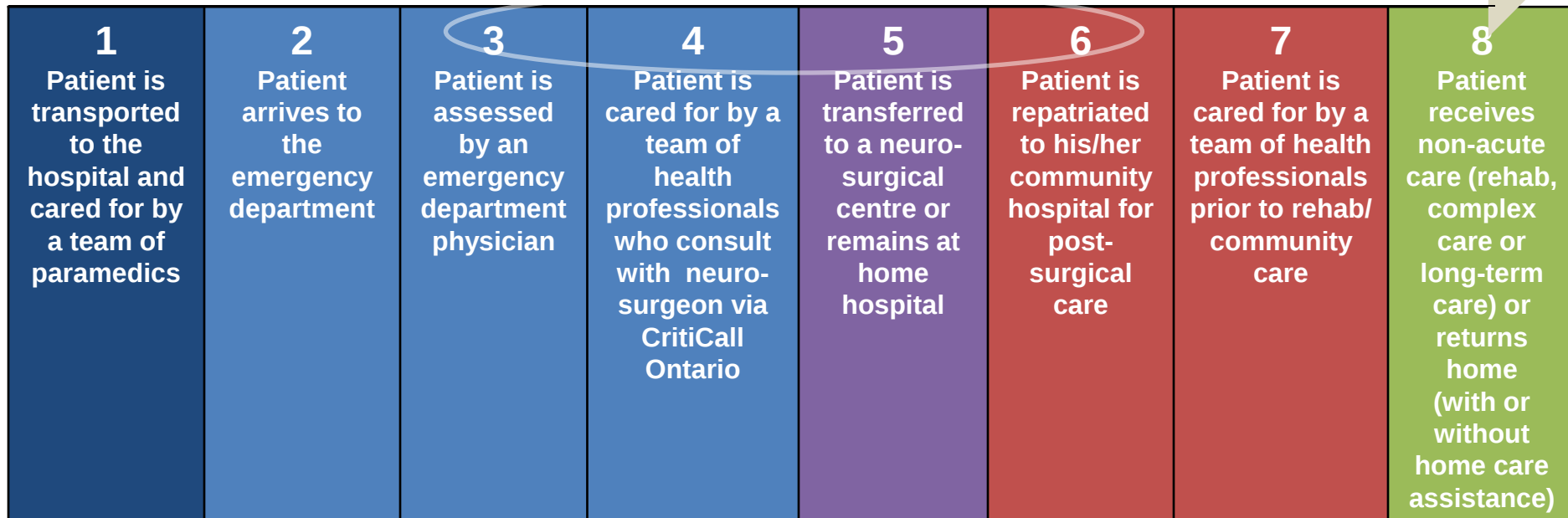


Guidelines for Basic Adult Neurological Observation



Neurosurgical Patient Flow Model – Urgent/Emergent Cases

Provincial Neurosurgery Ontario system goals and the principle of patient-centred care apply across the continuum



