Incidence of DVT in high risk patients at NYGH

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Introduction

- Post operative venous thromboembolism (VTE) events

Deep Venous Thrombosis (DVT)
Pulmonary Embolism (PE)

- leading causes of morbidity and mortality in surgical patients

- Pulmonary embolism
  - may cause sudden death
  - may independently reduce survival for up to 3 months after diagnosis
  - Those who live may develop pulmonary hypertension

- Deep venous thrombosis result in
  - venous hypertension
  - lead to debilitating swelling and chronic pain

Heit JA, 2005. Wakefield TW et al,2008.

- Prevention of these events requires
  - diligent prophylaxis which must be considered for all surgical patients

Early recognition and treatment of VTE is crucial

- New Yangon General Hospital
  - 200 bedded hospital opened since 1984
  - Yet no standardized risk-stratified prophylaxis protocol for VTE till 2016

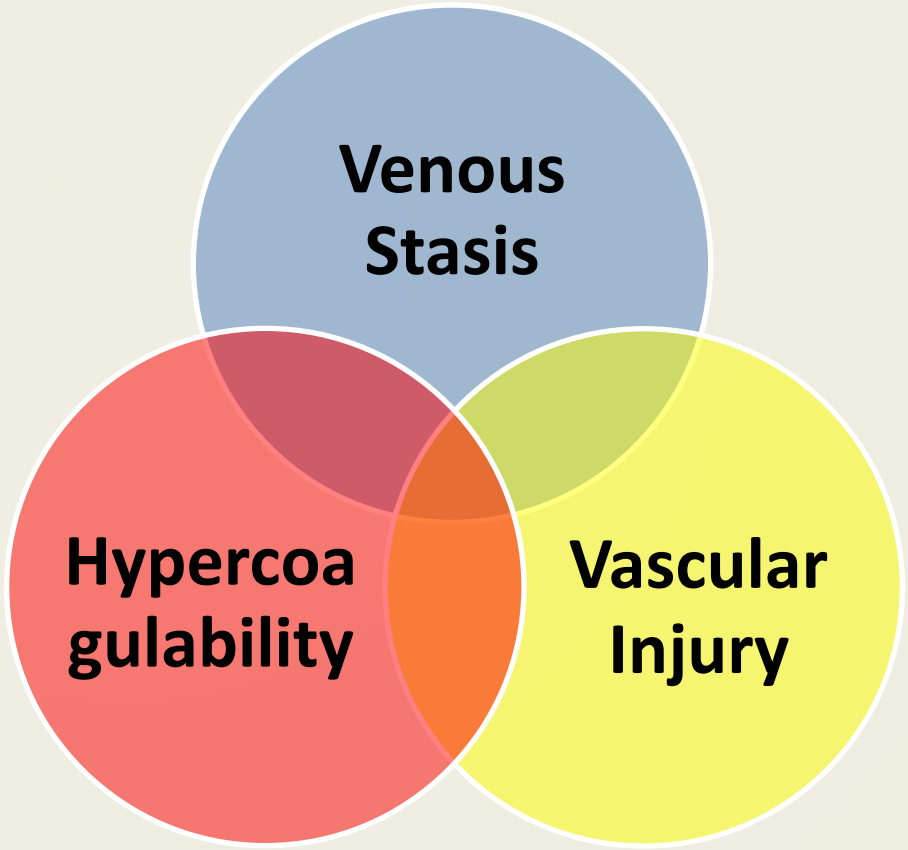
- Plan to detect VTE incidence and reduce VTE complications

- In screening of VTE,
  - important to detect the risk factors for VTE in patients.

- a lot of risk factors assessment that link to development of VTE

Rudolph Virchow

- link the development of VTE to the presence of at least 1 of these 3 conditions:



- In 1992
  - the Thromboembolic Risk Factors **(THRIFT)** Consensus Group identified acquired risk factors for VTE

- Sixteen years later
  - the most recent update of the American College of Chest Physicians **(ACCP)** guidelines for VTE prophylaxis revealed the same risk factors for VTE

