PREVENTING TBI IN THE ELDERLY

University Malaya, November 23rd, 2017

Anne Felicia Ambrose MD, MS
Vice Chair of Education, AECOM
Residency Program Director,
Co-Director, TBI Program
Burke Rehabilitation Hospital
New York

Definition-TBI

A. A traumatically induced physiologic disruption of brain function

B. Associated with any of the following.

1. Any period of loss of consciousness

2. Any loss of memory of the event immediately before or after the accident, with posttraumatic amnesia

3. Any alteration in mental state at the time of the accident (e. g, feeling dazed, disoriented, or confused).

4. Focal neurological symptoms

ACRM, 2010

Severity of traumatic brain injury

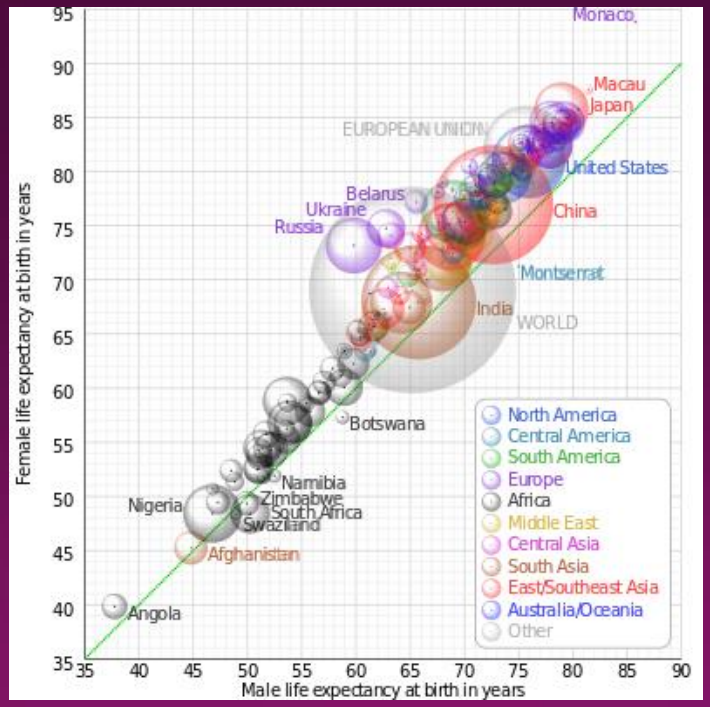
	GCS	PTA	LOC
Mild	13–15	< 1 day	0–30 minutes
Moderate	9–12	>1 to <7 days	> 30 min to < 24 hours
Severe	3–8	>7 days	> 24 hours

Defining elderly

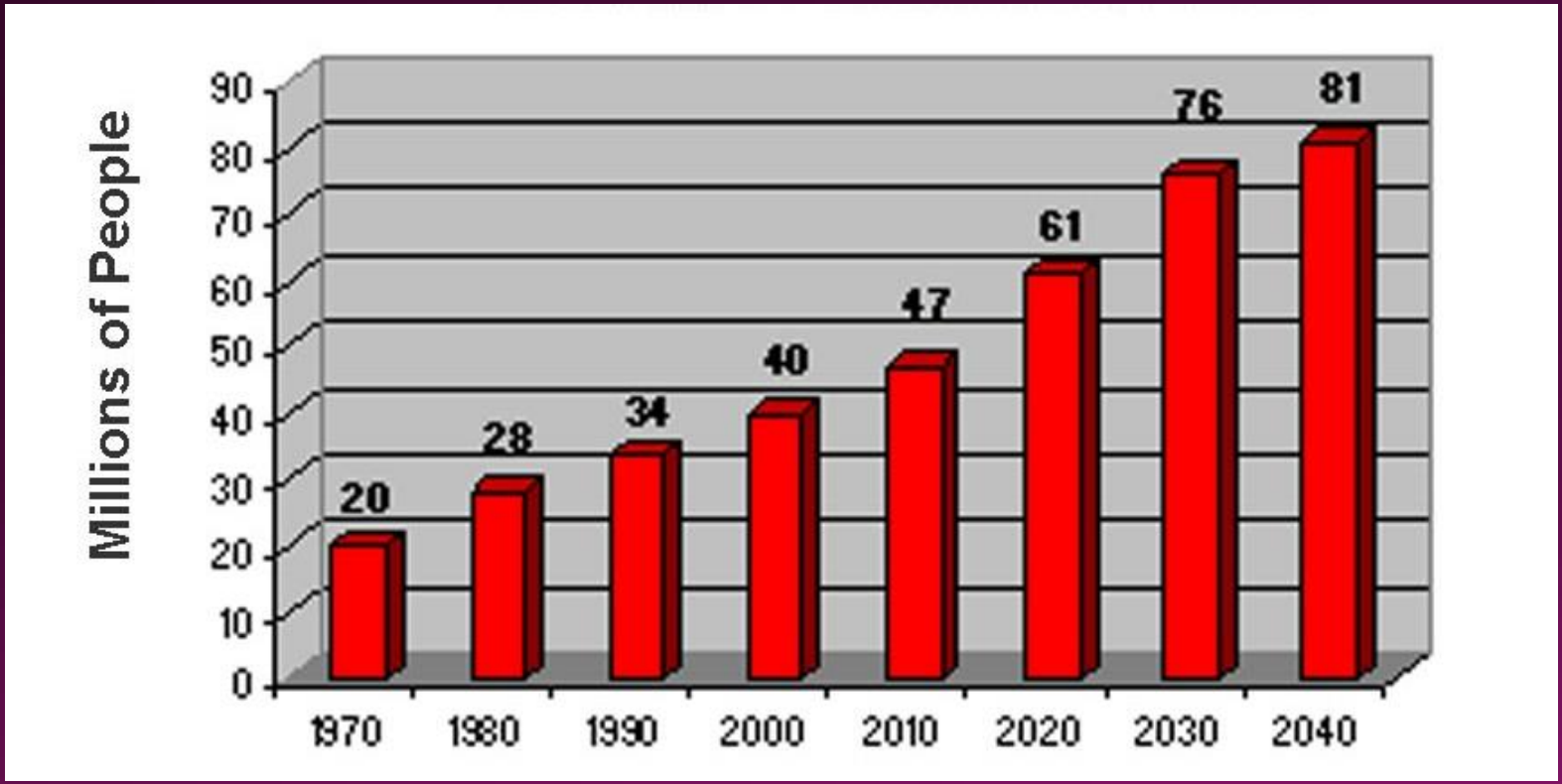
- Bismarck's definition
  - age 70-(1889)
  - decreased to age 65 (1916)

Otto Van Bismark

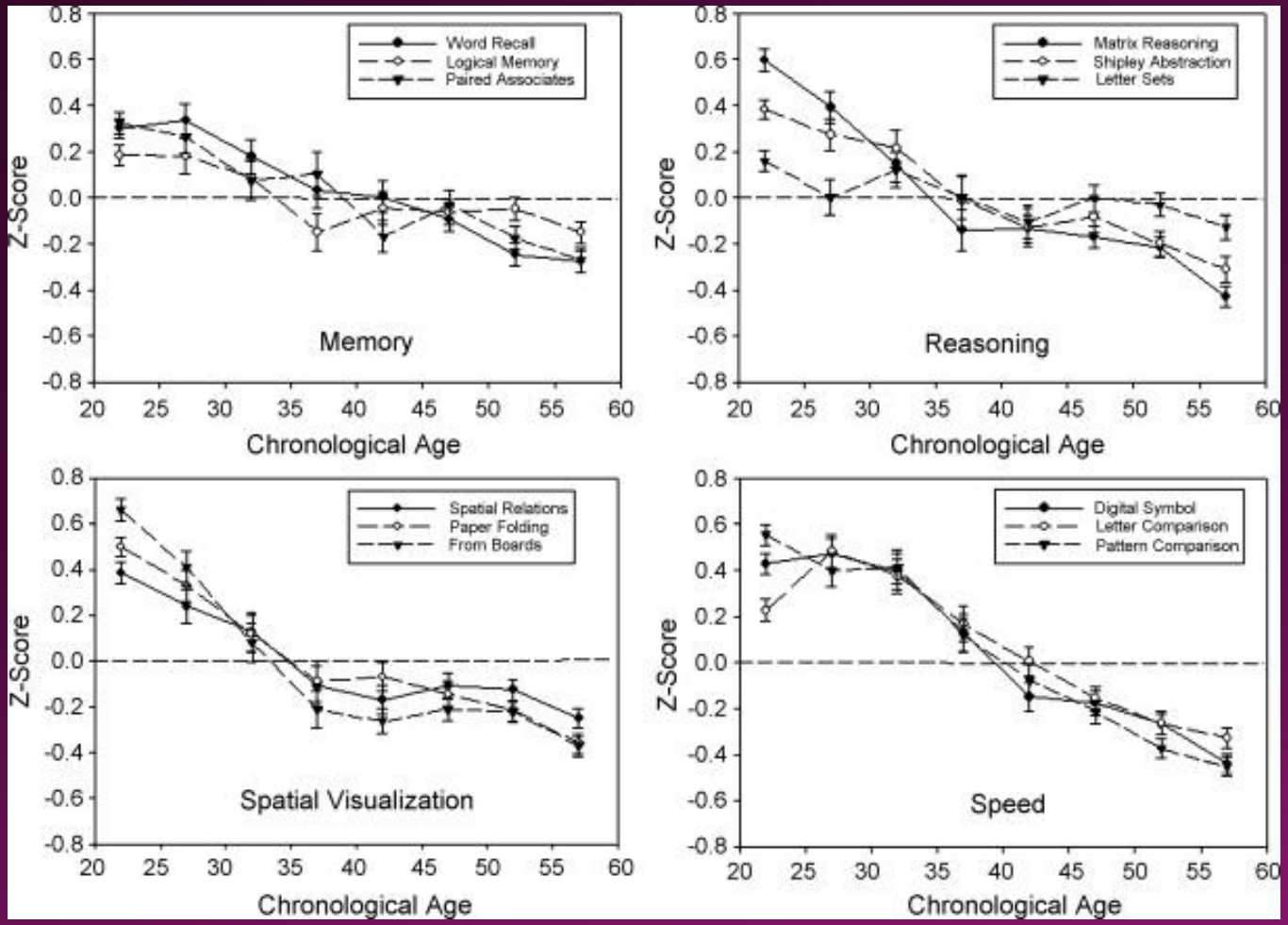
Prussian Life expectancy	Men	women
1889	35.6 years	38.4 years
2009	75.9 years	81.5 years



Medicare Projections

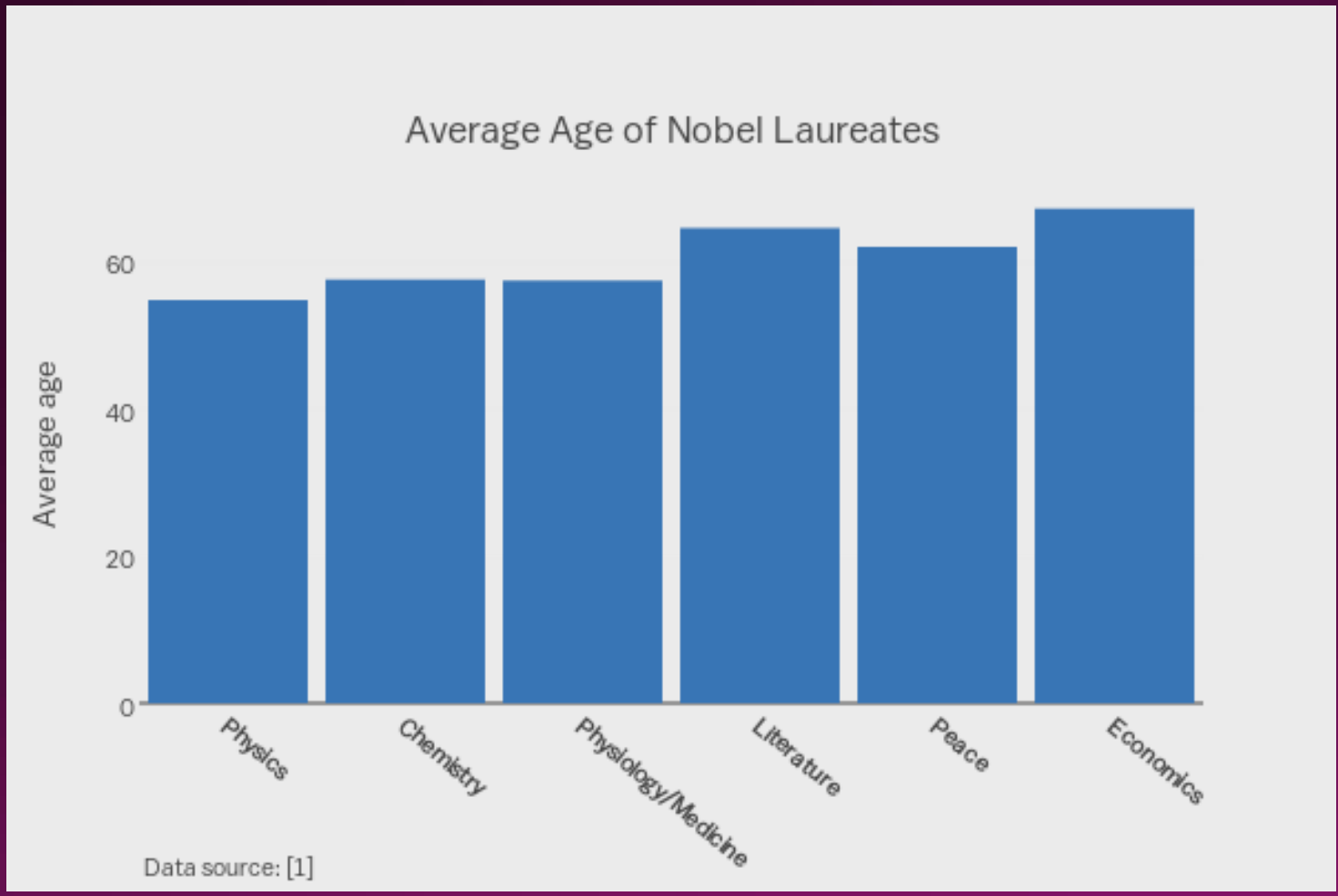


Normal cognitive aging



Salthous, NeurobiolAging,2009

Age of Nobel Prize winners (1900-2000)



