Trauma and Coagulopathy: Guidelines for Reversal

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Objectives

- Identify why anti-thrombotic agents have become such an issue with trauma care.
- Identify the most common concerns for patients who are on anti-thrombotics.
- Discuss the appropriate nursing assessment and interventions for trauma patients who require anti-thrombotics.

The Society of Trauma Nurses and The Hartford Institute of New York University

Reversal of Anti-Coagulation for Elderly Patients Taking Anti-Coagulation Medication Who Sustain a Head Injury

STN Taskforce Members

Taskforce Chair:

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The Issue

- Trauma is one of the leading causes of death and disability in the United States.
- Many of those injured, are over the age of 65 years.

Anticoagulation

- Is a high-risk therapy, sometimes needed for patients with a wide variety of medical and surgical issues.
- Can utilized on either in or out-patient arena.
- It is a profitable business.

The Issue

- TBI is on the decline in younger individuals (> 15 years and < 65 years) due to preventative measures
  - seatbelt use
  - protective head gear worn in sporting or athletic activities
  - greater public education
- Falls in the elderly are a leading cause of TBI and no decrease has been seen in that age group.

Definitions

- Elderly - 65 and older.
  - definition utilized by the Commonwealth of Pennsylvania and the Pennsylvania Trauma Systems Foundation.

Epidemiology

- Those 65 and over are a rapidly growing population in the United States.
- The number of people 65 and over is projected to increase from 35 -39 million in 2010 to 53-69 million by the year 2020. This increase is attributed to the extended life expectancy of surviving baby boomers.
- About 20 percent of the US's total population will be over 65 in 2030, compared to approximately 13 percent now.

National Estimates of the 10 Leading Causes of Nonfatal Injuries Treated in Hospital Emergency Departments, United States – 2009

	Age Groups										
Rank	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	Total
1	Unintentional Fall 147,280	Unintentional Fall 955,381	Unintentional Fall 631,381	Unintentional Fall 615,145	Unintentional Struck By/Against 1,027,646	Unintentional Fall 791,629	Unintentional Fall 794,906	Unintentional Fall 928,315	Unintentional Fall 781,827	Unintentional Fall 2,202,024	Unintentional Fall 8,765,597
2	Unintentional Struck By/Against 31,360	Unintentional Struck By/Against 372,402	Unintentional Struck By/Against 406,045	Unintentional Struck By/Against 574,267	Unintentional Fall 917,167	Unintentional Overexertion 654,125	Unintentional Overexertion 564,548	Unintentional Overexertion 444,515	Unintentional Struck By/Against 232,696	Unintentional Struck By/Against 242,014	Unintentional Struck By/Against 4,435,906
3	Unintentional Other Bite/Sting 10,922	Unintentional Other Bite/Sting 137,352	Unintentional Cut/Pierce 104,940	Unintentional Overexertion 276,076	Unintentional MV-Occupant 741,159	Unintentional Struck By/Against 643,495	Unintentional Struck By/Against 495,060	Unintentional Struck By/Against 410,712	Unintentional Overexertion 217,605	Unintentional Overexertion 180,152	Unintentional Overexertion 3,207,877
4	Unintentional Foreign Body 8,860	Unintentional Foreign Body 126,060	Unintentional Other Bite/Sting 92,885	Unintentional Cut/Pierce 118,440	Unintentional Overexertion 703,809	Unintentional MV-Occupant 553,680	Unintentional MV-Occupant 419,564	Unintentional MV-Occupant 363,618	Unintentional MV-Occupant 216,997	Unintentional MV-Occupant 174,999	Unintentional MV-Occupant 2,643,652
5	Unintentional Fire/Burn 7,846	Unintentional Cut/Pierce 84,095	Unintentional Pedal Cyclist 84,590	Unintentional Pedal Cyclist 118,095	Other Assault* Struck By/Against 451,123	Unintentional Cut/Pierce 382,187	Unintentional Cut/Pierce 308,801	Unintentional Cut/Pierce 271,617	Unintentional Cut/Pierce 171,584	Unintentional Cut/Pierce 127,735	Unintentional Cut/Pierce 1,997,752
6	Unintentional Other Specified 7,036	Unintentional Overexertion 83,056	Unintentional Overexertion 77,742	Unintentional Unknown/ Unspecified 98,282	Unintentional Cut/Pierce 422,182	Other Assault* Struck By/Against 301,791	Other Assault* Struck By/Against 194,859	Unintentional Other Specified 179,577	Unintentional Other Bite/Sting 81,881	Unintentional Other Bite/Sting 86,559	Other Assault* Struck By/Against 1,252,243
7	Unintentional Overexertion 6,249	Unintentional Other Specified 62,861	Unintentional MV-Occupant 58,049	Unintentional MV-Occupant 75,701	Unintentional Other Specified 191,694	Unintentional Other Bite/Sting 158,668	Unintentional Other Specified 164,558	Unintentional Poisoning 159,067	Unintentional Other Specified 77,309	Unintentional Poisoning 65,707	Unintentional Other Bite/Sting 1,067,922
8	Unintentional Inhalation/ Suffocation 6,057	Unintentional Fire/Burn 49,896	Unintentional Foreign Body 55,185	Other Assault* Struck By/Against 73,360	Unintentional Other Bite/Sting 178,506	Unintentional Other Specified 153,741	Unintentional Other Bite/Sting 129,701	Other Assault* Struck By/Against 141,586	Unintentional Poisoning 75,542	Unintentional Other Transport 62,519	Unintentional Other Specified 924,345
9	Unintentional Cut/Pierce 6,049	Unintentional Unknown/ Unspecified 48,454	Unintentional Dog Bite 43,512	Unintentional Other Bite/Sting 59,912	Unintentional Unknown/ Unspecified 176,499	Unintentional Unknown/ Unspecified 113,738	Unintentional Poisoning 124,292	Unintentional Other Bite/Sting 131,536	Unintentional Other Transport 46,573	Unintentional Unknown/ Unspecified 59,185	Unintentional Unknown/ Unspecified 755,175
10	Unintentional MV-Occupant 4,942	Unintentional Poisoning 41,265	Unintentional Other Transport 39,732	Unintentional Other Transport 55,176	Unintentional Other Transport 123,824	Unintentional Poisoning 101,454	Unintentional Unknown/ Unspecified 94,310	Unintentional Unknown/ Unspecified 81,378	Other Assault* Struck By/Against 45,992	Unintentional Other Specified 48,972	Unintentional Poisoning 708,318

Centers for Disease Control and Prevention
National Center for Injury Prevention and Control

*The "Other Assault" category includes all assaults that are **not** classified as sexual assault. It represents the majority of assaults.
Source: NEISS All Injury Program operated by the Consumer Product Safety Commission (CPSC).
Produced by: Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC.