Selected acquired risk factors for VTE

ACCP 2008	THRIFT 1992
• Increasing age • Immobility, paresis • Previous VTE • Cancer and/or its treatment • Trauma (major or lower limb) • Obesity • Central venous catheters • Inflammatory bowel disease • Nephrotic syndrome • Pregnancy and postpartum • Estrogen therapy or estrogen containing oral contraceptive • Acute medical illness	• Increasing age • Immobility (> 4 d), limb paralysis • Previous VTE • malignancy • Surgery (pelvis, hips, legs) • Trauma (pelvis, hips, legs) • Obesity • Varicose veins • Heart failure • Recent myocardial infarct • Inflammatory bowel diseases • Nephrotic syndrome • Pregnancy • High dose estrogen therapy • infection

- decided to use the Caprini risk stratification method

Caparini Risk Scoring Model

- adaptable to individual patient's risk factors
- less likely to underestimate the hazards of VTE
- Has been well validated
- The most up-to-date model

Methods

- study design
  - hospital based, prospective and interventional study
- Study duration
  - from October 2016 to September 2017 of one year duration

- Study population
  - all surgical patients admitted to NYGH
  - Total number of 2119 patients

Caprini risk scoring model

- more than 30 risk factors in the Caprini model

- categorized as

low (score 1-2)
moderate (score 3-4)
high (score 5 and more)

- All patients admitted to our hospital was assessed with Caprini score .

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_____

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

Subtotal:

* most frequently missed risk factor

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 antiocoagulant 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	Prophylaxis Regimen
0	VERY LOW	❑ Early ambulation
1-2	LOW	❑ Sequential Compression Device (SCD)
3-4	MODERATE	Choose ONE of the following medications +/- compression devices: ❑ Sequential Compression Device (SCD) - Optional ❑ 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	HIGH	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

UMHS ENOXAPARIN DOSING GUIDELINES

- MUST wait 24 hours before starting Enoxaparin if patient has epidural catheter
- D/C Enoxaparin 10-12 hours prior to removing epidural catheter
- May restart Enoxaparin 24 hours after epidural catheter has been removed.

NON-PREGNANT PATIENTS

Body weight < 150kg, CrCl > 30mL/min: **Enoxaparin 40mg SQ daily**
Body weight < 150kg, CrCl = 10-29mL/min: **Enoxaparin 30mg SQ daily**
Body weight > 150kg, CrCl > 30mL/min: **Enoxaparin 30mg SQ BID**

PREGNANT PATIENTS

Prevention of DVT:#
Maternal body weight (start of therapy) < 75 kg:
Recommend 30 mg SQ once daily until 20 weeks
Recommend 30 mg SQ BID after 20 weeks
Maternal body weight (start of therapy) ≥ 75 kg:
Recommend 40 mg SQ once daily until 20 weeks
Recommend 40 mg SQ BID after 20 weeks
#Wait 12 hours before regional anesthesia

MONITORING RECOMMENDATIONS

- Patients who are obese (actual body weight > 150 kg)
- Patients who are pregnant
- Patients with renal insufficiency (creatinine clearance < 30 ml/min)

Indication	Desired Level (Draw 4 hours after the 4th dose)	Recommendations for Dose Alteration		
		Anti-factor Xa Level (units/ml)	Dose Adjustment	Repeat Anti-factor Xa To Be Obtained
Prevention of DVT/PE	0.2 to 0.5 units/ml	< 0.2	Increase by 25 %	4 hours after 4th dose
		0.2 to 0.5	No change	Repeat in 1 week, then monthly thereafter
		0.6 to 1	Decrease by 20 %	4 hours after 4th dose
		> 1	Hold for 3 hours, then decrease next dose by 30%	4 hours after 4th dose

Ideal Body Weight
IBW, men = 50 kg + 2.3 (inches > 5 feet)
IBW, women = 45.5 kg + 2.3 (inches > 5 feet)

Each risk factor represent one point

- ☐ Age 41-60 years
- ☐ Swollen legs (current)
- ☐ Varicose vein
- ☐ Obesity (BMI >25)
- ☐ Minor surgery planned
- ☐ Sepsis (within 1 month)
- ☐ Acute myocardial infarction
- ☐ Congestive heart failure (within 1 month)
- ☐ Medical patient currently at bed
- ☐ History of inflammatory bowel disease
- ☐ History of prior major surgery (within 1 month)
- ☐ Abnormal pulmonary function (COPD)
- ☐ Serious lung disease including pneumonia (within 1 month)
- ☐ Other risk factors _____