Traumatic Brain Injury

Epidemiology

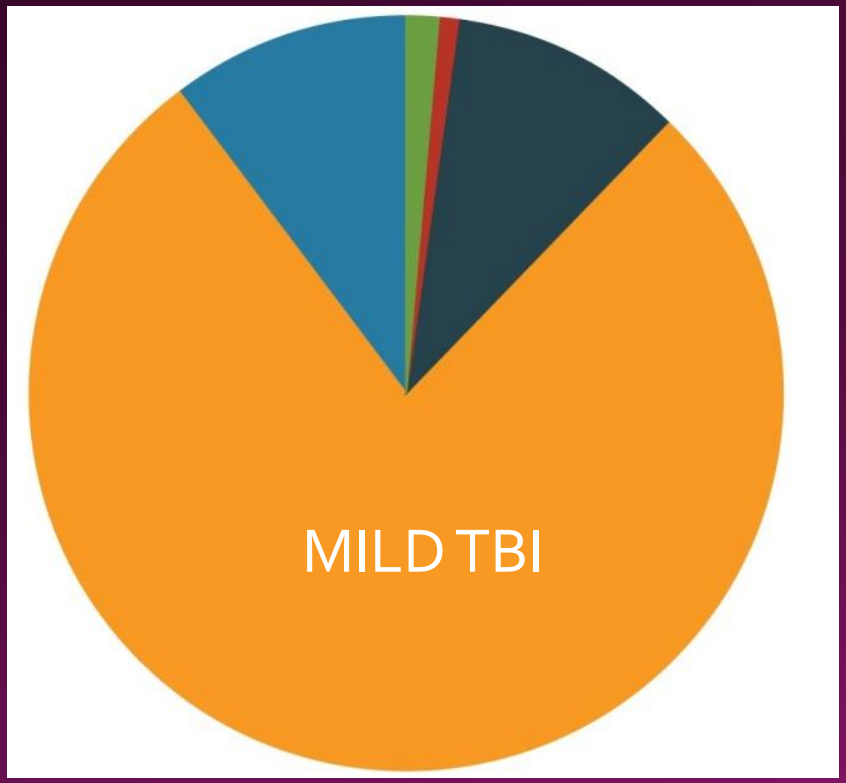
INCIDENCE

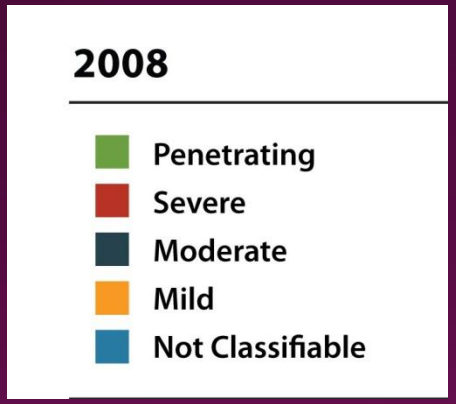
- Global incidence rate of TBI -WHO estimates
  - Estimated at 200 per 100 000 population/ year
  - Estimated deaths – 1.2 million
  - 70 percent fatalities (850,000) < 45 years of age

- Malaysia (2007)
  - 114,000 admitted to 5 Major ED
  - Male -84.6%
  - Age- Majority young 15-24 (34.5%) and 25-34 (21.3%).
  - Race- Malays 51.8% ,11%-foreigners.
- Road/street and highway trauma -76%
- Intracranial injuries - 45% of all traumatic brain injuries. Traumatic SDH -28.3%.
  - NATIONAL TRAUMA DATABASE JANUARY TO DECEMBER 2007

Is TBI in the elderly a problem?