CS227502

Centers for Disease Control and Prevention, 2010

10 Leading Causes of Injury Deaths by Age Group Highlighting Unintentional Injury Deaths, United States – 2008

	Age Groups										
Rank	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	Total
1	Unintentional Suffocation 1,058	Unintentional Drowning 443	Unintentional MV Traffic 385	Unintentional MV Traffic 532	Unintentional MV Traffic 8,647	Unintentional MV Traffic 6,358	Unintentional Poisoning 7,545	Unintentional Poisoning 9,496	Unintentional MV Traffic 4,137	Unintentional Fall 19,742	Unintentional MV Traffic 37,985
2	Homicide Unspecified 156	Unintentional MV Traffic 346	Unintentional Drowning 138	Homicide Firearm 143	Homicide Firearm 4,394	Unintentional Poisoning 5,946	Unintentional MV Traffic 5,446	Unintentional MV Traffic 5,866	Unintentional Poisoning 3,547	Unintentional MV Traffic 6,167	Unintentional Poisoning 31,116
3	Homicide Other Spec., Classifiable 98	Homicide Unspecified 192	Unintentional Fire/Burn 111	Suicide Suffocation 141	Unintentional Poisoning 3,188	Homicide Firearm 3,612	Suicide Firearm 2,796	Suicide Firearm 3,789	Suicide Firearm 3,079	Unintentional Unspecified 4,769	Unintentional Fall 24,013
4	Unintentional MV Traffic 98	Unintentional Fire/Burn 169	Homicide Firearm 44	Unintentional Drowning 123	Suicide Firearm 2,009	Suicide Firearm 2,357	Homicide Firearm 1,966	Suicide Poisoning 2,004	Unintentional Fall 1,809	Suicide Firearm 4,143	Suicide Firearm 18,223
5	Undetermined Suffocation 46	Unintentional Suffocation 145	Unintentional Suffocation 41	Unintentional Fire/Burn 64	Suicide Suffocation 1,653	Suicide Suffocation 1,752	Suicide Suffocation 1,855	Suicide Suffocation 1,772	Suicide Poisoning 1,164	Unintentional Suffocation 3,200	Homicide Firearm 12,179
6	Unintentional Drowning 41	Unintentional Pedestrian, Other 111	Unintentional Other Land Transport 28	Unintentional Other Land Transport 64	Unintentional Drowning 569	Suicide Poisoning 764	Suicide Poisoning 1,486	Unintentional Fall 1,300	Suicide Suffocation 818	Adverse Effects 1,677	Suicide Suffocation 8,578
7	Homicide Suffocation 32	Homicide Other Spec., Classifiable 77	Unintentional Pedestrian, Other 24	Suicide Firearm 50	Homicide Cut/Pierce 504	Undetermined Poisoning 606	Undetermined Poisoning 836	Homicide Firearm 1,146	Unintentional Suffocation 562	Unintentional Poisoning 1,296	Suicide Poisoning 6,442
8	Undetermined Unspecified 28	Homicide Firearm 56	Unintentional Fall 22	Unintentional Suffocation 50	Suicide Poisoning 334	Homicide Cut/Pierce 476	Unintentional Fall 540	Undetermined Poisoning 1,066	Homicide Firearm 489	Unintentional Fire/Burn 1,118	Unintentional Suffocation 6,125
9	Adverse Effects 24	Unintentional Struck by or Against 44	Homicide Unspecified 15	Unintentional Poisoning 37	Unintentional Other Land Transport 302	Unintentional Drowning 429	Unintentional Drowning 406	Unintentional Drowning 510	Unintentional Fire/Burn 476	Suicide Poisoning 675	Unintentional Unspecified 5,911
10	Unintentional Fire/Burn 22	Unintentional Fall 38	Unintentional Struck by or Against 13	Unintentional Firearm 29	Undetermined Poisoning 299	Unintentional Fall 297	Homicide Cut/Pierce 393	Unintentional Suffocation 490	Undetermined Poisoning 455	Suicide Suffocation 580	Unintentional Drowning 3,548

Centers for Disease Control and Prevention
National Center for Injury Prevention and Control

Source: National Center for Health Statistics (NCHS), National Vital Statistics System.
Produced by: Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC.

CS227502

Anatomic and Physiologic Differences

- Higher mortality rate due to:
  - Age-related deterioration
  - Decreased stress tolerance and physiologic reserve
  - Greater complication risk
  - Pre-existing chronic disease
  - Pre-existing nutritional deficits

Mechanisms of Injury

- Falls
- Motor Vehicle Crashes
- Pedestrian-Automobile Crashes
- Violence

Falls

- Most common unintentional injury for those over 75
- Mort rate increases dramatically with age
- 50% of elderly who fall do so repeatedly
- Most fall on a level surface and suffer an isolated orthopedic injury.
- Many falls occur in nursing homes

Common Causes of Geriatric Falls

- Syncope due to:
  - dysrhythmias, venous pooling, orthostatic hypotension, hypoxia, anemia, or hypoglycemia.
- Other factors include:
  - alcohol and medications (antihypertensives, antidepressant, diuretic and hypoglycemia agents).
- Changes in postural stability, balance, motor strength, and coordination, reaction time, poor visual acuity and visual attention, overload of information, slower gait

Geriatric TBI

- With aging, the brain progressively atrophies and decreases in size by 10% between ages 30 - 70
- Subtle changes in cognition and memory make evaluation of mental status difficult
- Lower incidence of epidural hematomas
- Higher incidence of subdural hematomas
- The increased “dead space” within the skull may delay symptoms of ICH
- We should have a low threshold for head CT

Geriatric Falls and Bleeding

- Anticoagulants
  - Heparin
  - Unfractionated heparin
  - Low-molecular weight heparin
  - Warfarin
  - Hirudin
- Antiplatelet Agents
  - Aspirin
  - ADP inhibitors
  - GPIIb/IIIa Antagonists
  - Phosphadiesterase (PDE) inhibitors
- Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)
  - Ibuprofen
  - COX-2 inhibitors
- Thrombolytics
  - Streptokinase
  - Urokinase
  - Tissue plasminagen activator (tPA)

Reasons Why People Are On Anticoagulants

- Atrial fibrillation
- Deep vein thrombosis
- Mechanical heart valves
- Stroke prevention
- Heart attacks
- Heart failure
- Pulmonary emboli
- Angina
- Stents
- Orthopedic procedures
- Wound care
- Just because….