For Women only

- ☐ Oral contraceptives or hormone replacement therapy
- ☐ Pregnancy or postpartum (within 1 month)
- ☐ History of unexplained stillborn infant , recurrent spontaneous abortion (≥3), premature birth with toxemia or growth restricted infant

Subtotal	

Each risk factor represent 2 points		
☐ Age 61- 74years ☐ Central venous access ☐ Major surgery (>45 minutes) ☐ Malignancy (present or previous) ☐ laparoscopic surgery (>45 minutes) ☐ Patient confined to bed (> 72 hours) ☐ Immobilization plaster cast (<1 month)	**Subtotal**	

Each risk factor represent 3 points		
☐ Age 75 or older ☐ Family history of thrombosis ☐ History of DVT/PE ☐ Congenital or acquired thrombophilia	**Subtotal**	
Each risk factor represent 5 points		
☐ Stroke (within 1 month) ☐ Hip, pelvis or leg fracture (within 1 month) ☐ Acute spinal cord injury (paralysis) (within 1 month)	**Subtotal**	

- In this study, we only emphasized in high risk score patients for chemoprophylaxis

- For low and moderate risk score patients
  - encouraged early ambulation after post operative period

- no intermittent pneumatic compression device (for mechanical prophylaxis) in operation theatre

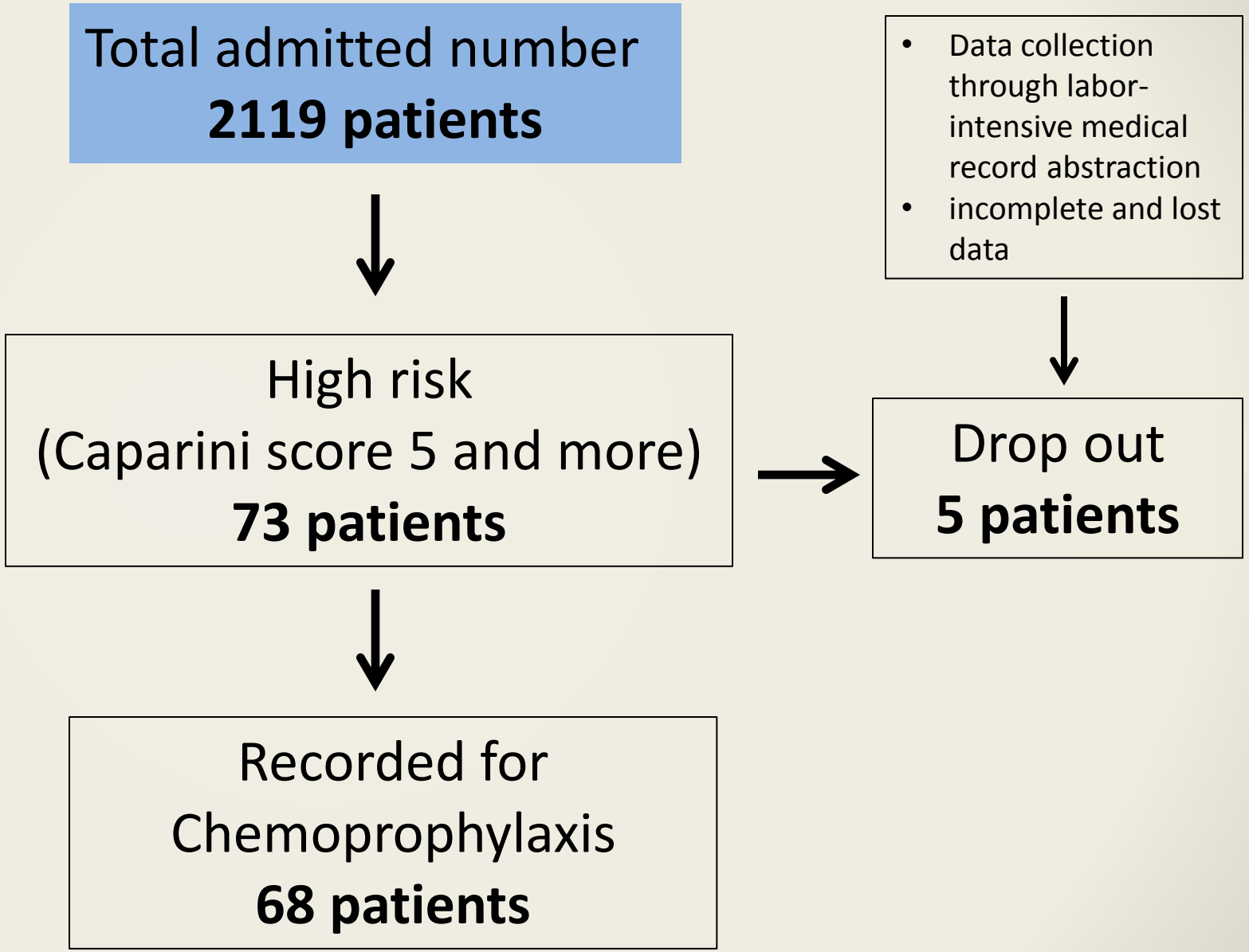
Chemoprophylaxis

- all patients with Caprini high score (5 or more)
- low molecular weight heparin(Enoxaprin)
- subcutaneously once a day dose adjusted to patient's body weight
- Duration of prophylaxis
  - at least 5 post operative days or until patient can ambulate
- started prophylaxis post operative 12 – 24 hours

- DVT was confirmed by Duplex Ultrasound.
- Any suspected leg swelling and pain in post operative period
  - checked by Duplex Ultrasound to detect DVT

- Association between the incidence of DVT and background characteristics
  - calculated by Fisher's exact test
  - p value 0.05 was statistically significant

Results


Total admitted number
2119 patients
High risk
(Caparini score 5 and more)
73 patients
Recorded for
Chemoprophylaxis
68 patients
Drop out
5 patients
Data collection through labor-intensive medical record abstraction
incomplete and lost data