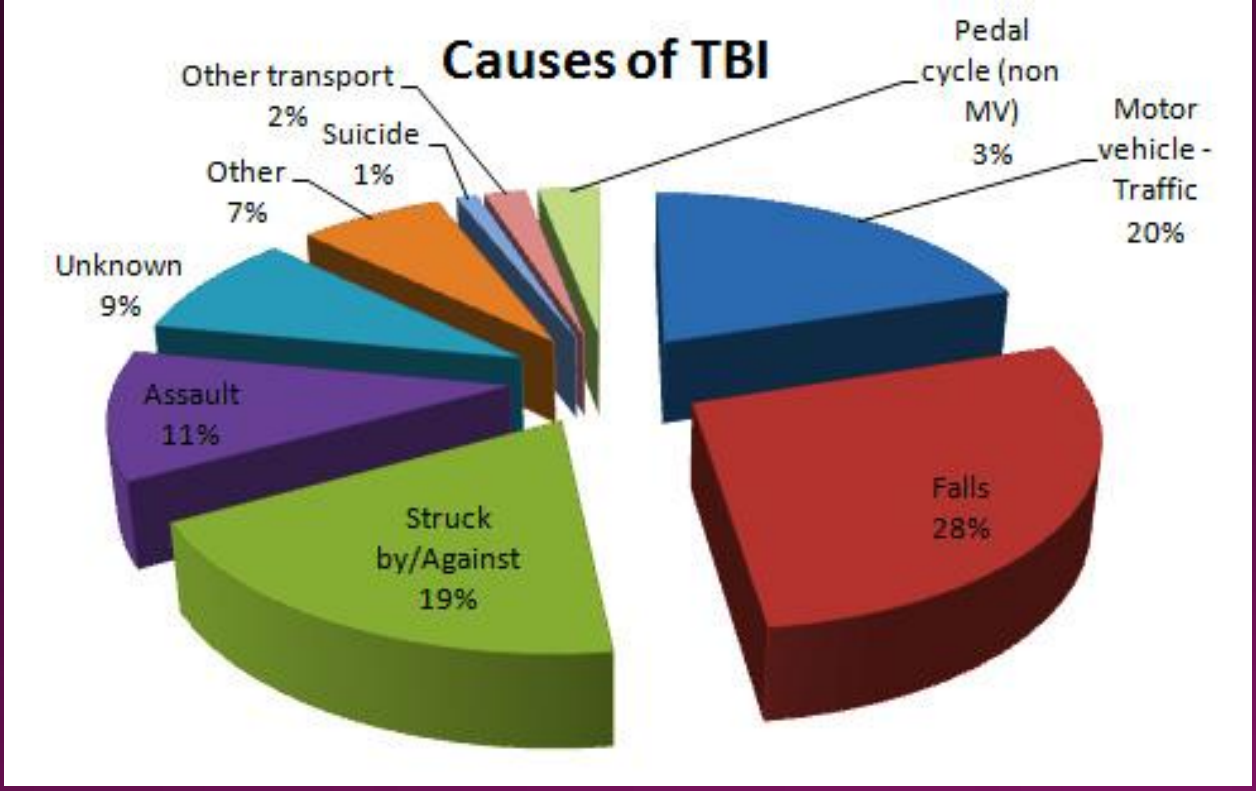
Epidemiology



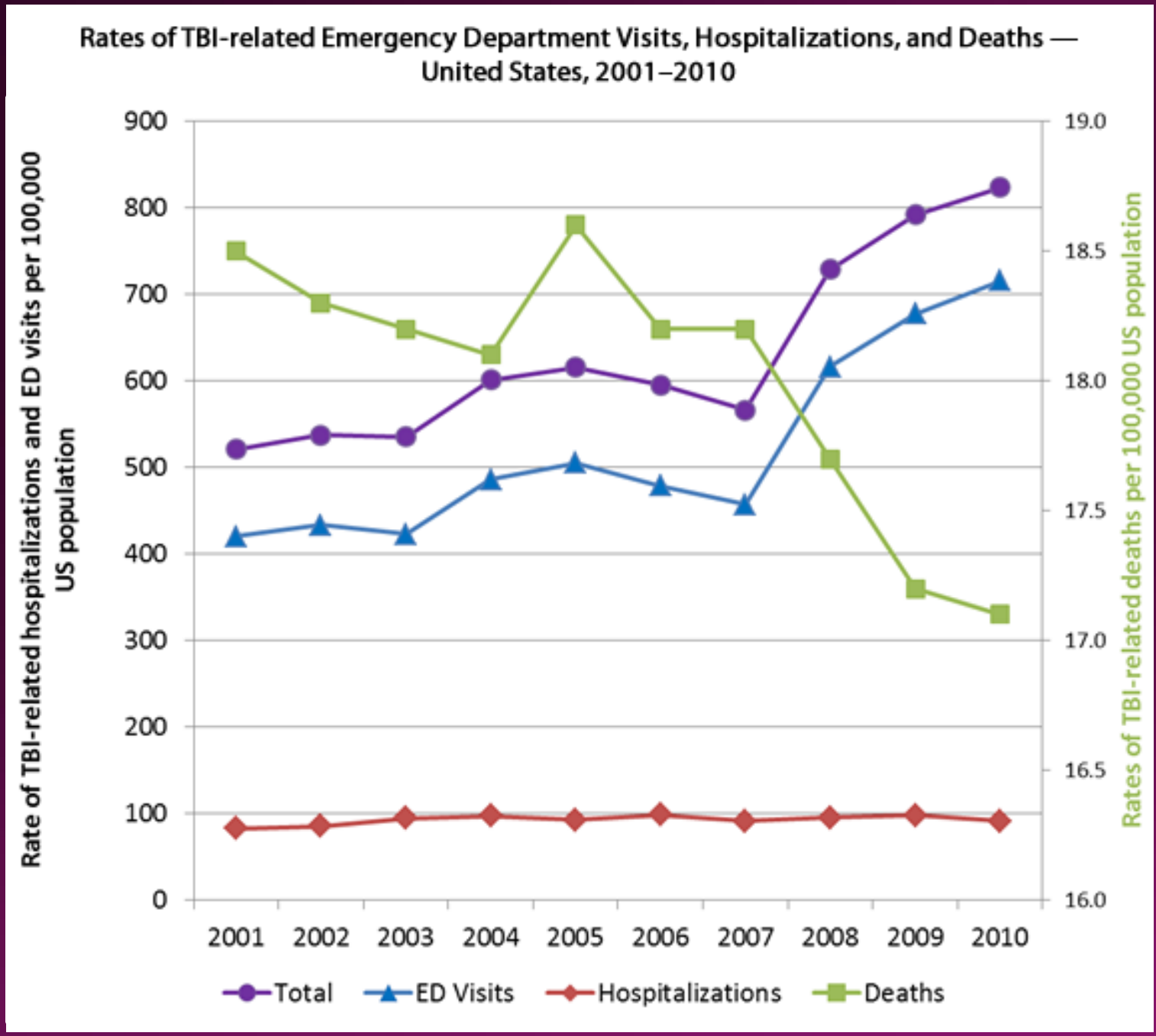


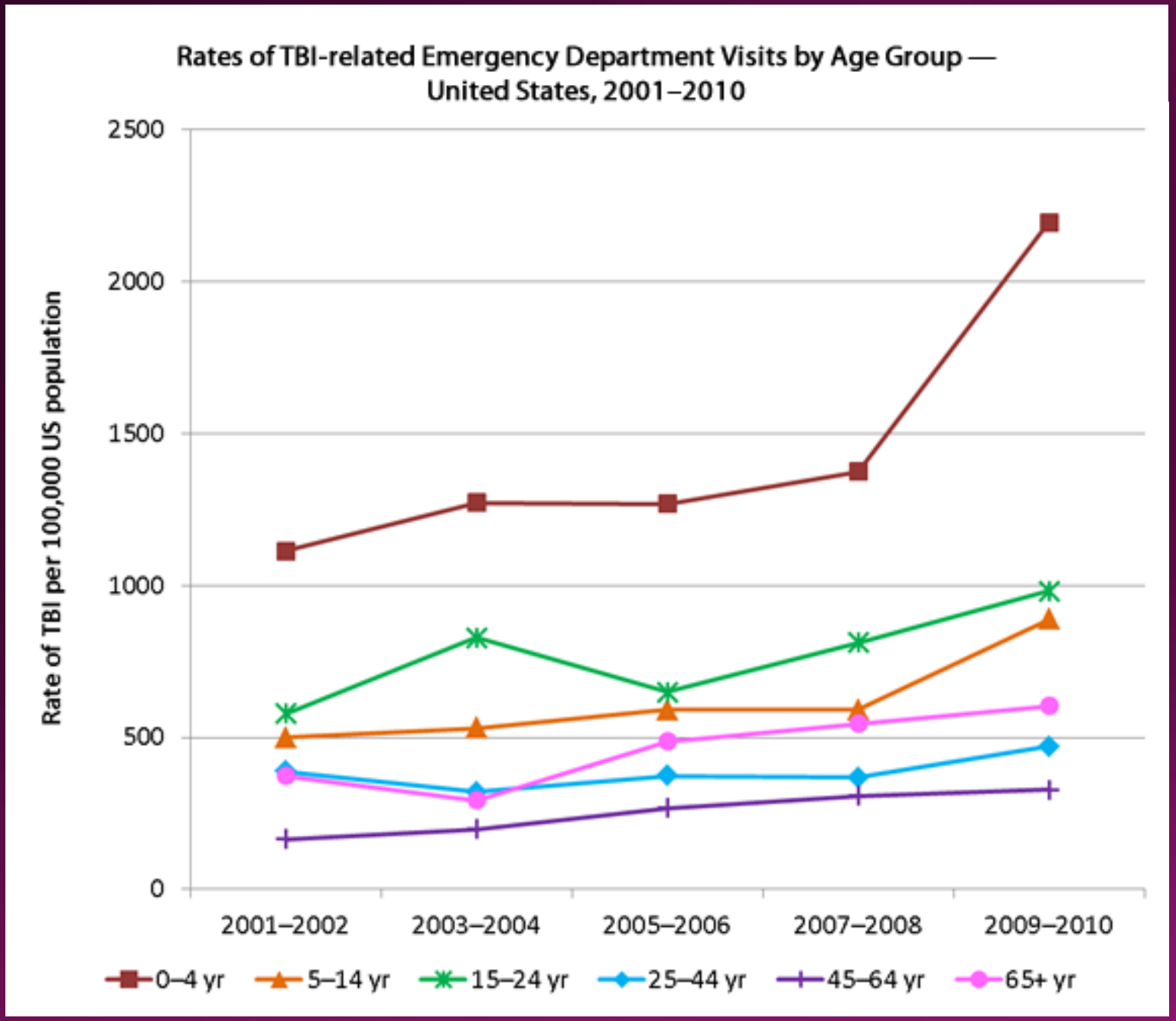
DOD 2011

Epidemiology-all ages

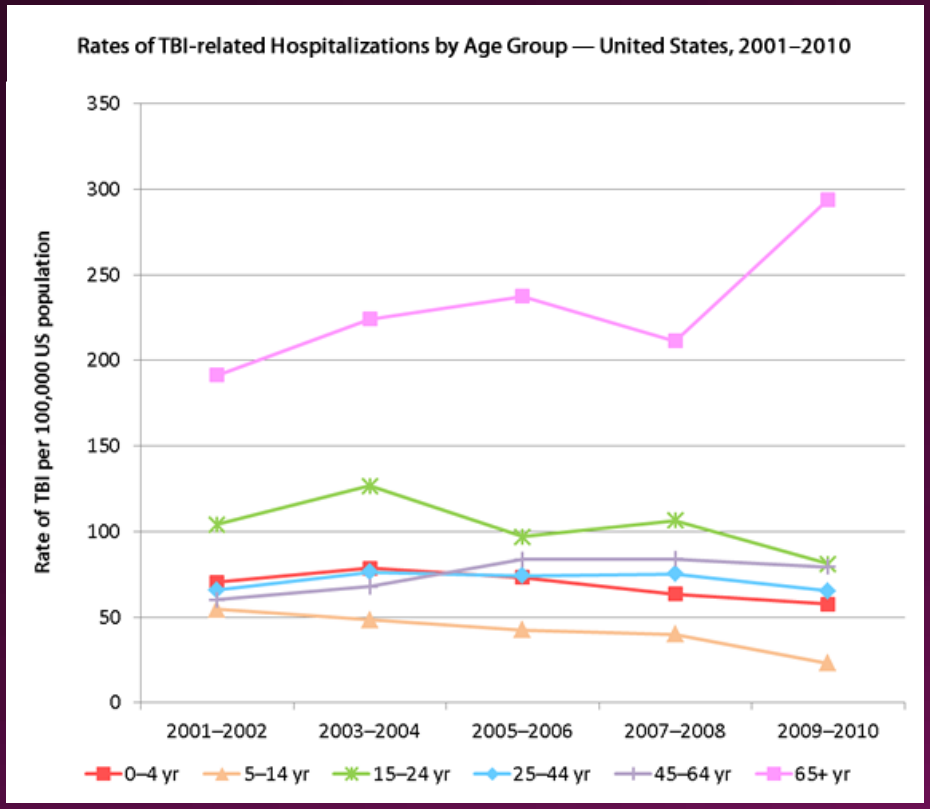


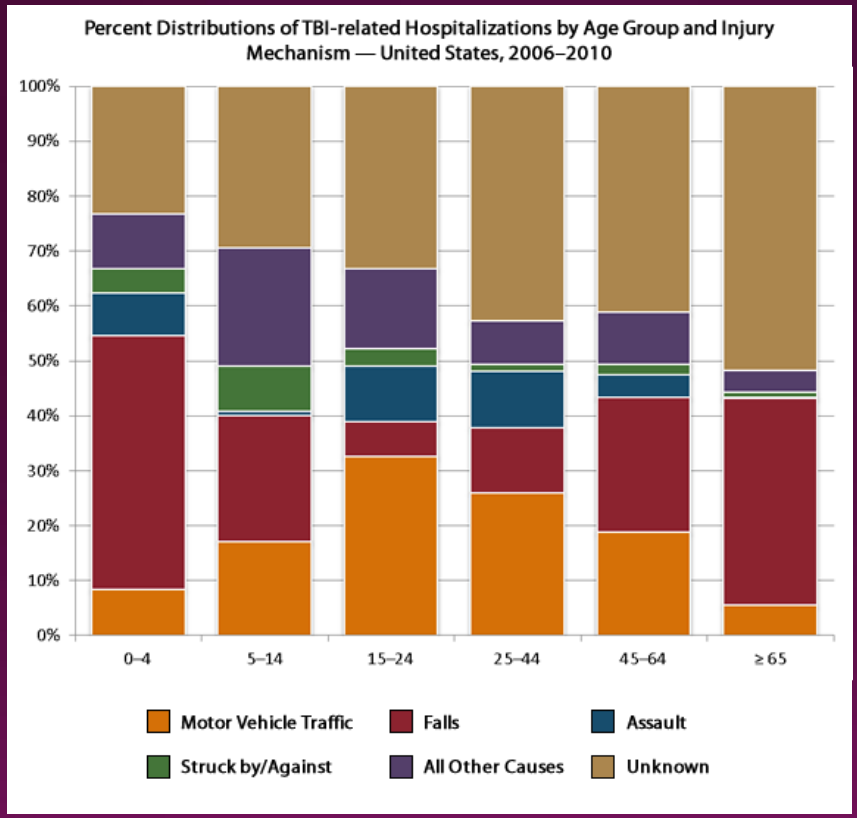
CDC 2006


Rates of TBI-related Emergency Department Visits, Hospitalizations, and Deaths — United States, 2001–2010
Rate of TBI-related hospitalizations and ED visits per 100,000 US population
Rates of TBI-related deaths per 100,000 US population
900
800
700
600
500
400
300
200
100
0
19.0
18.5
18.0
17.5
17.0
16.5
16.0
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Total
ED Visits
Hospitalizations
Deaths


Rates of TBI-related Emergency Department Visits by Age Group — United States, 2001–2010
Rate of TBI per 100,000 US population
2500
2000
1500
1000
500
0
2001–2002
2003–2004
2005–2006
2007–2008
2009–2010
0–4 yr
5–14 yr
15–24 yr
25–44 yr
45–64 yr
65+ yr

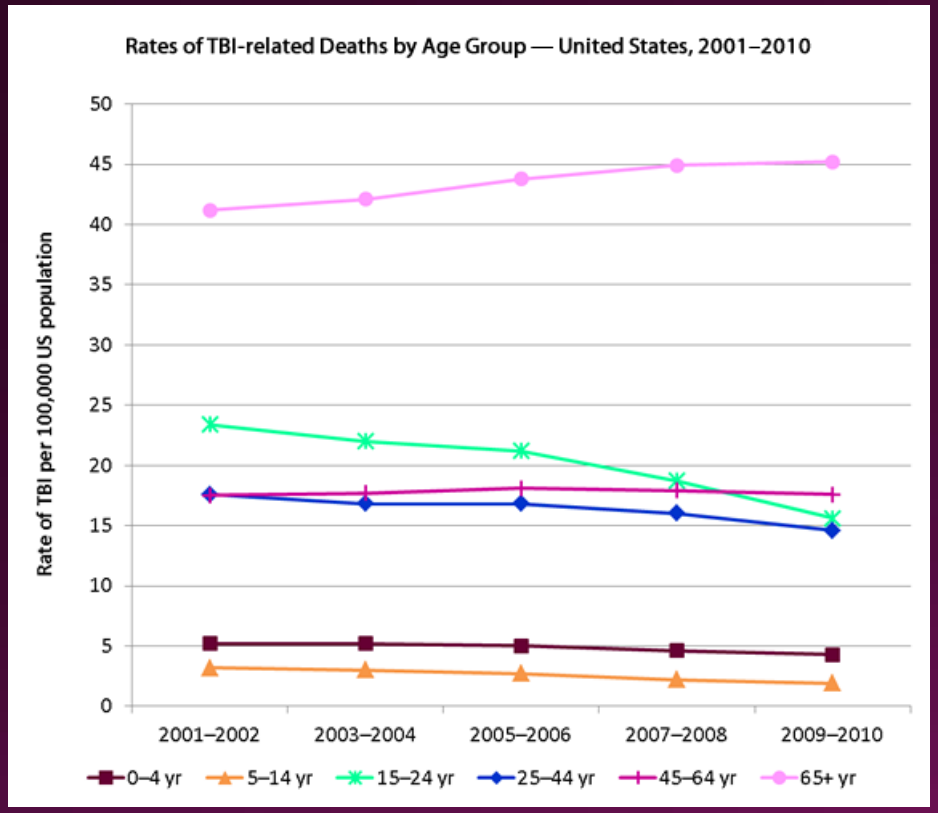
TBI- Hospitalization

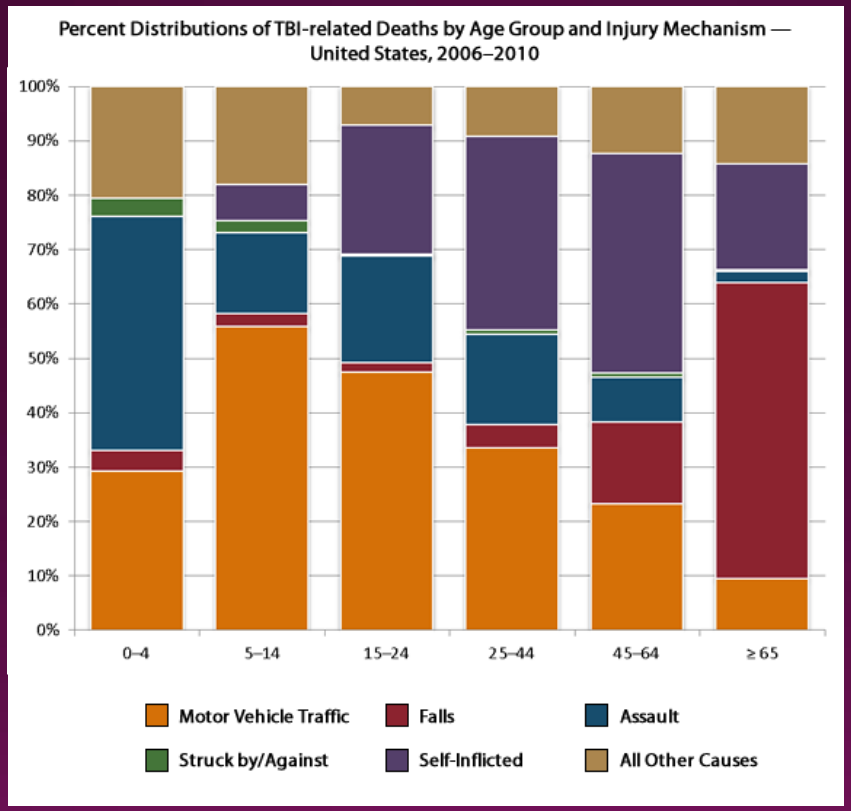




- Falls are the leading cause of TBI, accounting for 40% of all TBIs in the United States that resulted in an ED visit, hospitalization, or death.
- More than two-thirds (81%) of TBIs in adults aged 65 and older are caused by falls.

