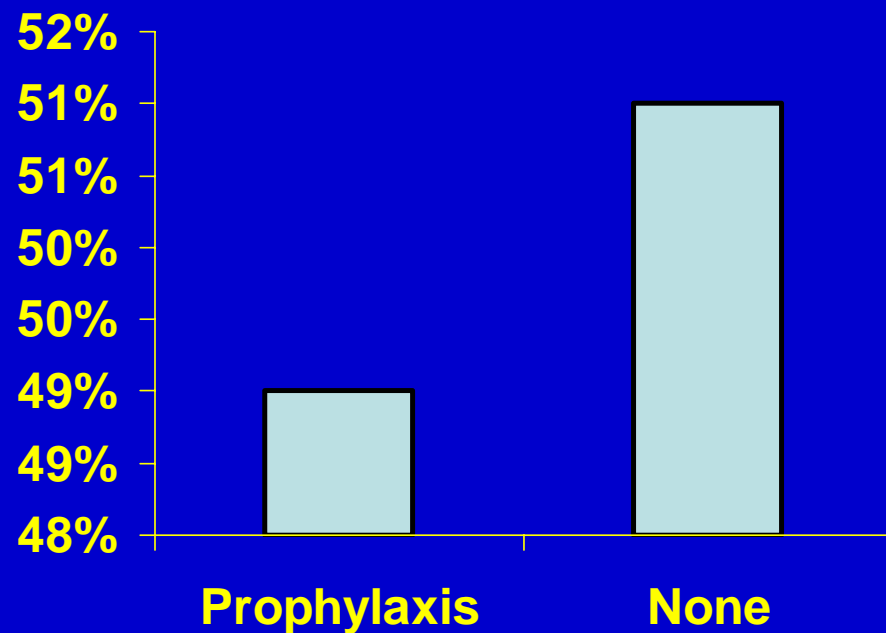
Medication	Date	Need to check	Medication Details	Planned action on admission
Acetaminophen (Tylenol) PO 650 MG Q4H	12/22/05	<input type="checkbox"/>		Continue at pre-adm Dose/Freq
Amlodipine PO 2.5 MG QD Take one tablet...	12/22/05	<input type="checkbox"/>		Continue at pre-adm Dose/Freq
Atenolol PO 50 MG QD	12/22/05	<input type="checkbox"/>		Continue at pre-adm Dose/Freq
Furosemide (Lasix) PO 10 MG QD	12/22/05	<input type="checkbox"/>		Continue at pre-adm Dose/Freq Continue at different Dose/Freq Discontinue Substitute with different med

VTE Incidence in Worcester, MA

- Medical records of residents (n=477,800)
- 587 VTE events (104 per 100,000 population)
- 30 Day recurrence 4.8 %