Background characteristics of high risk patients (N = 68)

Age	Numbers (%)
<=40	7 (10.3)
41-60	24 (35.3)
>60	37 (54.4)
Sex	
Male	37 (54.4)
Female	31 (45.6)
Pathology	
Benign	13 (19.1)
Malignant	55 (80.9)

Background characteristics of high risk patients continued

BMI	Numbers (%)
<= 25	50 (73.5)
> 25	18 (26.5)
Operation	
Major	55 (80.9)
Minor	4 (5.9)
Observed	9 (13.2)
Duration of Enoxaparin	
≤ 5 days	27 (39.7)
> 5days	41 (60.3)

Clinical characteristics of high risk patients

DVT	Numbers (%)
Yes	7 (10.3)
No	61 (89.7)
Complication of Enoxa	
Yes	4 (5.9)
No	64 (94.1)
Viral infection	
B	4 (5.9)
C	3 (4.4)
Non	61 (89.7)
Sepsis	
Yes	6 (8.8)
No	62 (91.2)

- overall incidence of DVT in the study period
  - 7 out of 2119 admitted patients i.e.; **0.3%**
- The incidence of DVT in high risk patients
  - 7 out of 73 patients i.e.; **9%**

Association between occurrence of DVT and background characteristics

	Yes	No	P value (Fisher's exact test)
Age (years)			**0.606**
<=40	1 (14.3)	6 (85.7)	
41-60	3 (12.5)	21 (87.5)	
>60	3 (8.1)	34 (91.9)	
Sex			**1.000**
Male	4 (10.8)	33 (89.2)	
Female	3 (9.7)	28 (90.3)	
BMI (kg/m2)			**1.000**
≤25	5 (10.0)	45 (90.0)	
>25	2 (11.1)	16 (88.9)	
Pathology			**0.598**
Benign	1 (7.7)	12 (92.3)	
Malignant	6 (10.9)	49 (89.1)	

Association between occurrence of DVT and background characteristics

	Yes	No	P value (Fisher's exact test)
Operation			**0.023**
Major	3 (5.5)	52 (94.5)	
Minor	1 (25.0)	3 (75.0)	
Observed	3 (33.3)	6 (66.7)	
Duration of Enoxa			**0.105**
≤ 5days	5 (18.5)	22 (81.5)	
>5days	2 (4.9)	39 (95.1)	
Sepsis			**0.507**
Yes	0 (0.0)	6 (100.0)	
No	7 (11.3)	55 (88.7)	

Discussion

- Reviewing the hospital data analysis, there was no DVT patients in low and moderate risk patients

- data were collected only for in-patients not extended to follow-up period

- In this study period,
  - had not found documented PE despite there were cases of unexplained death.
  - But autopsy result did not show PE in unexplained death
- So there was no PE cases in this study

- We intended to strict adherence to risk stratification guideline in our hospital but..