TBI – Deaths

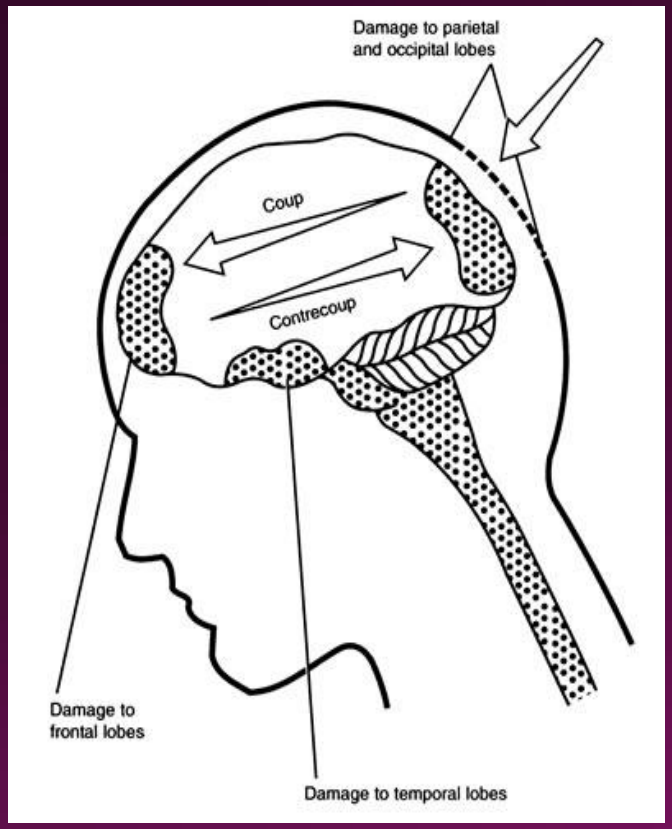




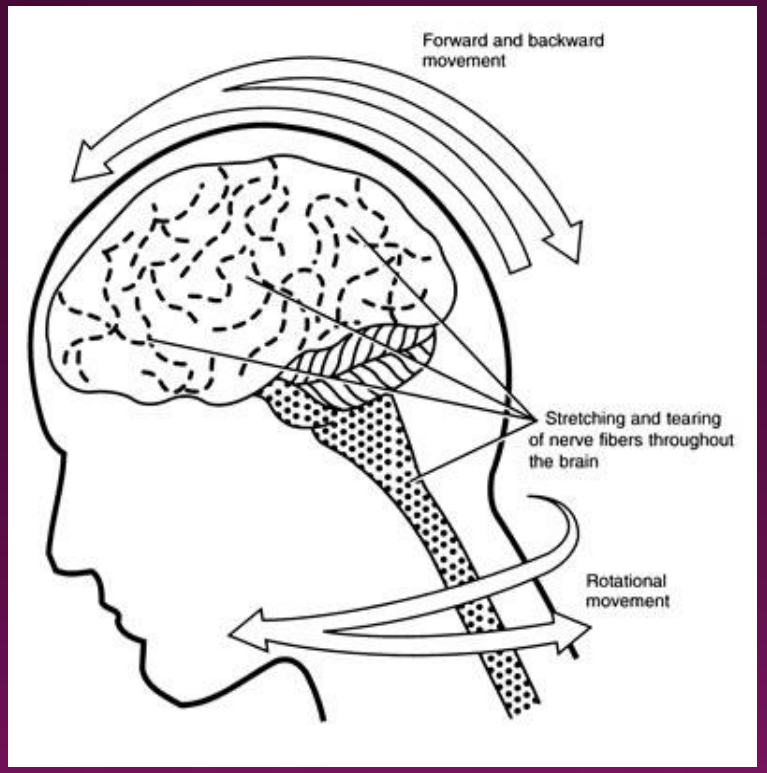
- Falls were the leading cause of death for persons 65 years or older.
- Men were nearly three times as likely to die as women.

PATHOPHYSIOLOGY

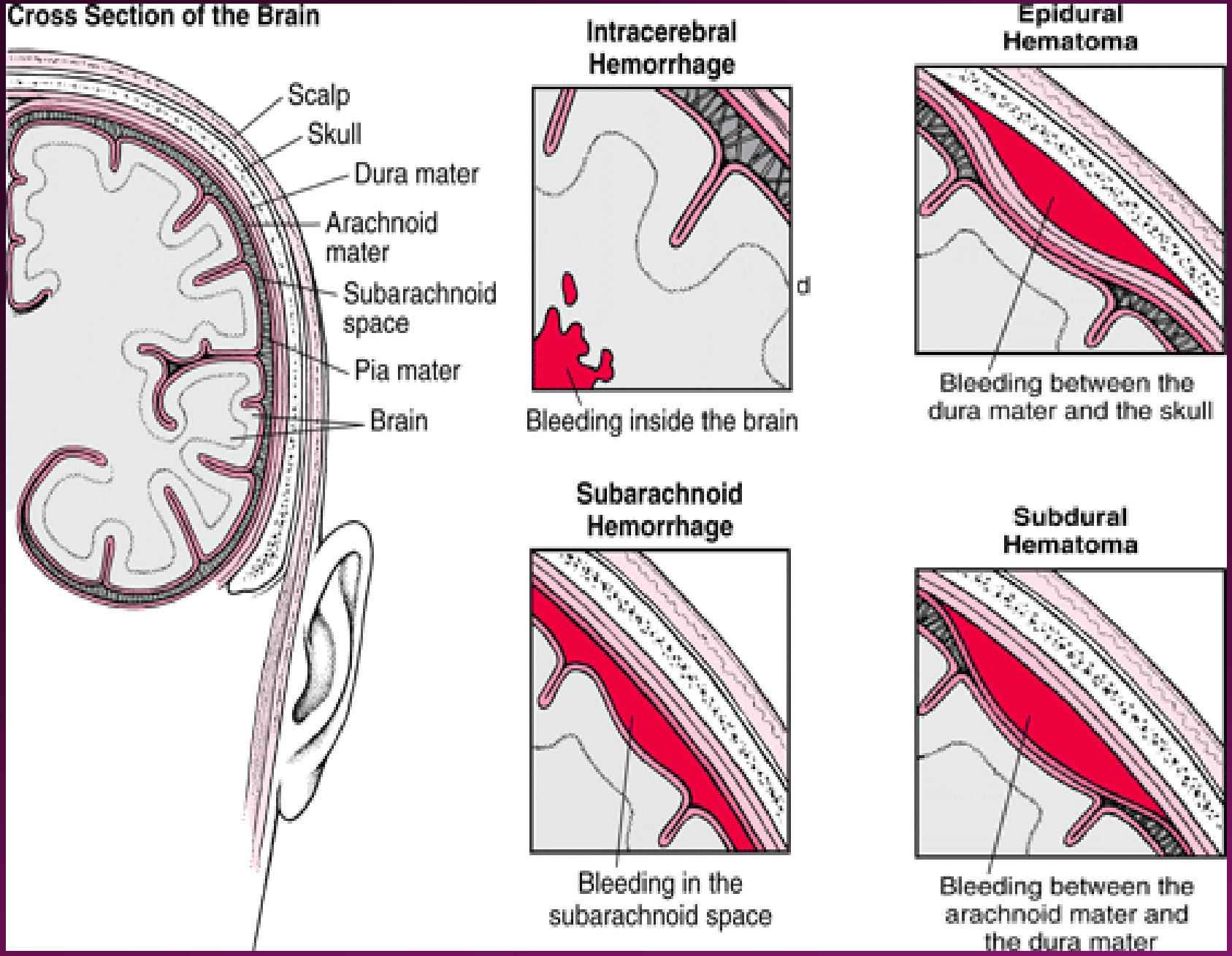
Mechanisms of Injury



Acceleration-deceleration

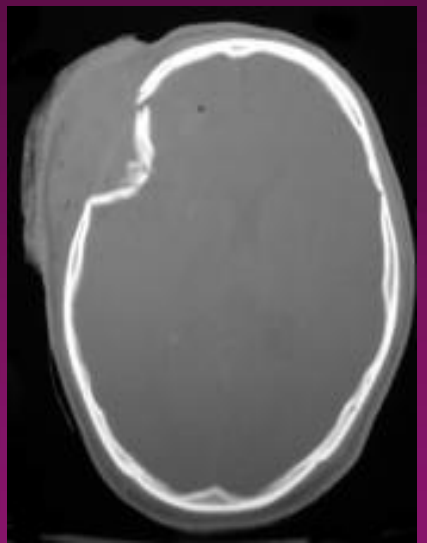


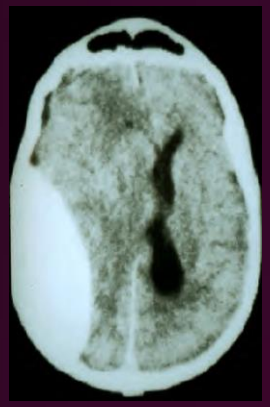
rotational


Cross Section of the Brain
Scalp
Skull
Dura mater
Arachnoid mater
Subarachnoid space
Pia mater
Brain
Intracerebral Hemorrhage
Bleeding inside the brain
Epidural Hematoma
Bleeding between the dura mater and the skull
Subarachnoid Hemorrhage
Bleeding in the subarachnoid space
Subdural Hematoma
Bleeding between the arachnoid mater and the dura mater

Skull Fracture

- Associated with more severe head injury, increased mortality and morbidity, Seizures
- May be associated with facial or mandibular fractures, , may have rhinorrhea or otorrhea secondary to CSF leak.
- Increased risk of seizures and intracranial hematoma.





Epidural hematoma (EDH)

- Lucid interval
- Associated skull fracture (squamous part of temporal bone)
- Most commonly arterial (middle meningeal artery)
- Enlarges fairly rapidly ,causing mass effect
- Appears biconvex on CT scan
- Even with appropriate care, 15 – 20% will die.

Subdural Hematomas

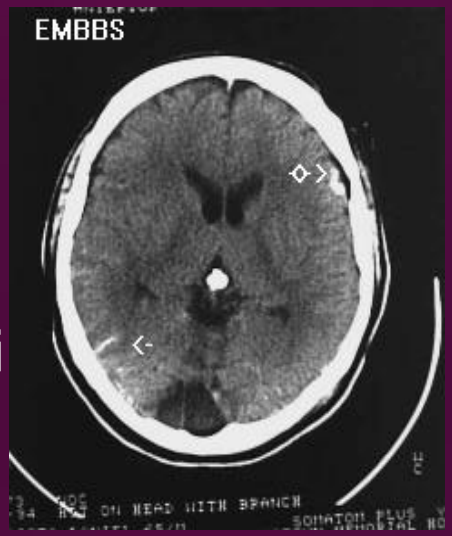
- **Mortality** -50-85%, especially elderly
  Acute – symptoms < 24hours. 50% – 80% mortality rate.
  Sub-acute – symptoms from 2-10 days. 25% mortality rate.
  Chronic – symptoms after 2 weeks. 20% mortality rate.