Neurosurgical Centres in Ontario

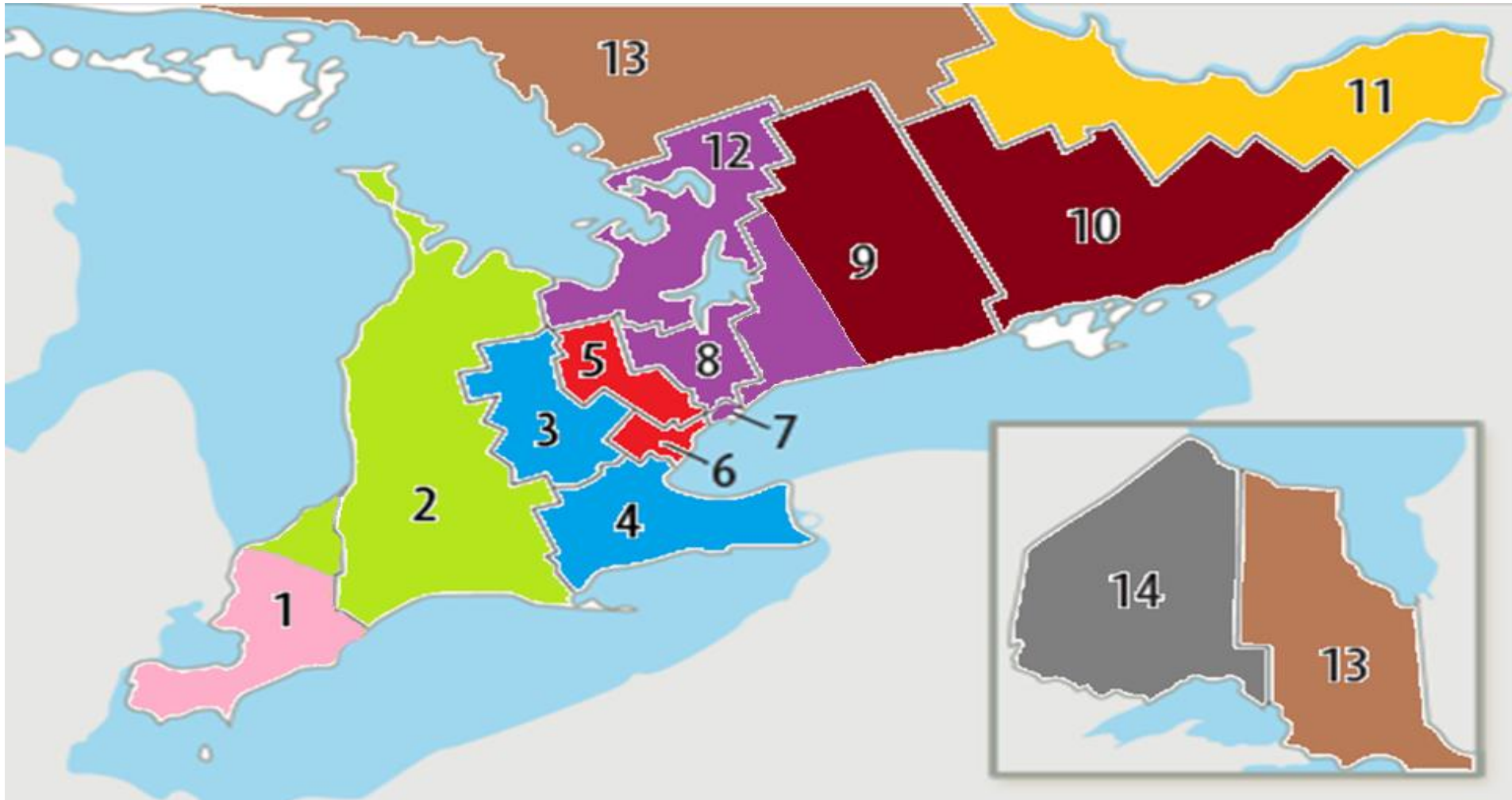
All neurosurgical centres have been designated as Level 2 or Level 3:

	Level 2 Neurosurgical Centre	Level 3 Neurosurgical Centre
Services	May not provide certain neurosurgical services (i.e., coil embolization)	Provides all neurosurgical services
Coverage	Generally do not provide 24/7/365	Provide 24/7/365 coverage

Provincial Neurosurgical and Spine Roster, facilitated by CritiCall Ontario, creates access to neurosurgical services (consult, transfer) for non-neurosurgical sites:

Level 2 Centre	Level 3 Partner
Health Sciences North	Toronto Collaborative (SMH, SHSC, UHN)
Kingston General Hospital	The Ottawa Hospital
Thunder Bay Regional Health Sciences Centre	Hamilton Health Sciences
Trillium Health Partners	Toronto Collaborative (SMH, SHSC, UHN)
Windsor Regional Hospital	London Health Sciences Centre





	Windsor Regional Hospital – Quellerie Site		Trillium Health Partners (Mississauga)		The Ottawa Hospital
	London Health Sciences Centre		Toronto Collaborative (SMH, SHSC, UHN)		Health Sciences North
	Hamilton Health Sciences Centre		Kingston General Hospital		Thunder Bay Regional Health Sciences Centre