- 5 patients drop-out data
- 8 high risk patients did not included in the prophylaxis regimen
- 4 patients who suffered DVT did not get DVT chemoprophylaxis properly
- 23% of high risk patients did not receive the recommended prophylaxis

- This indicate that there was a leakage in our practice of DVT prophylaxis.

- In other studies
  - there is evidence that prophylaxis measures are often under used with at-risk patients receiving inappropriate or no prophylaxis.
  - A large multinational study revealed that only 59% of surgical patients received evidence based VTE prophylaxis

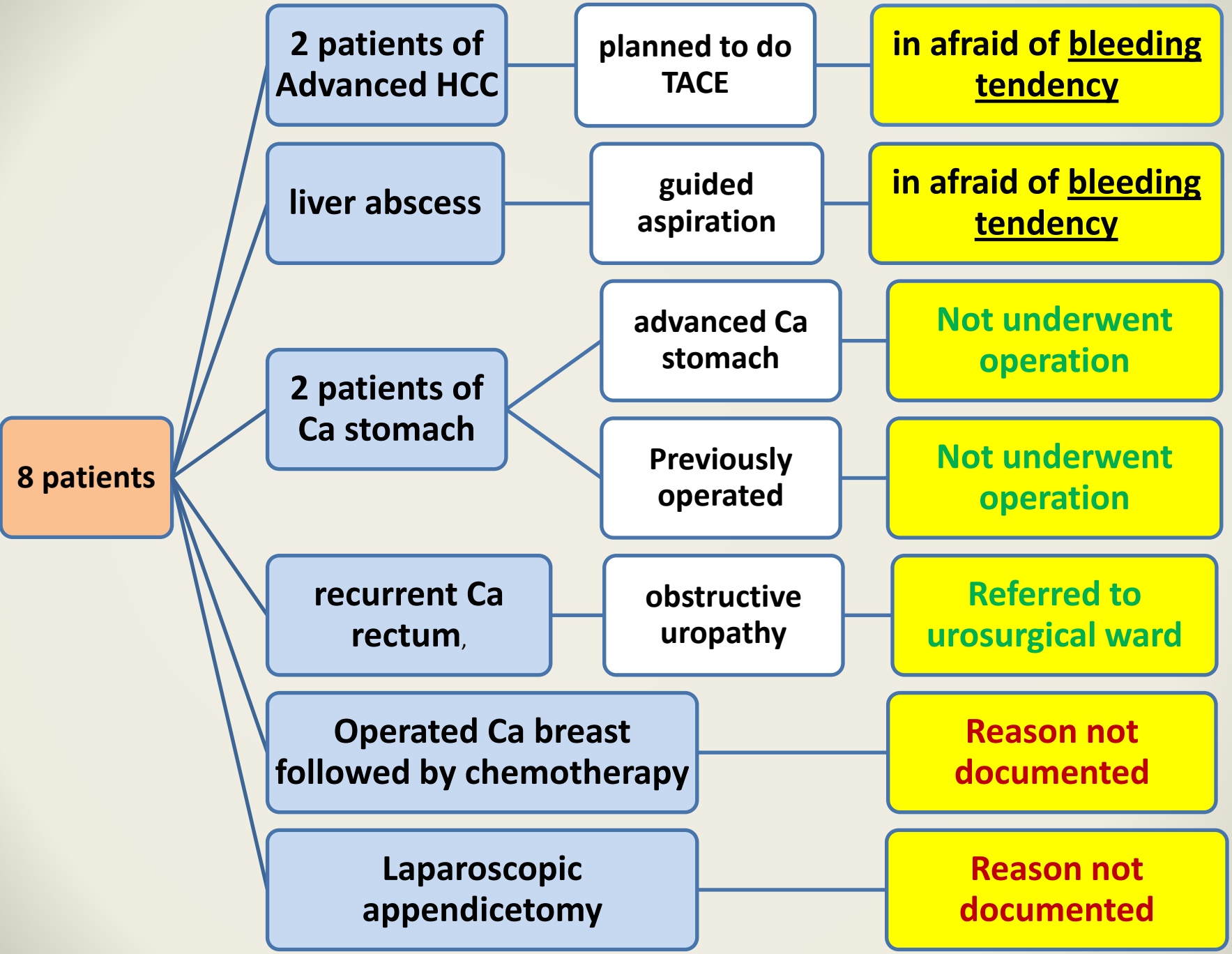
Amin A et al, 2007. Amin A et al, 2009. Cohen AT et al, 2008.