So Who Is Old?

Bruce Springsteen

- Born: Sept 23, 1949 Long Branch, NJ
- 62 years old
- Accomplished musician, songwriter
- Med hx: Has not disclosed any health concerns

David Letterman

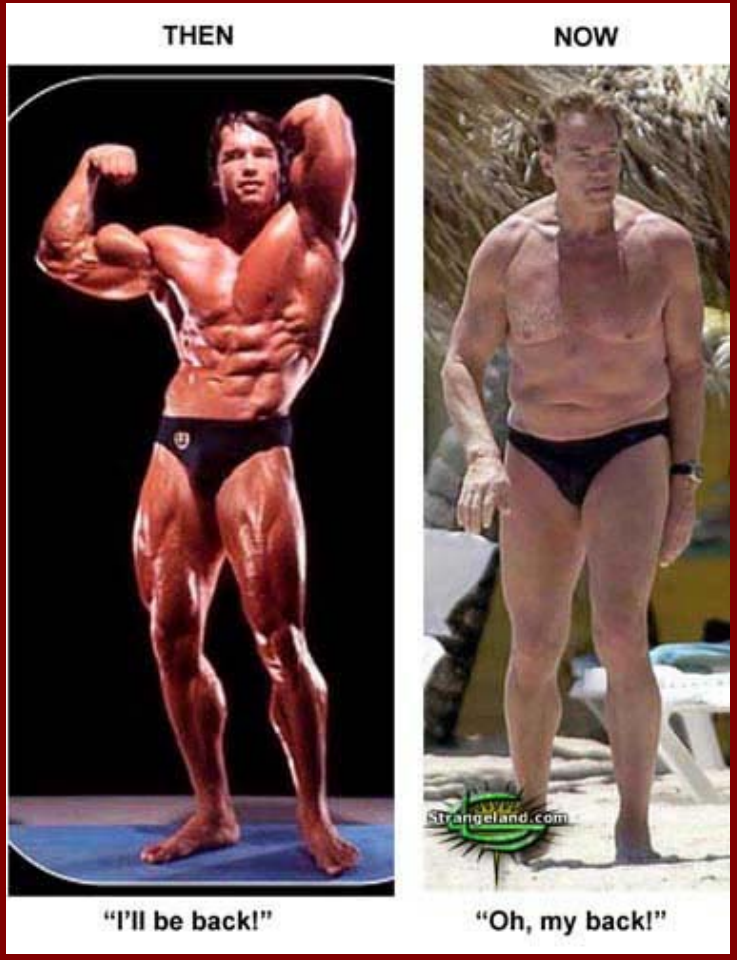
- Born: April 12, 1947 Indianapolis, IN
- 63 years old
- Late night talk show host, comedian, writer, businessman
- Med hx: Jan. 1, 2000 had quintuple bypass surgery (52 years old)

Arnold Schwarzenegger

- Born: July 30, 1947 Austria
- 63 years old
- Body builder, actor, business, Governor of CA
- Med hx: Born with bicuspid aortic valve (had 2 leaflets - not 3)

Arnold Schwarzenegger

- 1997 had replacement valve (made from his own transplanted tissue)
- Dec 9, 2001 – MCC with 6 fx ribs; spent 4 days in the hospital
- Jan 8, 2006 – MCC with 15 stitches in his lip
- Dec 23, 2006 – tripped over pole and broke R femur while skiing in Sun Valley, ID
- Dec 26, 2006 – 90 minute surgery to repair femur fx

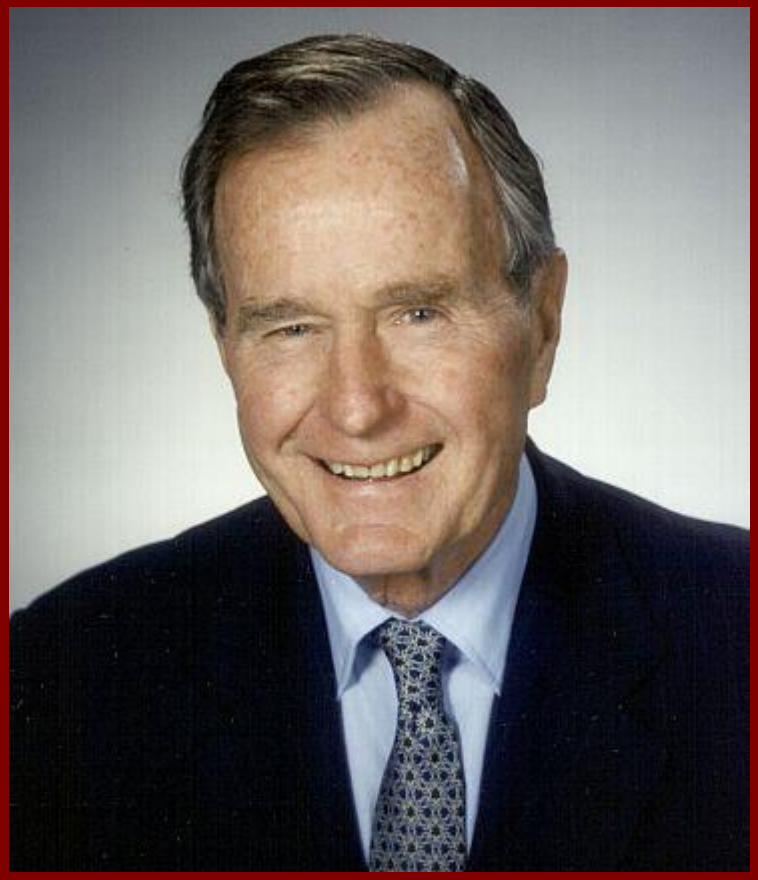


Paul McCartney

- Born June 18, 1942 England, 69 years old
- Singer, songwriter, activist
- Med hx: None

George H.W. Bush

- Born: June 12, 1924
  New Haven, CT
  (88 years old)
- War hero, pilot, oil man, statesman, Ambassador, CIA Director, Vice-President and President of the United States
- Med hx: Takes Coumadin for atrial fibrillation due to hypothyroidism