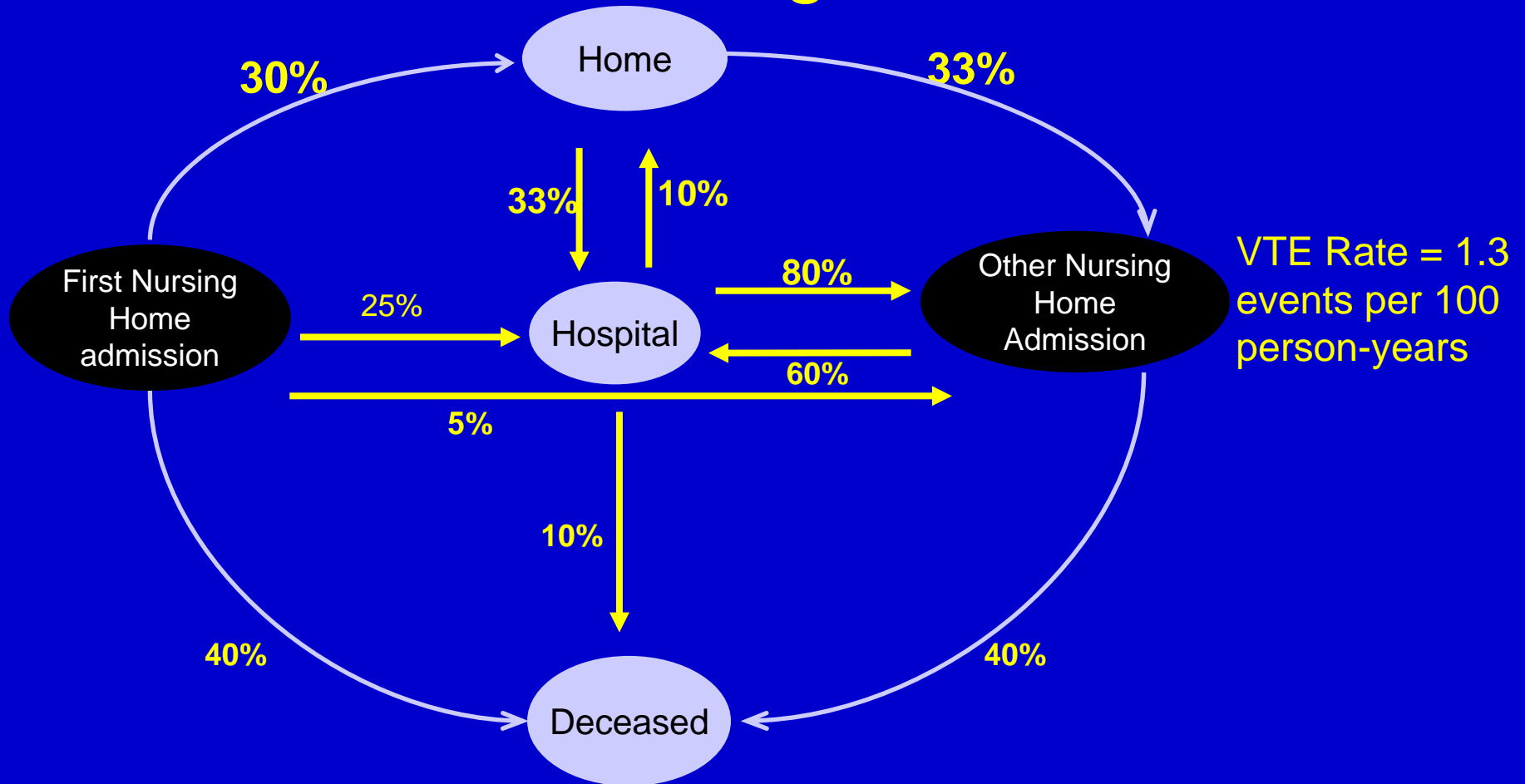
Patients receiving prophylaxis during high risk periods



Risk of VTE after Acute Infection in the Community Setting

	UTI		RTI		
	Post Infection	n	Incidence Ratio	n	Incidence Ratio
• n=7278					
• Office practices					
• Urinary tract infections	1-2 weeks	47	2.10 (1.56-2.82)	68	1.92 (1.49-2.44)
• Respiratory infections	3-4 weeks	43	1.93 (1.42-2.63)	51	1.46 (1.10-1.93)
– Pneumonia	5-8 weeks	77	1.91 (1.43-2.29)	106	1.62 (1.32-1.98)
– Bronchitis	9-12 weeks	62	1.59 (1.23-2.06)	70	1.16 (0.91-1.47)
– influenza	13-26 weeks	189	1.63 (1.39-1.90)	257	1.37 (1.19-1.57)

Natural History of Residents Discharged from Nursing Homes



Approximate proportion of patients moving from one status to another

Acutely Ill Elderly Medical Patients

- **Biology**
 - Coagulation factors
 - Inflammatory proteins
 - Endothelial function
 - Immobility
 - Muscle tone?
- **Little data exist on VTE prophylaxis in elderly medical patients at the time of hospital discharge.**

Age	Events per 100,00
50-59 years	62-147 events
70-79 years	316-765 events

- It is unknown whether clinicians prescribe prophylaxis at the time of transition to:
 - Home
 - Skilled nursing facility
 - Rehabilitation center

VTE Prophylaxis beyond Hospital Discharge in At-Risk Medical Patients

Primary Objectives:

Quantify how often VTE prophylaxis is prescribed to at-risk hospitalized medical patients at the time of hospital discharge.

For each at-risk patient discharged, compare the presence or absence of discharge VTE prophylaxis with the presence or absence of in-hospital VTE prophylaxis.