- Based on Cassidy practice of prophylaxis,
  - among patients stratification to the high risk category,
    - 89% received appropriate pharmacologic prophylaxis and duration.
    - 10% of patients did not receive the recommended prophylaxis.

- He also advice to collect data through the electronic inpatient medical record system.

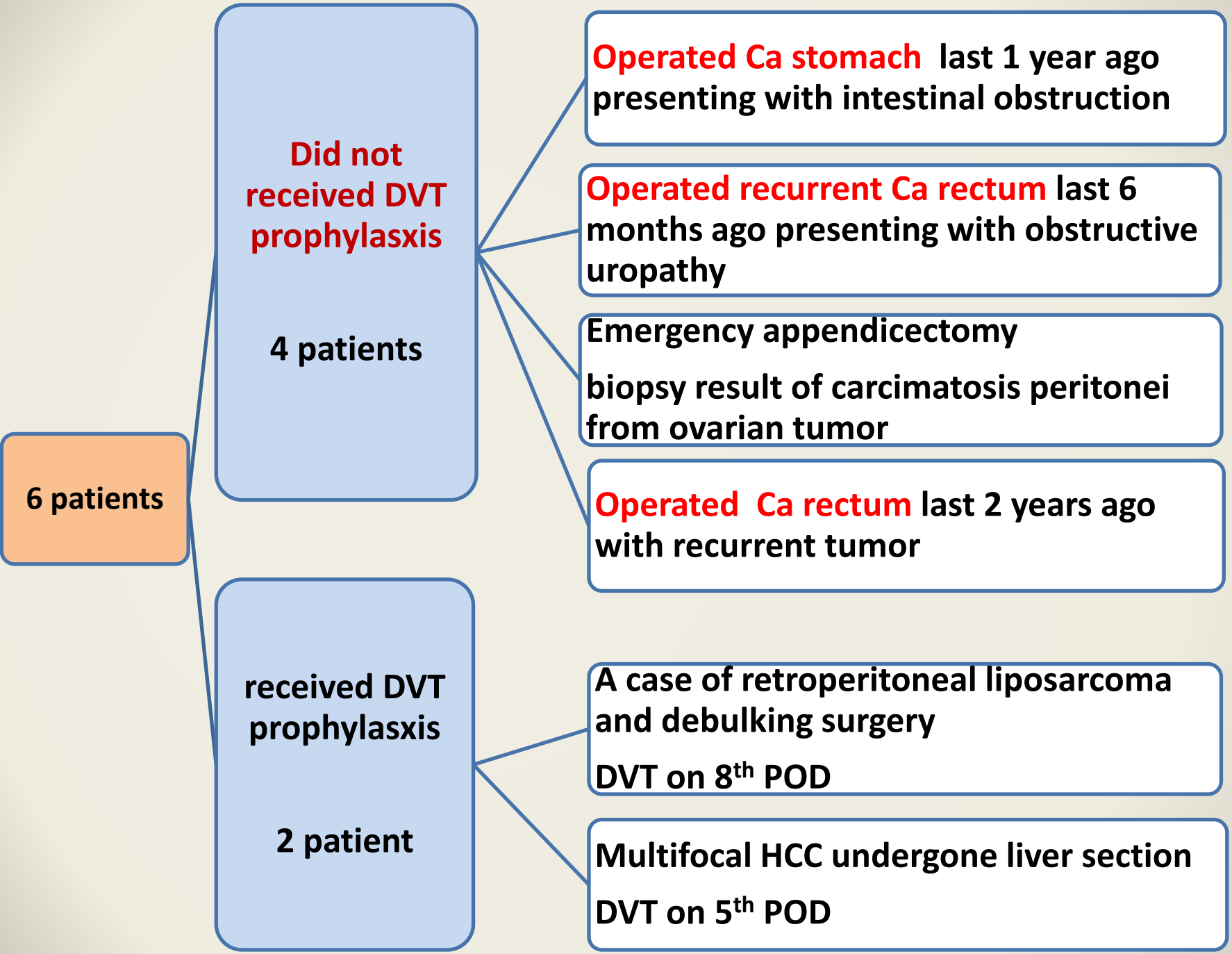
Cassidy MR 2012

Audit to 8 high risk patients who did not receive chemoprophylaxis


8 patients
2 patients of Advanced HCC
planned to do TACE
in afraid of bleeding tendency
liver abscess
guided aspiration
in afraid of bleeding tendency
2 patients of Ca stomach
advanced Ca stomach
Not underwent operation
Previously operated
Not underwent operation
recurrent Ca rectum,
obstructive uropathy
Referred to urosurgical ward
Operated Ca breast followed by chemotherapy
Reason not documented
Laparoscopic appendicetomy
Reason not documented

- Those 8 patients did not suffer DVT in their hospitalized period

6 DVT patients with malignant origin


6 patients
Did not received DVT prophylasxis
4 patients
Operated Ca stomach last 1 year ago presenting with intestinal obstruction
Operated recurrent Ca rectum last 6 months ago presenting with obstructive uropathy
Emergency appendicectomy
biopsy result of carcimatosis peritonei from ovarian tumor
Operated Ca rectum last 2 years ago with recurrent tumor
received DVT prophylasxis
2 patient
A case of retroperitoneal liposarcoma and debulking surgery
DVT on 8th POD
Multifocal HCC undergone liver section
DVT on 5th POD

DVT patient with benign pathology

- History of previous DVT with bilateral hydrocele with right sided atrophic testis
- He underwent right orchidectomy with DVT prophylaxis.
- In the period of chemoprophylaxis, he encountered the complication of LMWH at post operative day 9^{th}, bleeding from wound site.
- So we stopped chemoprophylaxis.

- After stopping of chemoprophylaxis, he noticed leg swelling and pain and confirmed DVT by Duplex scan.
- Then we gave therapeutic regime of LMWH followed by life long warfarin

- After auditing the data and found that 17 patients with high risk Caprini score were not get proper DVT prophylaxis.

- Among them, 4 patients were suffered DVT; 24%.