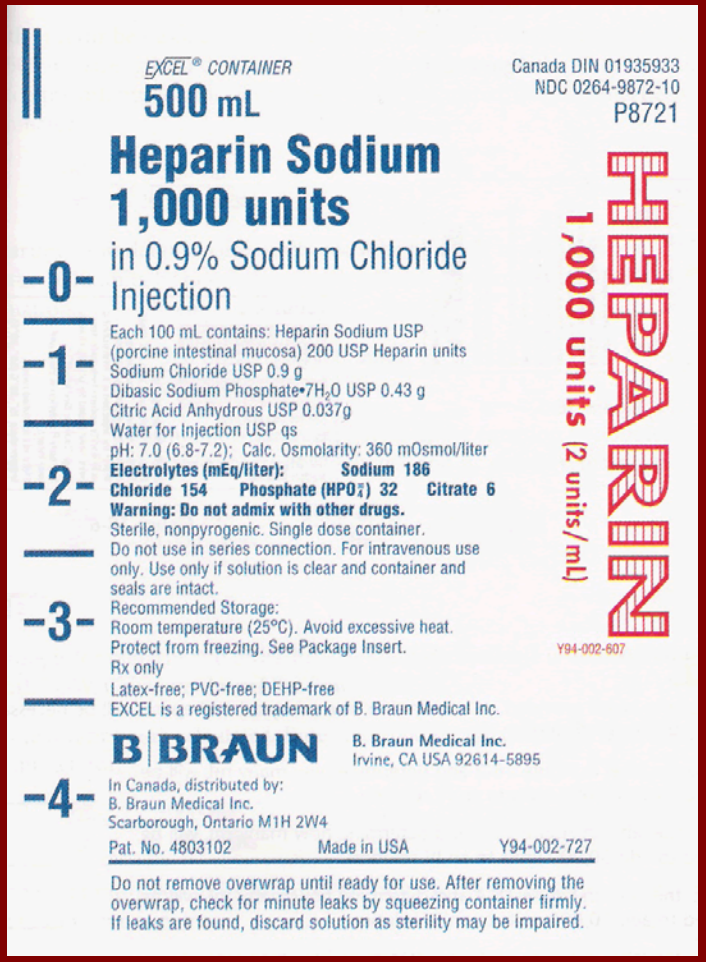


Nancy Davis Reagan

- Born: July 6, 1921 NYC; 90 years old
- Actress, author, First Lady of California and the US
- Med hx: Oct 2008 – fell and broke sacrum and pelvis

Heparin

- Commonly used polysaccharide anticoagulant that inactivates thrombin and thus inhibits the coagulation cascade from forming a fibrin thrombus
- The effect is a prolonged PTT.
- As heparin inhibits thrombus, PT should be prolonged too



Heparin

- Heparin overdose is a PTT in excess of 2-2.5 times control
- Antidote is protamine sulfate (50 mg) which can reverse the effects. Reasonable dose is 1 mg/kg.

Warfarin

- Most commonly used oral anticoagulant in North America
- Inhibits thrombin formation
- Best selling drug
- Underestimated drug

Unfractionated Heparin

- A glycosaminoglycan that exerts its anticoagulant effect thru binding and poteniation of ATIII
- Given sub q, IV infusion
- Therapy gauged by PTT or INR which is prolonged
- Half-life is 1 hour
- Reversed by protmaine sulfate

Low Molecular Weight Heparin (LMWH)

- Has 1/3 the molecular weight of heparin
- Has more antifactor Xa activity than inhibition of thrombin
- Does not prolong PTT (since it does not affect thrombin)
- Half-life is much longer than heparin and mainly cleared by the kidneys.
- Protamine is only able to neutralize 60% of LMWH activity

Plavix

- Is used to prevent strokes and heart attacks in patients at risk for these problems.
- In a class of medications called antiplatelet drugs.
- Works by keeping platelets from sticking together and preventing clots.

Aspirin

- Is in a group of medications called salicylates.
- Reduces the clumping action of platelets
- It works by stopping the production of certain natural substances that cause fever, pain, swelling, and blood clots.

All the Others

- Natural herbs
- Drug interactions
- ?????

Guiding Principle

- Patients who sustain a TBI and are taking an anti-coagulant will require a rapid reversal of that agent.
- Anticoagulants are taken by many patients (especially geriatric patients) to avoid a life-threatening event.
- Unfortuanately, once a traumatic injury occurs, these agents may increase their mortality due to the disruption of the clotting factors.

Pre-Hospital Arena

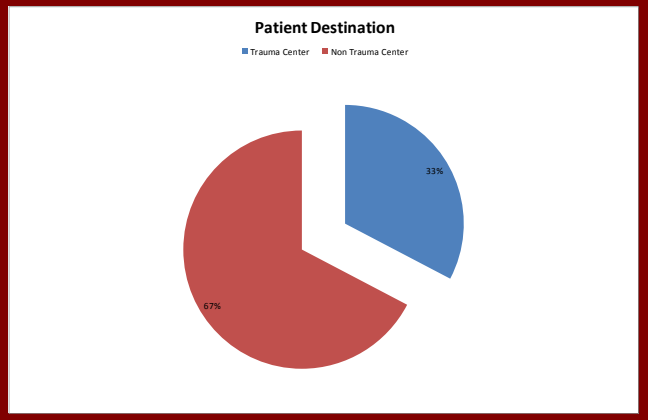
- EMS need to evaluate all trauma pts for:
  - any co-morbidities or significant medical hx which would be a predictor of anticoagulant use (i.e. A-fib, valvular replacement, DVT, stroke, etc.

Pre-Hospital Arena

- EMS need to consider transport to a trauma center if any type of anticoagulant is being taken or the use of one is suspected

Pre-Hospital Arena

- Undertriage
  - Often transported to a non-trauma center
  - Under recognition of beta blockers
  - Pre-hospital training on elderly changes
  - No resources to transfer
  - Patient often under triage themselves
  - “They look good”



PTSF Data 2011

Undertriage of elderly trauma patients to state-designated trauma centers

- Even when trauma is recognized and acknowledged by EMS, providers are consistently less likely to consider transporting elderly patients to a trauma center. Arch Surg. 143(8):776-81; discussion 782, 2008 Aug.
- EAST Guidelines (level II) suggest that all patients > 70 y/o should be taken to a trauma center EAST Guidelines

Emergency Dept Care

- If the patient is in a non-trauma center and they take anti-coagulants, consider transfer
- Determine:
  - patient's Glasgow Coma Scale (GCS)
  - patient's age
  - pre-existing medical conditions (why they are on anti-coagulants).
  - need to initiate reversal

Emergency Dept Arena

- Ask about any prescription or over the counter medications they are taking.
- If anticoagulants are being taken, determine the reason for their use.

Emergency Dept Arena

- Evaluate for co-morbidities or significant medical hx which would be predictor of anticoagulant use
  - atrial fib, valve replacement, DVT, stroke, etc.

Activation or Not?