- Most often caused by rupture of veins that bridge the subdural space due to sudden change in velocity of the head

- Can be seen in elderly with "minor" trauma
  Brain atrophy; tension on bridging veins
  Anticoagulants More common in alcoholics, fallers

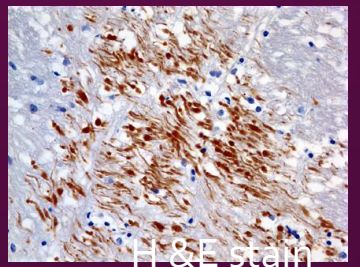
- **Crescent-shaped, hyperdense, extra-axial collection spreading diffusely over one hemisphere and can extend along the falx and tentorium**

Subarachnoid Hemorrhage



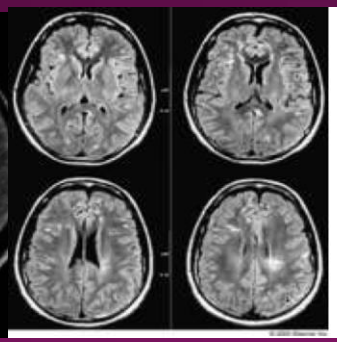
- Seen to a degree in most serious TBI brai
- Increased risk of NPH
- Prognosis is grim, with mortality and permanent disability a common result of subarachnoid hemorrhage.
- About 35 percent of patients die from the first subarachnoid hemorrhage

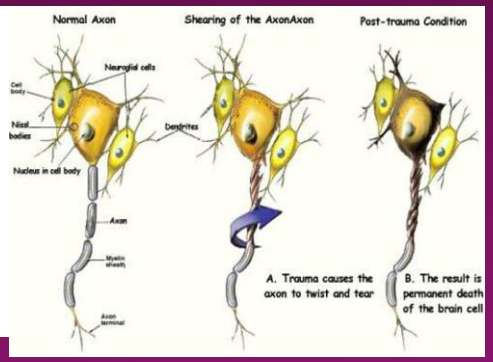
Diffuse Axonal Injury



- Axonal Shearing
- Distribution
  - Cerebral hemispheric gray-white matter interface and subcortical white matter,
  - body and splenium of corpus callosum,
  - basal ganglia,
  - dorsolateral aspect of brainstem,
  - cerebellum.
- Serum marker-S-100B, Neuron specific enolase (NSE)

MRI-flair





Pathophysiologic differences between young and elderly

Young	Elderly
• Diffuse=Focal • Brain volume increases to maximum bet 18-35, then reduces by 0.2-0.5%/yr • Vessels are pliable • EDH, associated with temporal bone fractures	• Focal > Diffuse • Brain Vol decreases by 6-11% after >65yrs • Increased Sub-dural space, • Increased mobily→ contracoup inj • Increased fragility of the vascular wall structure bridging veins adhere to the dura mater or to the brain surface firmly, resulting in subdural hematomas cause intracerebral hematomas in the elderly. • Epidural hematomas rarely occur in the elderly, since the dura mater adheres inner surface of the cranium.

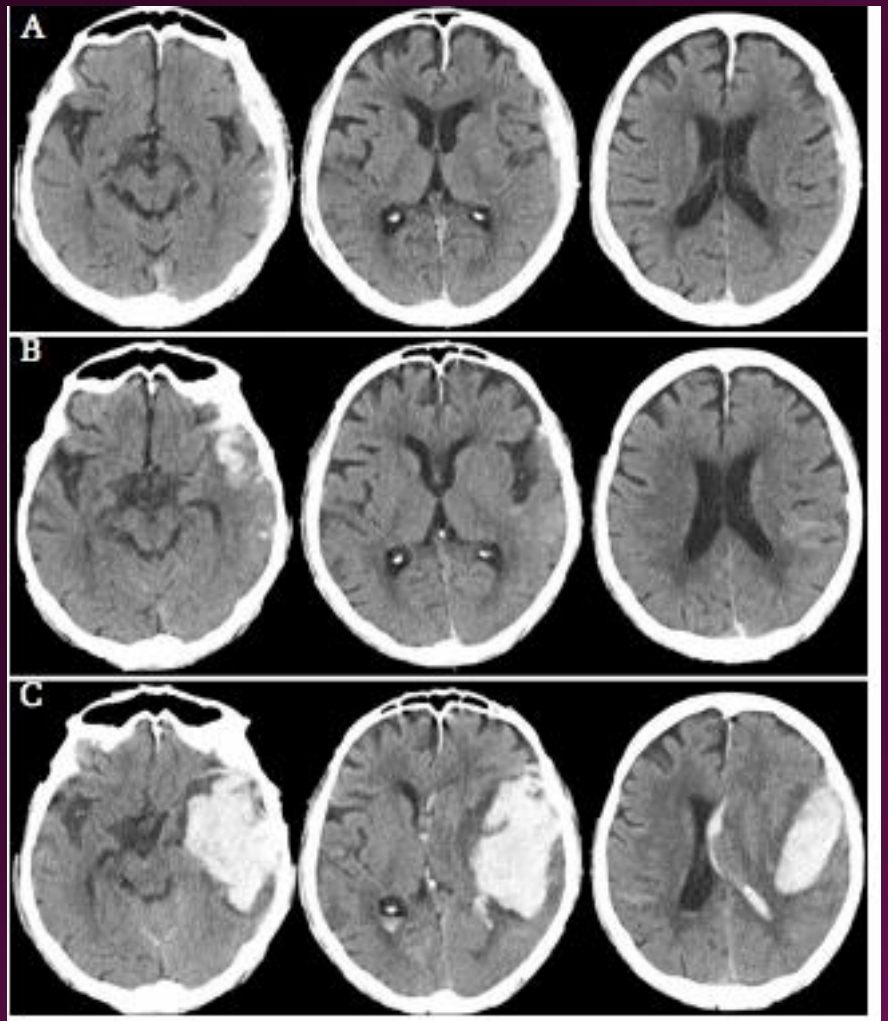


Fig. 4 Delayed expansion of traumatic intracerebral hematoma. Note: (A) Only a thin ASDH was evident on CT at 1 hour after trauma. (B) A small contusional hematoma appeared at 24 hours after trauma, although the initial ASDH was mostly washed out. (C) The contusional hematoma was fused and enlarged at 48 hours after trauma.

Delayed deterioration

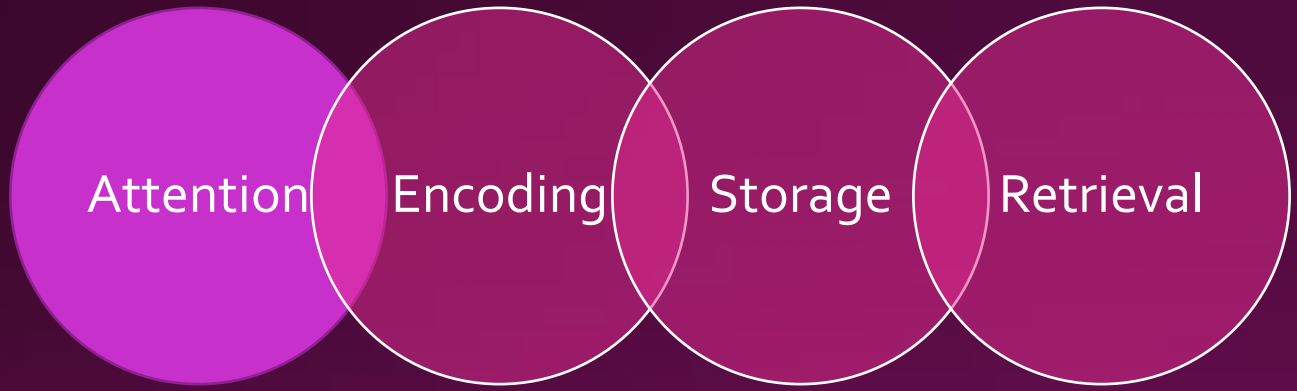
Traumatic Brain Injury

Clinical Manifestations

Post Concussive Symptoms

Physical	Cognitive	Emotional
Headache	Slowed processing	Anxiety
Dizziness	Decreased attention	Depression
Balance problems	Poor Concentration	Irritability
Nausea/Vomiting	Memory Problems	Mood lability
Fatigue	Verbal dysfluency	
Visual disturbances	Word-finding	
Sensitivity to light/noise	Abstract reasoning	
Ringing in the ears		

Process of Memory



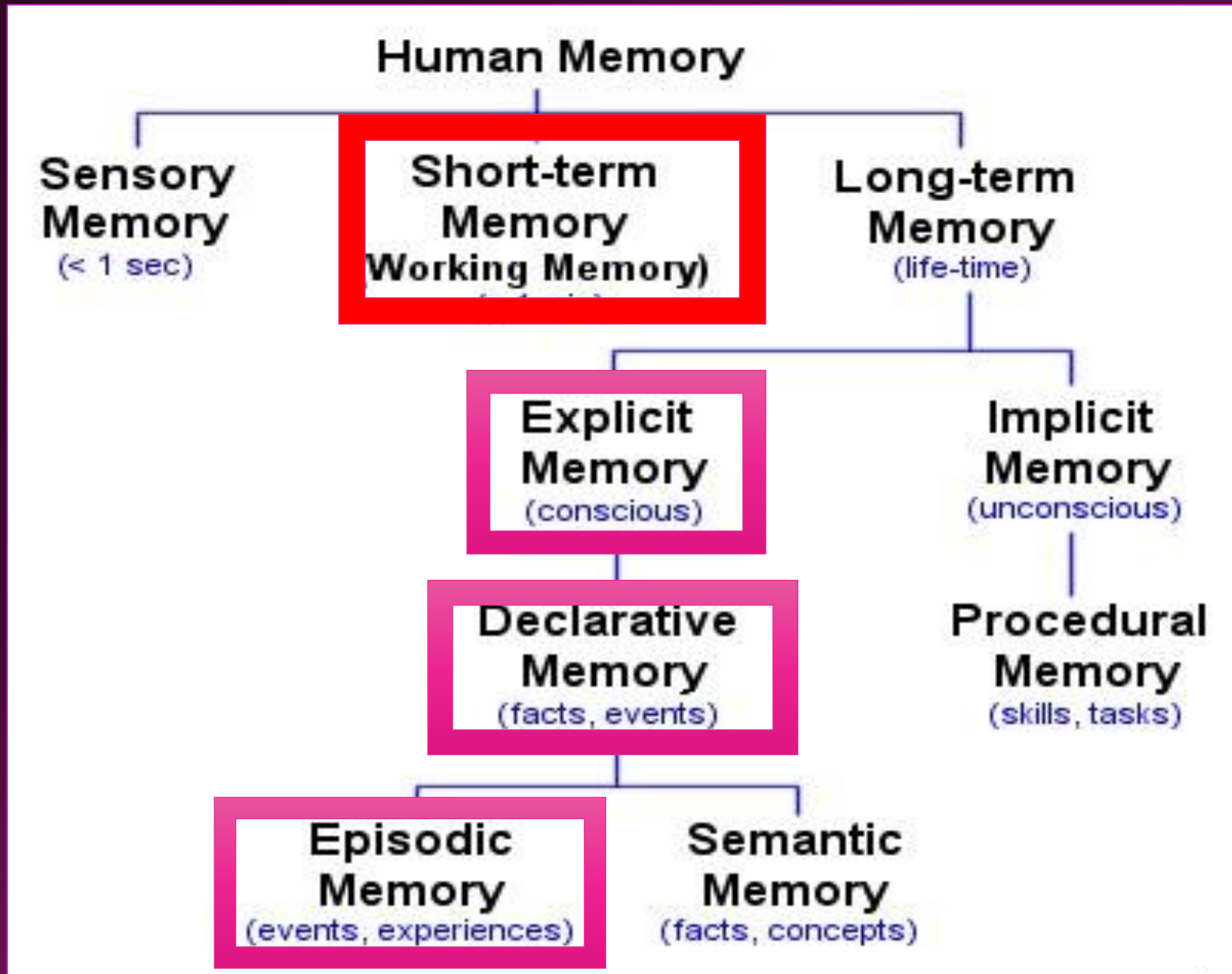
Attention

- Simple attention
- **Selective attention**
- **Sustained attention**
- **Divided attention**
- **Supervisory control**

Antegrade and Post traumatic amnesia

- PTA
  - Galveston Orienting Amnesic Test
  - Orientation LOG

- Factors affecting PTA
  - Alcohol, drugs
  - PTSD
  - Sedation,


Human Memory
Sensory Memory
(< 1 sec)
Short-term Memory
Working Memory)
Long-term Memory
(life-time)
Explicit Memory
(conscious)
Implicit Memory
(unconscious)
Declarative Memory
(facts, events)
Procedural Memory
(skills, tasks)
Episodic Memory
(events, experiences)
Semantic Memory
(facts, concepts)