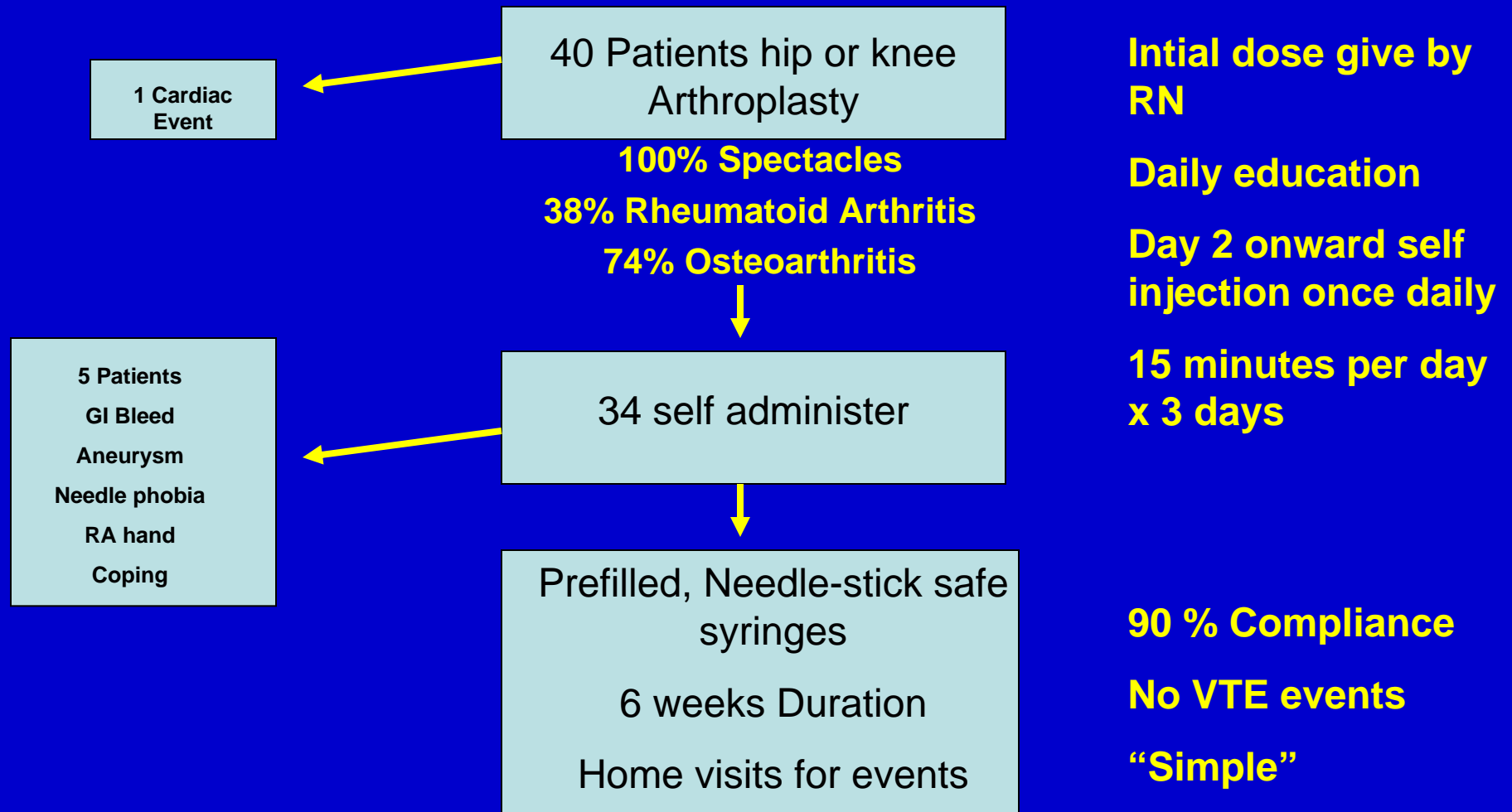
Secondary Objectives:

Determine the VTE incidence at 30 and 90 days post hospital discharge.

Determine major bleeding complications at 30 and 90 days post hospital discharge.

Explore the pharmacoeconomic consequences of VTE prophylaxis discharge strategies.

Self administration Extended Thromboprophylaxis



Initial dose give by RN

Daily education

Day 2 onward self injection once daily

15 minutes per day x 3 days

90 % Compliance

No VTE events

“Simple”

“Easy”

“Patients learn quickly”

Implementing Change

- **A gap exists between the evidence-based thromboprophylaxis guidelines and clinical practice.**
- **Educational programs can improve performance**
 - Provide a wide variety of interventions
- **Safety must be improved**
 - RPH involvement, Hi Tech may be solutions
- **VTE occurs in the community**
- **Extended prophylaxis is effective & feasible**