- Do you make your elderly an activation?
  - What's the criteria?
    - Age
    - Mechanism
    - Physiology
    - Personal Medical Hx
    - Medications

Impact of advanced age on trauma triage decisions and outcomes: a statewide analysis

- 13,820 (27%) elderly patients.
- Significantly less likely trauma team activation despite similar severity
- More often required urgent craniotomy and orthopedic procedures
- Undertriaged elderly patients had 4 times the mortality rate

Am J Surg. 197(5):571-4; discussion 574-5, 2009 May.

Emergency Dept Care

- Obtain a GCS and vital signs at time of triage:
  - **GCS** and a complete neuro exam should be reevaluated at a minimum every hour or more frequently as warranted.
  - Clinical signs of increased ICP include declining mental status, headache, vomiting, varying respirations, and bradycardia.
  - Changes in the pupillary response or GCS usually signals worsening brain injury.
  - Medical management of TBI is focused on preventing secondary insult.

Emergency Dept Care

- Send trauma panel bloods off and include PT, PTT, INR
- Obtain a STAT CT scan of the head.
- A NS consult should be obtained if the scan is positive for blood.
- Reversal of anticoagulant initiated in those patients diagnosed with intracranial hemorrhage or a strong suspicion.
- Repeat head CT scan in 4-6 hours unless a decreasing neuro exam requires it be sooner.

Vitamin K Antagonists

- Warfarin/Coumadin
  - Suggestive reversals
    - Vitamin K (10mg IV)
    - FFP: At least 2 to start
    - Some data supports rFVIIa but caution is advised
    - Tranexamin Acid (Anyone using yet?)

Unfractionated Heparin (UHF)

- Half life of IV Heparin is 60 minutes
- Reversal agent = Protamine
  - Time since last dose — Dose of Protamine
    - < 30 min — 1-1.5mg/100units
    - 30 – 60 min — 0.5 to 0.75mg/100 units
    - 60 – 120 min — 0.375 to 0.5mg/100units
    - >120 — 0.25 to 0.375mg/100 units
- Sub-Q Heparin may require a longer infusion of Protamine

Low Molecular Weight Heparins (LMWH)

- No proven antidote, Protamine is suggested but it may only neutralize 60% of the anti-factor Xa activity in LMWH
- Enoxaparin and Dalteparin
  - < 8 hours — 1mg Protamine/100 anti-factor Xa units LMWH followed by 0.5mg/100 if bleeding continues
  - > 8 hours — Smaller doses are needed

Low Molecular Weight Heparin

- The duration of action of either Enoxaparin and Dalteparin should dissipate within 24 hours of a therapeutic dose or 12 hours of a prophylactic dose.
- The duration of action of Enoxaparin may be significantly prolonged in renal insufficiency

Antiplatelet Agents

- Aspirin, Ticlid, Plavix, Effient
  - Platelet transfusion may be useful
  - DDAVP can be considered

IIb/IIIa Inhibitors

- Reopro — Give Platelets
- Aggrastat or Integrillin — Platelets, can transfuse Cryo and could also use DDAVP if needed.

Anti-Factor Xa Agents

- Fondaparinux (Arixtra)
  - No specific antidote
  - Limited data supports rFVIIa
  - Half life = 18hours
  - Peak is 3 hours after administration
- Apixaban and Rivaroxaban
  - No specific antidote
  - rFVIIa may be useful

Direct Thrombin Inhibitors

- Argatroban and Bivalirudin
  - No specific antidote
  - Rapidly eliminated upon cessation of the therapy
    - Argatroban
      - Half life 30 – 51 minutes
    - Bivalirudin
      - Half life dependent upon renal status

Direct Thrombin Inhibitors

- Dabigatran
  - NO REVERSAL
  - Half life 12 to 17 hours (renally cleared)
  - Hemodialysis
  - Activated Charcoal
  - PCC's or activated PCCs?
  - FFP?
  - rFVIIa?

ED/Critical Care Arena

- Once reversal of the anticoagulant has started, pt will need to be closely monitored for neurological changes and potential complications from the reversal (i.e. emboli phenomenon).
- Elderly pts anticoagulated with mild TBI, including those with a normal neurological exam and CT scan should be hospitalized for at least 24 hours for observation by either a TS or a NS.

Diagnostic Testing

- Need to be taken to CT quickly
- Need to have scan read quickly
- Need to be able to repeat scan quickly over the next few hours to days

Those Who Take….

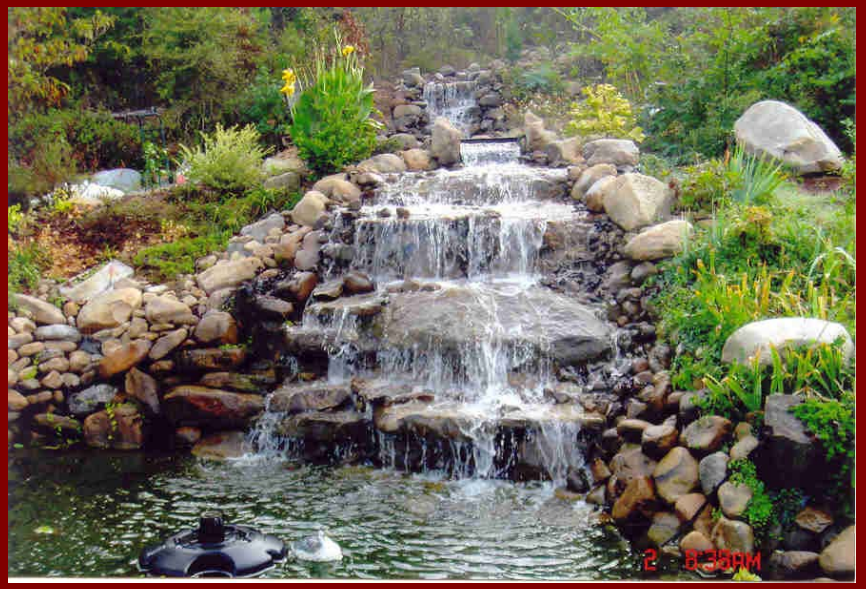
- Warfarin may present with small intracranial bleeds that ultimately progress to a larger hemorrhage.
- ASA on a daily basis will usually have small bleeds and other comorbid conditions.
- Plavix are at risk for an event somewhere between the ASA group and the warfarin group with regards to progression of their bleed.