TBI Executive Dysfunctions

Difficulty planning/ setting goals

Difficulty problem solving

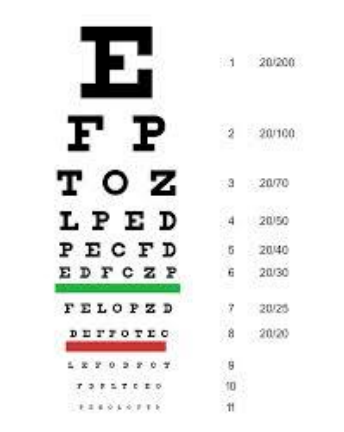
Difficulty organizing

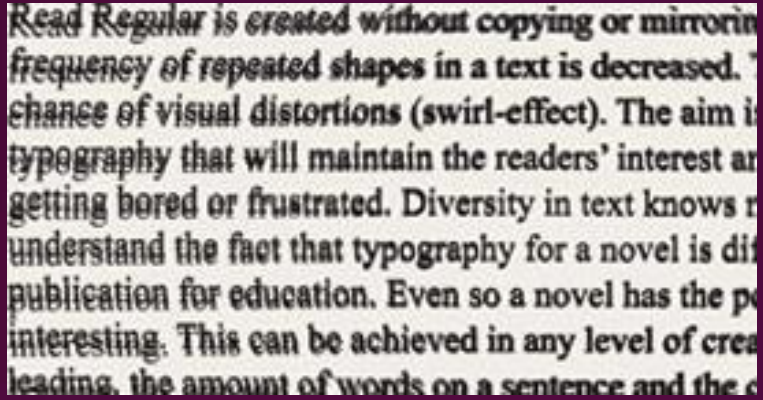
Difficulty prioritizing

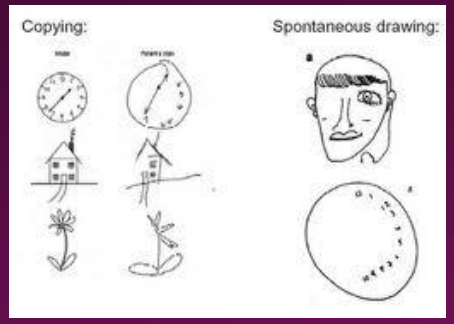
Difficulty being flexible

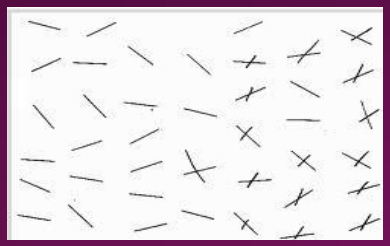
Decreased self awareness and self monitoring

Visual Deficits









EVALUATION

- History
- Physical Exam
- Imaging
- Neuropsychological testing

MINI MENTAL STATE EXAMINATION

- Orientation to time (5)
- Orientation to place (5)
- Registration of 3 words:(3)
- Attention And Calculation (5)
- Recall of 3 words (3)
- Language (2)
- Repetition (1)
- 3 Stage Command.(1)
- Write A Sentence ()
- Copy The Design.(1)

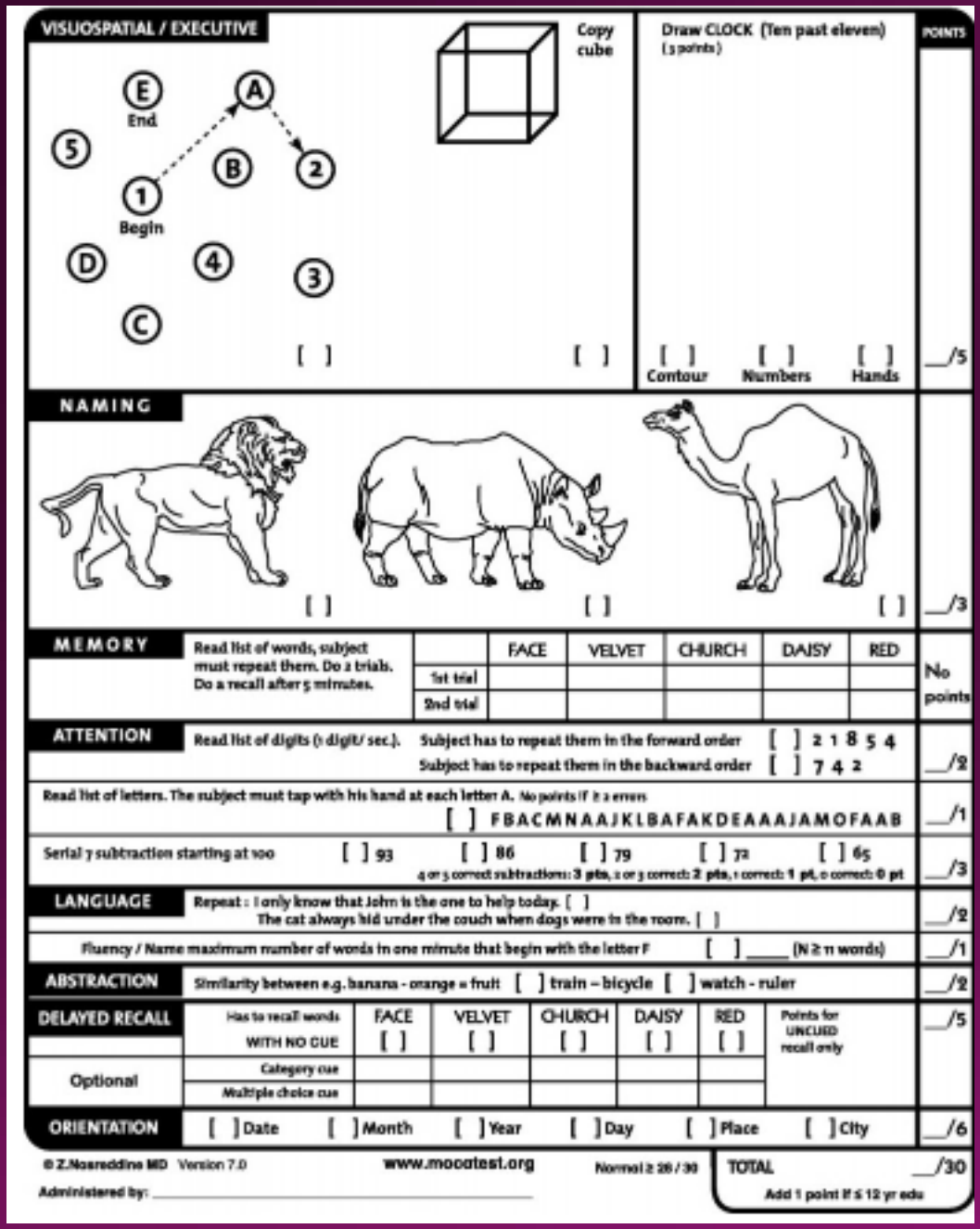
Total Score (30)

-Folstein MF. et al

MMSE	Alzeihmer'	Vascular	Lewy Body	mTBI
1-5 Orientation to time	X			
6-10 Orientation to place	X			
11 Repeat three objects				
12 Spelling WORLD backward			X	X
13 Recall three objects	X	X	X	
14,15 Recognize objects		X		
16 Recognize idiom eyes		X		
17 Close your eyes				
18 Copy a design		X	X	
19 Write a sentence		X		
20 Three-step command		X		

Vertesi et al;CanFamPhyOct2001

MOCA



VISUOSPATIAL / EXECUTIVE

Copy cube

Draw CLOCK (Ten past eleven) (3 points)

POINTS

E End, A, 5, B, 2, 1 Begin, D, 4, 3, C

[ ] [ ]

[ ] Contour [ ] Numbers [ ] Hands

__/5

NAMING

[ ] [ ] [ ]

__/3

MEMORY

Read list of words, subject must repeat them. Do 2 trials. Do a recall after 5 minutes.

	FACE	VELVET	CHURCH	DAISY	RED
1st trial					
2nd trial					

No points

ATTENTION

Read list of digits (1 digit/ sec.). Subject has to repeat them in the forward order [ ] 2 1 8 5 4

Subject has to repeat them in the backward order [ ] 7 4 2

__/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B

__/1

Serial 7 subtraction starting at 100 [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65

4 or 5 correct subtractions: 3 pts, 2 or 3 correct: 2 pts, 1 correct: 1 pt, 0 correct: 0 pt

__/3

LANGUAGE

Repeat : I only know that John is the one to help today. [ ]

The cat always hid under the couch when dogs were in the room. [ ]

__/2

Fluency / Name maximum number of words in one minute that begin with the letter F [ ] ____ (N ≥ 11 words)

__/1

ABSTRACTION

Similarity between e.g. banana - orange = fruit [ ] train – bicycle [ ] watch - ruler

__/2

DELAYED RECALL

	Has to recall words WITH NO CUE	FACE [ ]	VELVET [ ]	CHURCH [ ]	DAISY [ ]	RED [ ]	Points for UNCUED recall only
Optional	Category cue						
	Multiple choice cue						

__/5

ORIENTATION

[ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

__/6

© Z.Nasreddine MD Version 7.0 www.mocatest.org Normal ≥ 26 / 30

TOTAL __/30

Add 1 point if ≤ 12 yr edu

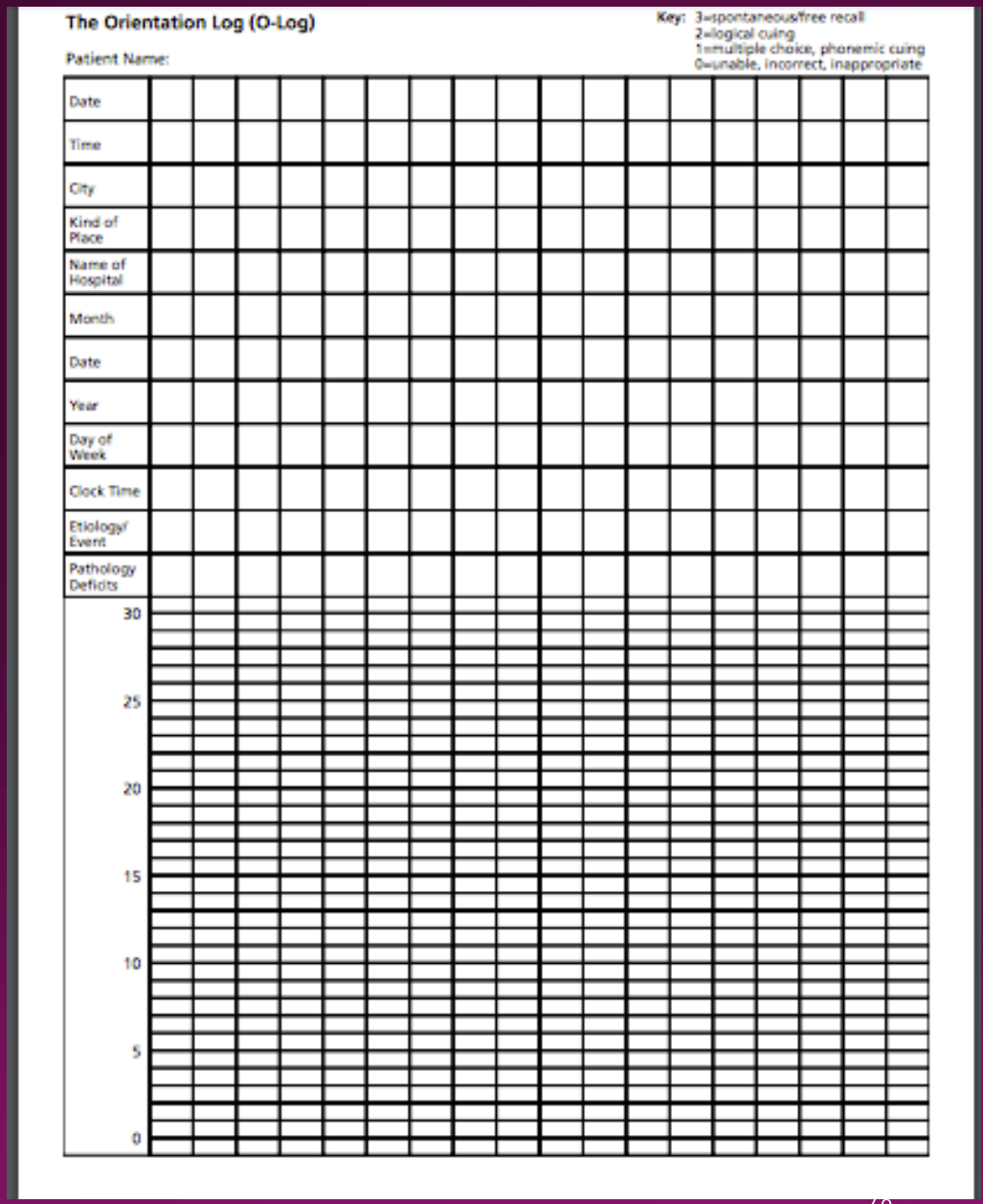
Administered by: _____

Galveston Orientation Amnestic Test

The Galveston Orientation and Amnesia Test (GOAT)

Question	Error score	Notes
What is your name?	/ 2	Must give both first name and surname.
When were you born?	/ 4	Must give day, month, and year.
Where do you live?	/ 4	Town is sufficient.
Where are you now?		
(a) City	/ 5	Must give actual town.
(b) Building	/ 5	Usually in hospital or rehab center. Actual name necessary.
When were you admitted to this hospital?	/ 5	Date.
How did you get here?	/ 5	Mode of transport.
What is the first event you can remember after the injury?	/ 5	Any plausible event is sufficient (record answer)
Can you give some detail?	/ 5	Must give relevant detail.
Can you describe the last event you can recall before the accident?	/ 5	Any plausible event is sufficient (record answer)
What time is it now?	/ 5	1 for each half-hour error, etc.
What day of the week is it?	/ 3	1 for each day error, etc.
What day of the month is it? (i.e. the date)	/ 5	1 for each day error, etc.
What is the month?	/ 15	5 for each month error, etc.
What is the year?	/ 30	10 for each year error.
Total Error:		
100 - total error		Can be a negative number.