- Despite guideline from multiple sources for VTE prophylaxis regimes
  - PE and DVT remains significant problems among hospitalized patients in United States

- High risk patients tend to receive insufficient prophylaxis and low risk patients may be over treated

- Caprini suggest that the solution to this problem is standardize risk assessment and commensurate prophylaxis

Caprini JA , 2010. Deheinzelin D et al, 2006

Complication of low molecular weighted heparin

4 patients

Bleeding from operated wounds

History of DVT with right orchidectomy for atrophic testis .

Complication at 9th day of chemoprophylaxis

Retroperitoneal tumor patient underwent debulking surgery

biopsy result of Non Hodgkin Lymphoma

Complication at 3rd day of chemoprophylaxis

Ca rectum with liver secondary performed ARR, splenectomy,RFA

Complication at 6th day of chemoprophylaxis

Ca stomach,

performed TG, OJ,JJ, splenectomy

Complication at 5th day of chemoprophylaxis

Conclusion

- first standardizes risk stratification prophylaxis protocol for DVT in the surgical ward of NYGH
- overall incidence of DVT patients during one year period is 0.3%
- incidence of DVT in high risk patients is 9%

- So strict adherence of risk stratification and standardized prophylaxis guideline is very important

- to reduce the incidence of DVT formation in surgical patients.

- After auditing the prophylaxis protocol, 23% of high risk patients actually did not received proper chemoprophylaxis.

- Because of improper chemoprophylaxis , 4 patients suffered DVT ; 24%.
- That shows there was a leakage in labour intensive medical record system.

- need to change our labor intensive data recording system to electronic prophylaxis recommendation system in future.

Limitations

1. single center based study
2. only detected the symptomatic DVT, not asymptomatic DVT
3. only used chemoprophylaxis , not used other mechanical prophylaxis for DVT
4. detected in general surgical patients , not included trauma, orthopedic, vascular patients.

Take home message

- Once VTE occurs
- 21.5% of patients will have a recurrent VTE within 5 years
- 2.6% incidence of PE
- Prevention is important in our patients.

Thank You