Medical Interventions

- Reversal agents should be given.
- The risks and benefits of anticoagulant use must be reevaluated once a traumatic ICH occurs.
  - Those on anticoagulants for atrial fibrillation, rate of a thrombolic event is 1in 1300 as compared to 1 in 2 risk of death following an intracranial hemorrhage.
  - Therapeutic and supratherapeutic INRs should be treated with fresh frozen plasma (FFP) and vitamin K or Factor VIIa in any patient with TBI. The INR should be maintained less than 1.4.

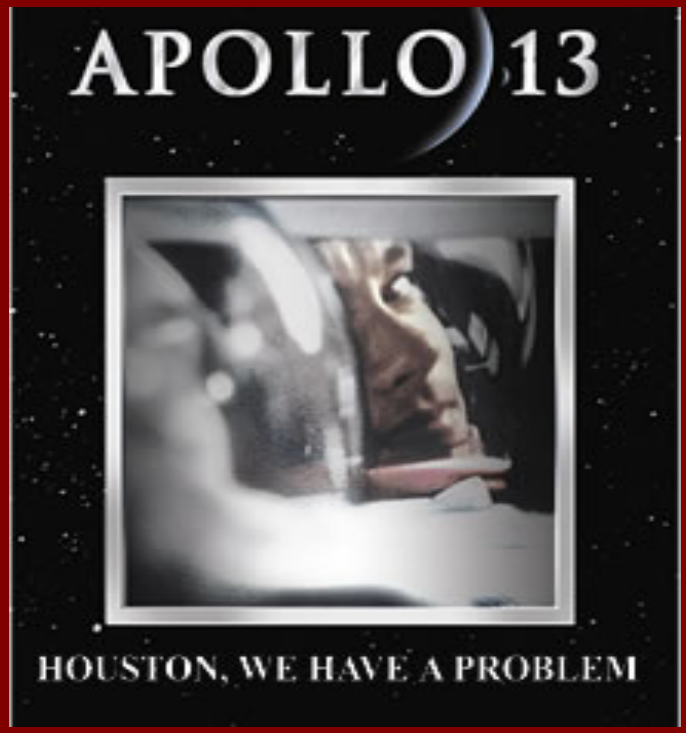
Surgical Interventions

- There is little point going to the OR or to IRAD if the bleeding cannot be controlled
- The faster the patient is reversed, the sooner they can go to the OR or IRAD



Common Concerns for Patients on Anti-Thrombotics

- Principle complication is spontaneous bleeding any where in the body
- Thrombocytopenia
- Heparin Induced thrombocytopenia (HIT)
- Death



Guiding Principle

- Patients who sustain a TBI and are taking an anti-coagulant will require a rapid reversal of that agent.
- Anticoagulants are taken by many patients (especially geriatric patients) to avoid a life-threatening event.
- Once a trauma occurs, these agents may increase their mortality due to the disruption of the clotting factors.
  - ***STN developed a protocol they believe will assist trauma providers by decreasing the risk of a life-threatening hemorrhage in geriatric trauma patients who are on anticoagulation therapy.***

The Society of Trauma Nurses and The Hartford Institute of New York University

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Society of Trauma Nurses Warfarin Rapid Reversal Pathway

Known Warfarin Therapy with acute trauma above the clavicles

History of Warfarin use and head trauma WITH CT evidence of intracranial bleeding.

NO

Significant signs of head trauma.
GSC≤14, positive loss of consciousness

YES-admit to Hospitalist

NO-DC home

Repeat Head CT in 3 hours or STAT with any signs/symptoms of increasing ICP.
Repeat PT q 6 hours for 24 hours or as needed.

Head CT positive for ICH

Head CT Negative for ICH

DC home with appropriate instructions and follow-up

YES

STAT bedside PT/INR and blood bank tube.
Consult Neurosurgery

INR ≤ 1.4

Vitamin K (IM OR IV)
Start ASAP
If Vitamin K is given IV, then infuse over 1 hour to decrease the risk of anaphylaxis

CONSIDER
Continue Vitamin K (IM/IV)

INR > 1.8

Vitamin K (IM OR IV) STAT
PCC per wt based dosing scale

35-50 Kg =	1500 IU	96-110 Kg = 3500 IU
51-65 Kg =	2000 IU	111-125 Kg = 4000 IU
66-80 Kg =	2500 IU	>126 Kg = 4500 IU
81-95 Kg =	3000 IU	