Orientation Log



The Orientation Log (O-Log)

Patient Name:

Key: 3=spontaneous/free recall
2=logical cuing
1=multiple choice, phonemic cuing
0=unable, incorrect, inappropriate

Date																	
Time																	
City																	
Kind of Place																	
Name of Hospital																	
Month																	
Date																	
Year																	
Day of Week																	
Clock Time																	
Etiology/ Event																	
Pathology Deficits																	
30																	
25																	
20																	
15																	
10																	
5																	
0																	

Improving TBI mortality

- Improved first responder response
- Increased availability of Level 1 Trauma Centers
- Improved neurosurgical techniques
  - Hemicraniectomy, Frameless Stereotaxy, Endovascular Surgery for Brain Aneurysms, Telemedicine, VP Shunt technology
- Improved after care

AHA Recommendation-TBI in the elderly

- Aggressive care early after ICH onset
- Postponement of new Do Not Attempt Resuscitation (DNAR) orders until at least the second full day of hospitalization (exclude pt with prior DNAR)
- DNAR status should not limit appropriate medical and surgical interventions unless otherwise explicitly indicated.

Emergency department management of elderly patients with severe TBI

	Brain Trauma Foundation Guidelines
GCS	Monitor continuously for clinical change
ABC	• Correct, SpO2 <90%,Intubate if GCS<9 • Maintain ETCO2 35–40 mm Hg • Correct hypotension (SBP <90 mm Hg) • Avoid hyperthermia
Phy Exam	Frequent reassessment for signs of cerebral herniation
Inv	CBC, Renal and hepatic fn, Anticoagulation profile-rapid correction, toxicolgy screens

Clinical management

- Prevent elevated ICP (target ICP <20 mm Hg)
- Head of the bed elevation to 30°
- Optimize cerebral venous drainage• Keep neck in neutral position• Loosen tight neck braces
- Monitor central venous pressure
- Sedation as needed to prevent agitation
- Avoid excess hypervolemia
- Consider ICP monitoring in high-risk patients
- **Early surgical intervention if neccessary**

Falls

Impact

- Leading cause of significant morbidity and mortality
- One in three over 65 years /a fall every year
- Those who fall once are 2-3 x more likely to fall again
- Fall-Top cause of non-fatal injuries treated in United States emergency rooms (2,403,146 visits). 734,000 hospitalization
  - Centers for Disease Control and Prevention [CDC], 2013.
- However, less than half their physicians are aware of the falls or the circumstances

Cost of falling

- Exceeded $30 billion in 2010.
  - (CMS, 2013)
- Projected annual direct/indirect cost of falls in the elderly will be $67.7 billion by 2020
- Since 2008, hospitals do not receive payments for treating injuries caused by falls in the hospital
  - (CMS, 2008).

Consequence of falling

1. Deaths-
    1. 25,464 in 2013 from unintentional falls among adults aged ≥65.,
    2. Death rate for men after a fall is 40% higher than for women, after adjusting for age (CDC, 2013).
2. Hospitalization->5% of all cause admission in >65
3. Loss of function associated with independent living. Compared with individuals 65 to 74 years of age, individuals 75 years of age or older are four to five times more likely to be admitted to a long term health care facility for one year or longer after a fall (CDC,2013). >40% NH admissions.
4. Fear of falling, even if uninjured, causing them to limit activity and leading to decreased physical fitness, decreased mobility, and a subsequent increase in the risk of falling

(American Geriatrics Society,Geriatrics Society, & American Academy of Orthopaedic Surgeons Panel on Falls Prevention,2001; CDC, 2013;Scheffer et ah, 2008).

- Injury-Over 50%
  - Most are minor lacerations, bruises
  - Fractures-About 5% of falls result in fractures of the humerus, wrist, or pelvis. About 2% of falls result in a hip fracture.

- Prolonged lie
  - 50% of elderly people who fall cannot get up without help. Remaining on the floor for > 2 h after a fall increases risk of
    - Dehydration
    - pressure ulcers,
    - rhabdomyolysis,
    - hypothermia,
    - pneumonia.

Risk factors for falls

1. Intrinsic factors (age-related decline in function, disorders, and adverse drug effects)
2. Extrinsic factors (environmental hazards)
3. Situational factors (related to the activity being done, eg, rushing to the bathroom)

Mechanism of falls

- Impairments in BP regulation
  - Anemia,
  - Arrhythmias,
  - Cardioinhibitory carotid sinus hypersensitivity
  - COPD,
  - Dehydration,
  - Infections (eg, pneumonia, sepsis),
  - Metabolic disorders (eg, diabetes, thyroid disorders, hypoglycemia, hyperosmolar states)
  - Neurocardiogenic inhibition after micturition
  - Postural hypotension,
  - Postprandial hypotension
  - Valvular heart disorders

Cognitive processing	Delirium, Dementia, Stroke
Gait	Arthritis, Muscle weakness Foot deformities, Vitamin D deficiency
Postural and neuromotor function	Cerebellar degeneration, Myelopathy (eg, due to cervical or lumbar spondylosis), Parkinson disease, Stroke/ Vertebrobasilar insufficiency Peripheral neuropathy,
Proprioception	Peripheral neuropathy (eg, due to diabetes mellitus), Vitamin B 12 deficiency
Otolaryngologic function	Acute labyrinthitis, Benign paroxysmal positional vertigo Hearing loss, Meniere disease
Vision	Cataract, Glaucoma, Macular degeneration Visual acuity, contrast sensitivity, depth perception, and dark adaptation.

Medications associated with falls	
Direct vestibular damage	Aminoglycosides Loop diuretics (high-dose)
Reduced alertness or slow central processing	Analgesics (especially opioids) Psychoactive drugs (especially antidepressants, antipsychotics, and benzodiazepines) Anticholinergics
Extrapyramidal syndromes, other antiadrenergic effects	Antipsychotics
Impaired cerebral perfusion	Antiarrhythmics Antihypertensives (especially vasodilators) Impaired cerebral perfusion

CNS-acting	(OR 9.90; 95% CI 1.6–60.63)
Anti-parkinson's	OR about 4–5
Cough Preparations-	5.7% (sedation worsening bladder obstruction)
NSAID Use	(OR 10.02, 95% CI 2.6–38.58; *P*=0.001).
Anti-alzheimer's	(HR 1.63, 95% CI 1.24–2.14; *P*=0.0005)
Antiplatelet Agents	(15.9% versus 1.3%, *P*<0.001)
Loop Diuretic	Next day (OR 2.46, 95% CI 1.02–5.92)
Thiazides -3 Weeks	(OR 4.28, 95% CI 1.19–15.42).
A-blockers	(first prescriptions (aOR 5.1, 95% CI 1.0–31.7) first month of treatment (aOR 4.1, 95% CI 0.7–23.9)
Digoxin Therapy	35% risk versus 22%
Diabetes Medications	(aOR 3.2, 95% CI 1.3–7.9)
Neurotoxic Chemotherapy	Double agent (9.15 per 1,000 person-months) single agent (7.76 per 1,000 person-months) or a nonneurotoxic agent (5.19 per 1,000 person-months).
Nasal Preparations	(aOR 1.49, 95% CI 1.07–2.08)
Antiglaucoma	(aOR 1.51, 95% CI 1.10–2.09)

Urological co-realtions

Increased risk of falls, associated with

1. Urinary Frequency
2. Urgency
3. Urge Incontinence
4. Nocturia\ >3x
5. Medications Used To Treat LUTI
6. Orthostatic Hypotension
7. Hesitancy/Straining

1. (Parsons et al., 2009;Temml et al., 2009; Vaughan et al., 2010).

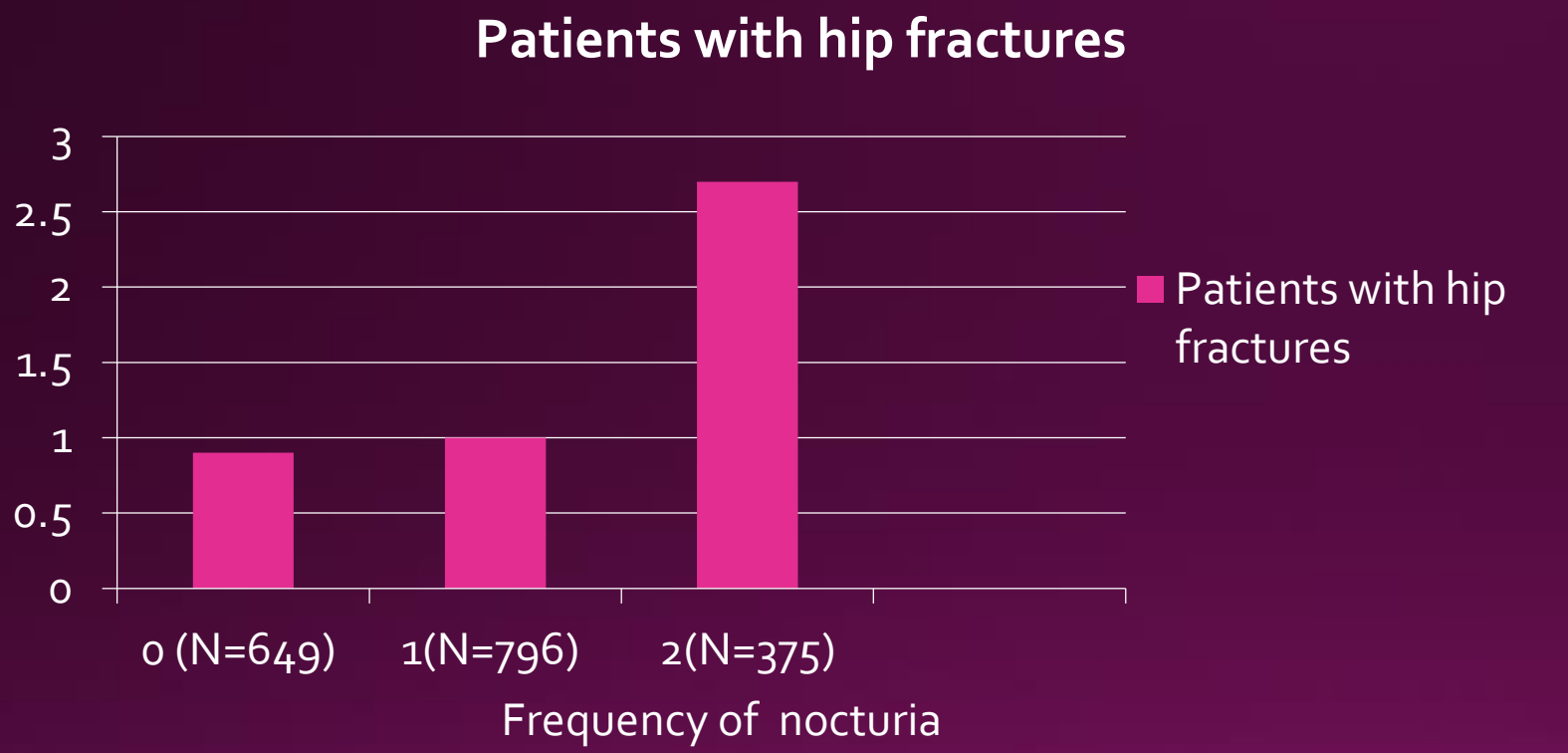
Association Between Nocturia and Fall Risk

1. University of Alabama study ,
2. 692 community dwelling men and woman without recent history of falling, data collected q6m x 36m

Frequency of Nightly Nocturia	Relative Risk of Fall (95% CI)
None (n = 98)	1.00 (ref)
One episode (n = 197)	0.77 (0.58 to 1.00)
Two episodes (n = 190)	0.89 (0.69 to 1.16)
Three episodes (n = 111)	1.14 (0.85 to 1.53)
Four episodes (n = 49)	1.28 (0.88 to 1.86)
Five or more episodes (n = 35)	1.21 (0.77 to 1.90)

Vaughan et al., 2010.

Nocturia and Hip Fractures in Men



- 1,820 men in Vienna, Austria, who underwent a health evaluation screening between 2000 and 2003
- Odds of having a hip fracture were 36% higher if nocturia 2 or more times

(Temml et al., 2009).