FFP 2 units stat type specific if possible, otherwise AB

PT/PTT, fibrinogen CBC STAT

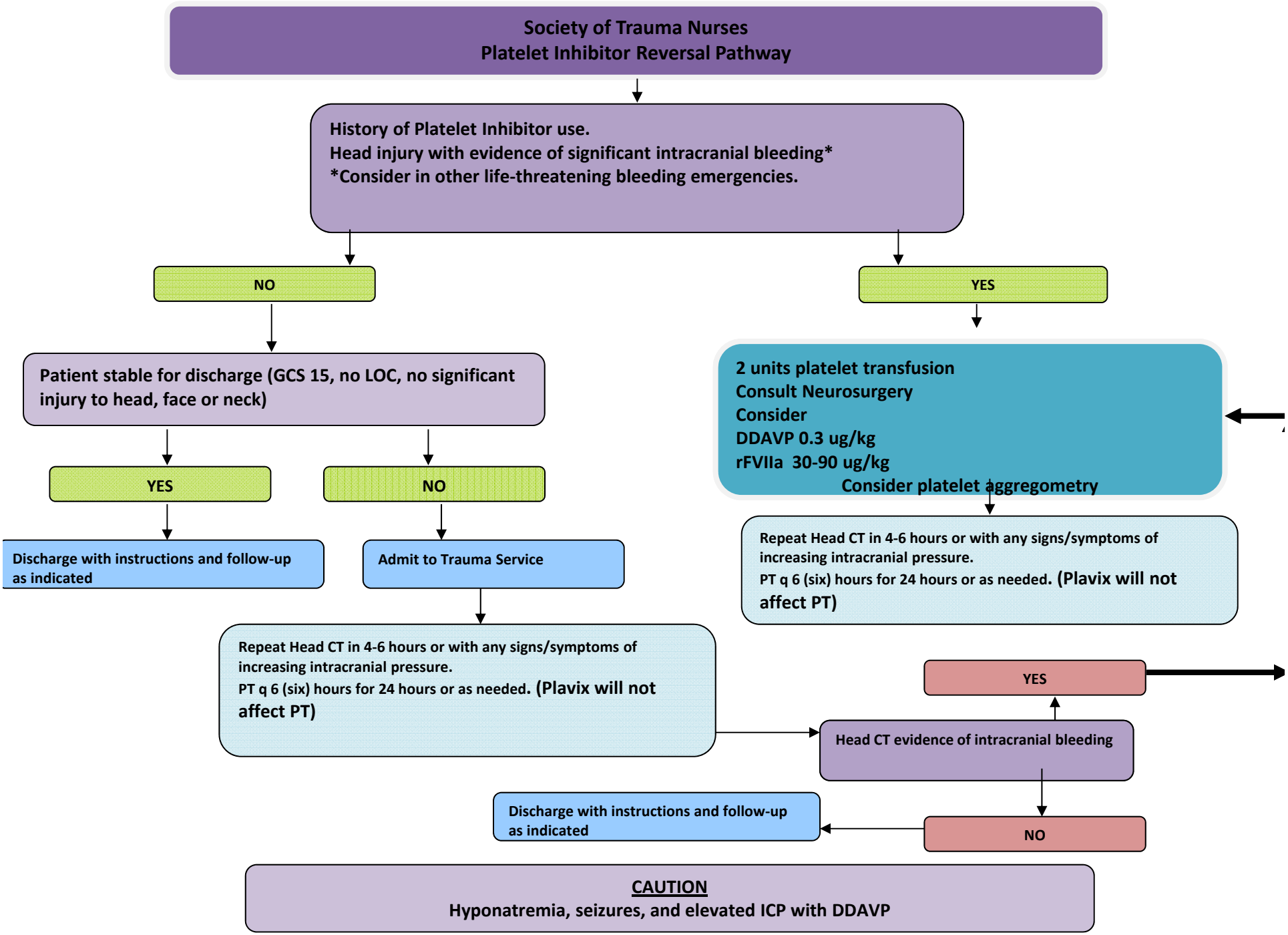
INR ≤ 1.4

INR ≥ 1.8

CONSIDER
PCC Repeat initial dose
If fibrinogen < 100mg/dl – 10 units Cryoprecipitate or 2 Unit(s) FFP

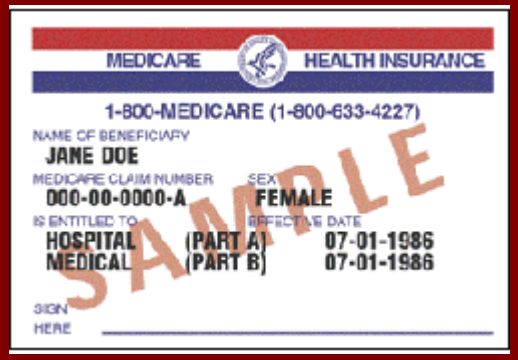
Repeat Head CT in 4 -6 hours or with any signs/symptoms of increasing intracranial pressure.
Repeat PT q 6 (six) hours for 24 hours or until INR ≤ 1.4

CONSIDER
Use of retrievable IVC in patients w/ hx of DVT, PE, coagulopathies, valve replacement


Society of Trauma Nurses
Platelet Inhibitor Reversal Pathway
History of Platelet Inhibitor use.
Head injury with evidence of significant intracranial bleeding*
*Consider in other life-threatening bleeding emergencies.
NO
YES
Patient stable for discharge (GCS 15, no LOC, no significant injury to head, face or neck)
2 units platelet transfusion
Consult Neurosurgery
Consider
DDAVP 0.3 ug/kg
rFVIIa 30-90 ug/kg
Consider platelet aggregometry
YES
NO
Discharge with instructions and follow-up as indicated
Admit to Trauma Service
Repeat Head CT in 4-6 hours or with any signs/symptoms of increasing intracranial pressure.
PT q 6 (six) hours for 24 hours or as needed. (Plavix will not affect PT)
Repeat Head CT in 4-6 hours or with any signs/symptoms of increasing intracranial pressure.
PT q 6 (six) hours for 24 hours or as needed. (Plavix will not affect PT)
YES
Head CT evidence of intracranial bleeding
Discharge with instructions and follow-up as indicated
NO
CAUTION
Hyponatremia, seizures, and elevated ICP with DDAVP

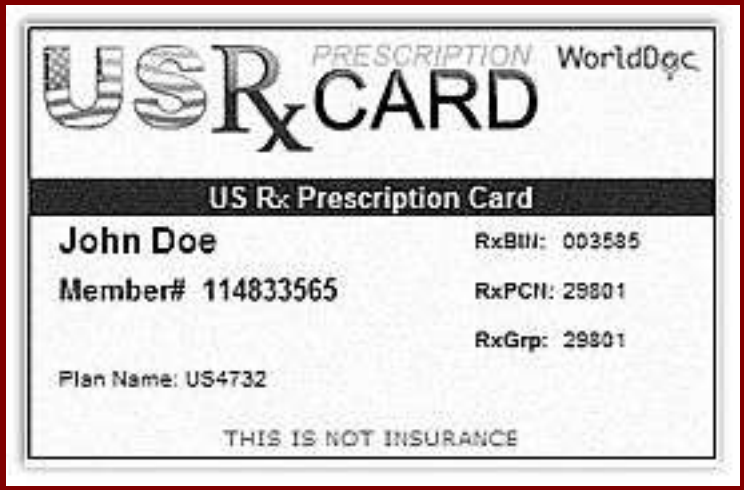
Issues and Concerns

- Follow-up
  - is there a clinic near by
  - do they have health insurance
  - do they have a doctor
  - will they participate in follow-up



Issues and Concerns

- Medications
  - Will they fill the prescriptions
  - Will they take the medication
  - Can they pay for the medications



Issues and Concerns

- Laboratory testing
  - Is there a convenient location
  - Are the hours convenient
  - Do they have health insurance to pay for it
  - Will they go have the lab work done

Issues and Concerns

- Potential for injury
  - trauma can happen at any time and any place
- Even when exercising care, taking precautions, etc – things can happen

Issues and Concerns

- Potential for complications –
  - Co-morbidities need to be addressed when someone is anti-coagulated
  - Polypharmacy (these are not benign drugs)
  - Geriatric team and specialists

Stopping the Anticoagulant

- Why were they on it
- What caused the trauma (syncope, clot, etc)
- How long do you think that they will need to be off of it
- How safe and effective is the alternative

Complication Specifics

- The risks and benefits of anticoagulant use must be reevaluated once a traumatic intracranial hemorrhage occurs.
  - Those on anticoagulants for atrial fibrillation, rate of a thrombolic event is 1 in 1300 as compared to 1 in 2 risk of death following an intracranial hemorrhage.
- What do you do when they throw clots
  - IVC, recoagulate, nothing

Restarting the Anticoagulant

- Needs to be in a monitored setting
- Does the team agree with the plan?
- What is the worst that could happen?
- Are we prepared for the worst?