Urinary Medications- alpha-blockers

1. Significant class effect of orthostatic hypotension , especially non-selective alpha-blockers

   (Feldstein & Weder,2012; Lavsa et al., 2010; Poon &Braun, 2005).

2. Significant risk factor for recurrent falls and all-cause mortality in the elderly

   (Masaki et al., 1998; Ooi,Hossain, & Lipsitz, 2000).

Side effect- Comparison

	Positive orthostatic test. (%)	Dizziness (%)
Tamsulosin(Flomax®) 0.4 mg (%)	16.0	14.9
Tamsulosin(Flomax®) 0.8 mg (%)	19.0	17.1
Alfuzosin(Uroxatral®)(%)	6.6	5.7
Doxazosin(Cardura®)(%)	NR	15.6
Terazosin(Hytrin®)(%)	NR	9.1
Silodosin(Rapaflo®)(%)	2.6	3.2

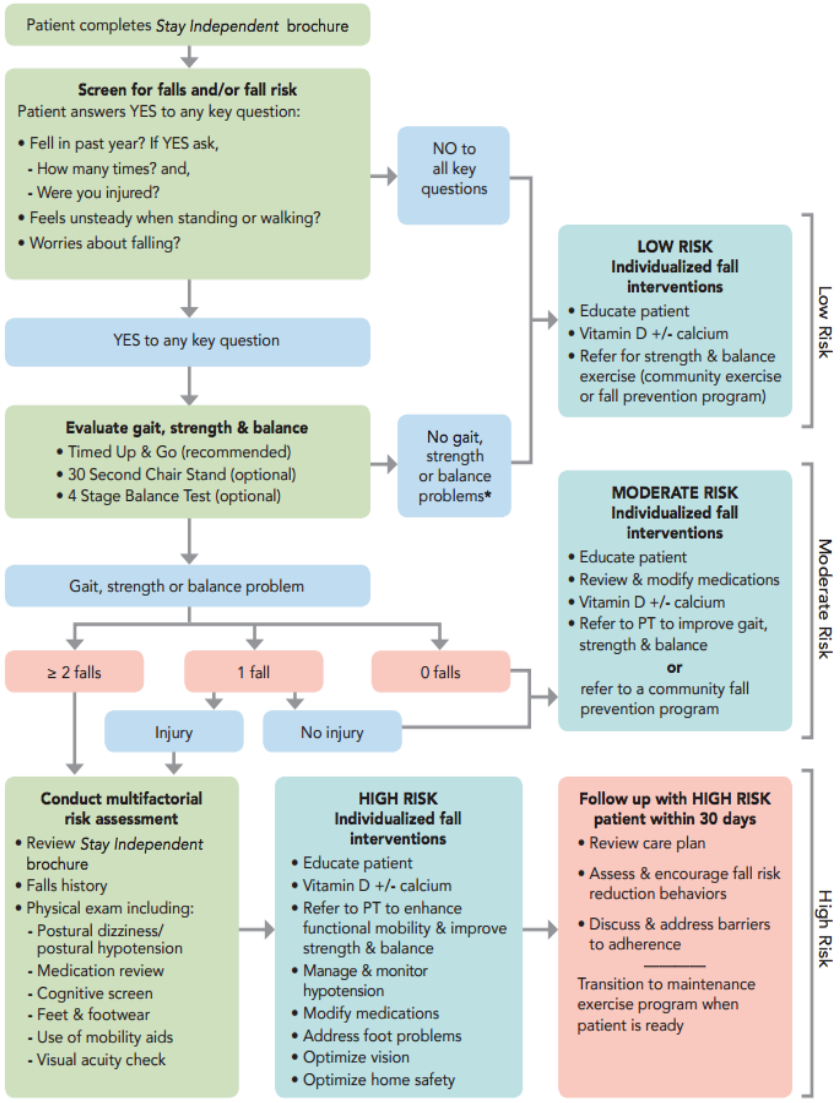
Screening and Prevention

1. AGS (2010) -at least annually .
2. CDC -each visit by using the Staying Independent Brochure as part of their Stopping Elderly Accidents, Deaths and Injuries (STEADI) initiative A comprehensive fall assessment is prompted when a
   a. patient Scores 4 or more on the Stay Independent Brochure
   b. answers yes to having fallen in the past year, feeling unsteady or have a fear of falling

Staying Independent Brochure

Yes (2)	No (0)	I have fallen in the past year.	People who have fallen once are likely to fall again.
Yes (2)	No (0)	I use or have been advised to use a cane or walker to get around safely.	People who have been advised to use a cane or walker may already be more likely to fall.
Yes (1)	No (0)	Sometimes I feel unsteady when I am walking.	Unsteadiness or needing support while walking are signs of poor balance.
Yes (1)	No (0)	I steady myself by holding onto furniture when walking at home.	This is also a sign of poor balance.
Yes (1)	No (0)	I am worried about falling.	People who are worried about falling are more likely to fall.
Yes (1)	No (0)	I need to push with my hands to stand up from a chair.	This is a sign of weak leg muscles, a major reason for falling.
Yes (1)	No (0)	I have some trouble stepping up onto a curb.	This is also a sign of weak leg muscles.
Yes (1)	No (0)	I often have to rush to the toilet.	Rushing to the bathroom, especially at night, increases your chance of falling.
Yes (1)	No (0)	I have lost some feeling in my feet.	Numbness in your feet can cause stumbles and lead to falls.
Yes (1)	No (0)	I take medicine that sometimes makes me feel light-headed or more tired than usual.	Side effects from medicines can sometimes increase your chance of falling.
Yes (1)	No (0)	I take medicine to help me sleep or improve my mood.	These medicines can sometimes increase your chance of falling.
Yes (1)	No (0)	I often feel sad or depressed.	Symptoms of depression, such as not feeling well or feeling slowed down, are linked to falls.
Total _____		Add up the number of points for each "yes" answer. If you scored 4 points or more, you may be at risk for falling. Discuss this brochure with your doctor.	

Algorithm for Fall Risk Assessment & Interventions



*For these patients, consider additional risk assessment (e.g., medication review, cognitive screen, syncope)

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

STEADI Stopping Elderly Accidents, Deaths & Injuries

Questionnaires

1. The Falls Risk for Older People in the Community scale (FROP-Com)
2. The St. Thomas Risk Assessment Tool for Fall in elderly (STRATIFY)
3. The Morse Fall Scale (MFS)
4. The Hendrich Fall Risk Assessment,

Get Up and Go

1. Observing abnormalities in gait and balance when the subject rises from a standard arm chair, walks 3 meters or 10 feet, turns around, walks back, and sits down.
2. Revised to include time-Timed Up and Go (TUG). Any individual with a time greater than 13.5 seconds is considered to be at an increased risk of falls. sensitivity (87%) and specificity (87%.
3. A systematic review in 2010 showed that the TUG is associated with a history of past falls, but its predictive ability for future falls was limited .
4. The CDC now recommends a 12 second cut off.

Five Times Sit to Stand (FSST)

1. Use a straight back chair with a solid seat that is 16" high.
2. Instructions: "Stand up and sit down as quickly as possible 5 times, keeping your arms folded across your chest."
3. Measurement: Stop timing when the participant stands the 5th time.
4. Outcomes:
   - > 13.6 seconds is associated with increased disability and morbidity (Guralnik 2000)
   - significant predictor of recurrent fallers in a community dwelling older population with 55% recurrent fallers failing this test compared to single (35%) and non-fallers (38%)
   - better predictor of future falls than the TUG or One Legged stance test .

Management

To Minimize Orthostatic Hypotension

1. Increase fluid intake to five to eight eight-ounce glasses of water per day to maintain plasma volume.
2. Increase intake of salt to 10 to 20 gm per day unless on a salt-restricted diet. (Figueroa, Basford, & Low, 2010).
3. Decrease or eliminate alcoholic beverages.
4. Gradually sit up from a lying position and dangle feet off the side of the bed for a few minutes before standing.
5. Keep the thermostat set at a cooler temperature to minimize blood vessel dilation.
6. Decrease amount of time in bed (if not confined to bed rest).
7. Avoid large or carbohydrate-heavy meals.
8. Use compression stockings if advised

Behavioral and lifestyle modifications

1. Fluid restriction after 6:00 p.m
2. Decreasing or eliminating caffeinated beverages and alcohol especially after 4:00,p.m
3. Reduction in nocturnal awakenings by keeping warm in bed
    1. Soda, Masui, Okuno and Yoshimura ,2010
4. Lower extremity edema
    1. Keep leg elevated while in sitting
    2. diuretic medication-adjust timings
5. Treat Sleep apnea with a CPAP helps reduce nocturia episodes (Appell & Sand,2008).

Vision

1. Test vision if > 2 falls or injury(CDC)

2. Vision assessment and correction does not reduce risk or rate of falls. In one such study, a comprehensive vision assessment with appropriate treatment actually increased the risk of falls and fractures

3. Addition to treatment of vision impairments, gait training with new visual aids is necessary to prevent fall risk. substituted multifocal glasses for single lenses during outdoor and walking

Mental Health and Cognitive Capacity

1. Depressive common risk factors between falls and depression including poor self-rated health and cognitive status, and slow walking .
2. Fear of falling, consequence and independent risk factor for future falls .
3. Activity restriction is associated with fear of falling in elderly populations and is a predictor of decline in physical function
4. Screening tool -Activities-specific Balance Confidence Scale

Footwear

1. Safest choice is to wear athletic or canvas shoes
2. Under icy conditions, anti-slip shoes

How to buy a shoe

1. Afternoon
2. Removable insole, avoid narrow mid outsole, Avoid pump style, Laces, velcro
3. Only front third should bend easily, should not distort easily when twisted side to side, strong counter
4. Wide toe box
5. Shoe length-Walk with toes straight, no squeak ,try on vinyl/linoneum

Choosing the right assistive device

1) What is the main purpose of the assistive device

   a. balance (including sensory and cerebellar systems),

   b. motor (including cerebral initiation of walking and muscular strength

   c. joint or skeletal problems.

Standard cane

Offset cane

offset 4-legged quad cane

1. The standard - mild sensory or coordination problems found in visual, auditory, vestibular, peripheral proprioceptive, or central cerebellar disease.

2. If the cane is required to bear weight, such as f patients with osteoarthritic hip or knee pain, then an offset cane could provide greater stability, as it allows force to be placed directly along the cane's shaft.

3. If substantial weight bearing is required, such as in a hemiplegic patient, then an offset 4-legged quad cane might be needed.

Is the cane the right length?

1. Elbow flexion -20° to 30° of flexion in the elbow when holding the cane approximately 15 cm from the lateral border of the toes (efficient elbow movement while walking).
2. Cane length should be roughly the distance from the ground to the greater trochanter or wrist crease when the patient's arm is hanging by their side

Is the cane being used correctly?

1. Advanced in unison with and on the side opposite the weak or painful leg.
2. Support up to 15% to 20% of a patient's body weight.
3. Using their standard cane grip backward, as this might signal unsafe and excessive weight bearing.

Assessing the need for a walker

1. A quick test you can do in the office would involve walking with the patient while holding their hand. If a single assisting hand helps them walk, then logically a cane might be of potential benefit. If, however, you need to hold both their hands to steady their gait, a walker might be a better choice.
   a. Weight
   b. Foldability
   c. Wheels
   d. Seat
   e. Brakes.

Exercises

Dose of exercise

1. Try to exercise 3 or more days a week.
2. Weekly recommendations-150 min
3. Effort- Strained conversation

Type of exercises

1) Balance exercise
    1) Single-leg stance
    2) One-Legged Balance
    3) Stork exercises
2) Aerobic exercises
3) Strengthening exercises
    1) Calf and ankle
    2) Buttocks and lower back
    3) Thigh exercises
4) Range of motion exercises
    1) Leg Swings
    2) Squats

How to fall safely

1. Protect your head.-Tuck your chin down, lowering your head, turn your head to the side. Bring your arms up to head level for additional protection. Put them in front of your head if falling forwards or behind your head if falling backwards.
2. Turn as you fall to land on your side, especially from a high surface
3. Keep arms and legs bent.
4. Stay loose. try breathing out as you fall to help keep your body relaxed.
5. Roll out of the impact.
6. Spread out the force of the fall.

Why do the Elderly Have worse outcomes?

Prognostic factors of TBI

- Prior history of medical illness,
- Multiple traumatic injuries,
- Mechanism of injury,
- Clinical severity such as Glasgow Coma Scale (GCS) score, pupillary response, hypoxia, hypotension.
- Age -one of the most reliable prognostic factors
  - Poorer survival
  - Poorer functional outcome
  - Duration of hospital stay is significantly longer
  - Increased medical, rehabilitation, and nursing care resources.