Restarting Issues

- Consider the potential morbidity and mortality of anticoagulation reversal if it is decided to not reanti-coagulate or initiate an alternative therapy within 24 hours.
- Anticoagulation should not be reinitiated in a pt with an ICH until it is deemed appropriate by a NS.
- Typically, ASA and Plavix can be restarted sooner than warfarin, but the plan needs to be initiated in consultation with a NS.

Redosing Issues

- Too much
- Too little
- Interaction with other medications, herbal and nutritional supplements drugs which can increase or decrease their strength

Nursing and Medical Assessments and Interventions

- Assessments
  - neuro, CV, body systems, etc
  - safe to be OOB, ambulating
  - safe to be making decisions
  - safe to go home

Nursing and Medical Assessments and Interventions

- Interventions – safety alarms, restraints, padded side rails
- Reduce bruising and edema
- Comfort measures including pain control
- PT/OT
- DVT precautions
- Resp tx for cough and deep breathing
- Special mattresses, skin care

Nursing and Medical Assessments and Interventions

- Diagnostic studies – repeat CT scans
- Laboratory Studies
  - Electrolytes
  - Magnesium
  - Calcium
  - Cardiac isoenzymes
- Other
  - 12-lead EKG

Renal Issues

- Impaired ability to concentrate urine
- Decreased glomerular filtration rate
- Slight increases in blood urea nitrogen and creatinine expected; changes considered when using contrast media and certain drugs
- Monitor renal functions and CT scans and drugs

Nursing and Medical Assessments and Interventions

- End-of-life decisions
- Guidelines for making treatment decisions
  - Patient's right to self-determination
  - Patient's best interest
  - Benefits of treatment outweigh adverse outcomes

Nursing and Medical Assessments and Interventions

- Specific directions for withholding or withdrawing treatments
- Advanced directives
  - Do they have one?
  - Is it with them?
  - Does the family know their wishes?
  - Is their a medical decision maker who can deal with a fluid and dynamic process?

Nursing and Medical Assessments and Interventions

- Long and short term goals:
  - Do they need rehab?
  - Can they get rehab?
  - Can they go home?
  - Is their a family member who can deal with a fluid and dynamic process?

Outcome Criteria

- For minor injury and an ISS < 9, the mortality for 65 years and older is increased
- For moderate injury and an ISS 9-24, the mortality for 45 years and older is increased

Outcome Criteria

- Markers for poor prognosis at admission:
  - Age > 75
  - GCS of 7 or less
  - Presence of shock on admission
  - Severe head injury
  - On anticoagulants
  - Development of Sepsis

Prevention

- Wear a Medic Alert bracelet
- Tape your name and emergency contact info inside your phone, helmet, wallet, etc
- Be safe and utilize appropriate precautions

Prevention

- **Rugs**
  - Use nonskid tape or backing on throw rugs
  - Tack down all carpet edges
- **Stairs**
  - Need good lighting
  - Solid easy to grasp handrail that is rounded or knobbed at the end
  - Consider painting or taping the top and bottom steps so they are easily noticed
  - Don’t rush when climbing up or down stairs
- **Bathroom**
  - Be sure mats are non-skid and there are treads in the tub and shower to prevent slips
  - “Grab bars” should be in the tub area and next to the toilet if possible
- **Traffic Lanes**
  - Clear walkways thru every room
  - Don’t use doorway, hall or stairs for storage

Prevention

- Floors
  - Do not walk on freshly washed or waxed floors.
  - Wipe up any spills immediately
  - Avoid wearing only socks, smooth soled shoes or slippers on uncarpeted floors
- Outdoors
  - Keep stairs, porches, and walkways free of wet leaves, snow and ice
  - Be sure stairs and walkways are in good repair. Use a handrail on stairs.

Prevention

- Carrying Objects
  - Make sure your view isn't blocked
  - Get a firm grip. Lift with your legs (knees bent, back straight) and walk slowly
  - Get help for heavy or awkward objects
- Reaching High Places
  - Use a solid step stool or ladder, not a chair or box
  - Avoid using the highest step on a ladder
  - Get help if you need it

Prevention

- Use crosswalks or cross at corners
- Wait for the signal and cross with the light and give yourself enough time to cross
- Always look both ways
- Carry a flashlight at night
- Always wear a seatbelt, helmet and other safety equipment
- If no sidewalk, walk facing traffic so you can see it coming toward you
- **Buses**
  - Take you time getting on and off
  - Brace yourself whenever it starts or slows down
  - Have your fare ready so you are not standing when the bus begins to move
  - Keep one hand free to hold the railings and brace yourself.

Everyone deserves to have a healthy Grandma and Grandpa to love them!

Questions????

References

- US Census Bureau. Available at: http://www.census.gov/. Accessed January 2011.
- *Daithi S. et al.* (*J Trauma.* 2010;69: 813–820)
- *Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS).http://www.cdc.gov/injury/wisqars/index.html. Published December 2011. Accessed January 2012.*

References

- Current population reports. Population Projections of the United States by Age, Sex, Race, and Hispanic Origin: 1995 to 2050. P25-1130. US Census Bureau. http://www.census.gov/prod/1/pop/p25-1130.pdf. Accessed March 15, 2010.
- Czosnyka M, Balestreri M, Steiner L, et al. Age, intracranial pressure, autoregulation, and outcome after brain trauma. J Neurosurg 2005; 102(3):450-454.
- Susman M, DiRusso SM, Sullivan T, et al. Traumatic brain injury in the elderly: Increased mortality and worse functional outcome at discharge despite lower injury severity. J Trauma 2002; 53(2):219-224.
- Vincent JL, Berre J. Primer on medical management of severe brain injury. Crit Care Med 2005; 33(6):1392-1399.

References

- Itshayek E, Rosenthal G, Fairfield S, et al. Delayed posttraumatic acute subdural hematoma in elderly patients on anticoagulation. Neurosurgery 2006; 58(5):E851-E856.
- Traumatic Brain Injury: Hope Through Research," NINDS. February 2002. NIH Publication No. 02-2478
- Delayed Posttraumatic Acute Subdural Hematoma in Elderly Patients on Anticoagulation. Neurosurgery 58:851-856, 2006
- Jacobs, David G., Plaisier Brian Ray et al. EAST Practice Management Guideline for Geriatric Trauma, Eastern Association for the Surgery of Trauma, 2001.
- Guidelines for Field Triage of Injured Patients Recommendations of the National Expert Panel on Field Triage, January 23, 2009 / 58(RR01);1-35