GUIDELINES FOR BASIC ADULT NEUROLOGICAL OBSERVATION

Neurosurgical Nurse Educator Network

Critical Care Services Ontario | April 2014

CCSO Critical Care Services Ontario

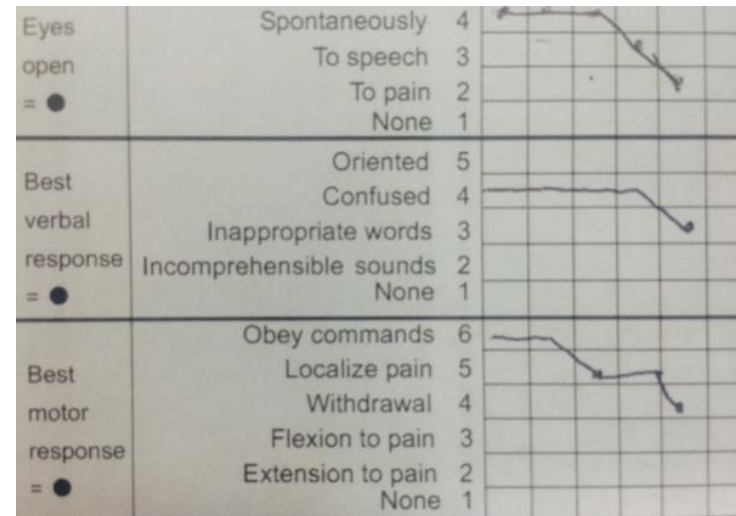
Why Perform a Neurological Assessment?

- The baseline neurological assessment and ongoing assessments are the most sensitive indicators of neurological change
- Early detection is important for successful treatment, management and prognosis



Why Perform a Neurological Assessment?

- Evaluation of the patient's neurological status
- Record a baseline
- Monitor and detect early changes
- Successfully manage and treat



What is Included

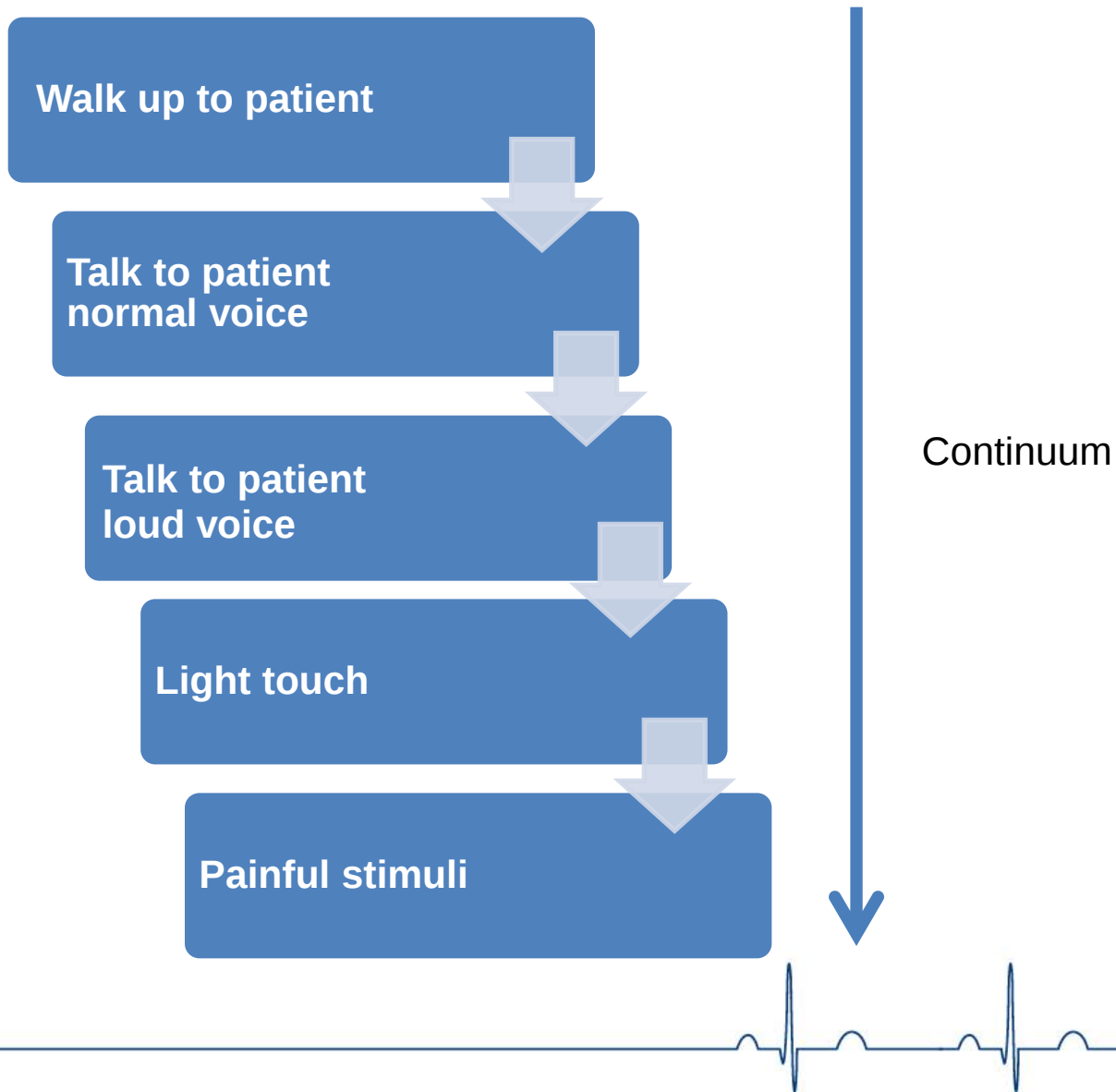
Assessment of the following:

- Level of consciousness (LOC) using the Glasgow Coma Scale (GCS)
- Pupillary response
- Limb movement/ strength
- Vital signs

The administration of continuous sedation of a patient may obscure the neurological assessment and the accuracy of the assesment.



General Approach



Painful Stimuli

Types Of Stimuli include:

- Peripheral painful stimuli(LOC/eye opening)
- Central painful stimuli(Movement/Motor)

Examples when to Use :

- If patient is not waking and to obey verbal commands
- In the absence of any purposeful spontaneous movements

Examples when NOT to Use :

- Obvious spontaneous movement that are purposeful in nature
- Hemiparesis



Peripheral Painful Stimuli

- Used to elicit an eye-opening response
- The recommended method is an interphalangeal joint pressure (IPJ)
 - Apply pressure with a pen/pencil to the lateral outer aspect of the proximal or distal interphalangeal joint (lateral aspect of the patient's finger or toe) for **10 to 15 seconds** to elicit a response.



Caution! A peripheral painful stimulus may elicit a spinal reflex, causing flexion of tested limb. A spinal reflex is not an indication of intact brain function.



Central Painful Stimuli

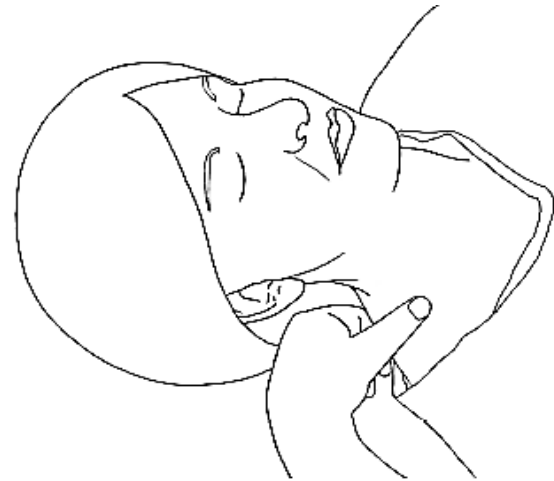
- Used to elicit a motor response
- Done by stimulating a cranial nerve, thus avoiding the possibility of eliciting a spinal reflex
- Recommended methods are
 - **Trapezius twist (Cranial Nerve XI)**
 - **Supra-orbital pressure (Cranial Nerve V)**
 - **Jaw margin pressure (Cranial Nerve V)**



Central Painful Stimuli

Trapezius twist (Cranial Nerve XI)

- Using the thumb and two fingers as pincers.
- Take hold of about two inches of the muscle located at the angle where the neck and shoulder meet.
- Twist and gradually apply increasing pressure for **10 to 20 seconds** to elicit a response.
- **Note:** High level spinal cord injuries may interfere with assessment using Trapezius twist.



Note: Sternal rub is NOT recommended due to potential for severe bruising and residual pain and discomfort.



Central Painful Stimuli

Supra-orbital pressure (Cranial Nerve V)

- Place the flat of the thumb on the supra-orbital ridge (small notch below the inner part of eyebrow), while the hand rests on the head of the patient.
- Apply gradually increasing pressure for **10 to 20 seconds** to elicit a response.
- Note: Supraorbital pressure is **NOT** to be used with orbital, skull, facial fractures, or frontal craniotomies.



Note: Sternal rub is NOT recommended due to potential for severe bruising and residual pain and discomfort.



Central Painful Stimuli

Alternative method of applying central pain

Jaw margin pressure (Cranial Nerve V):

- Place the flat of the thumb at the angle of the jaw at the maxilla-mandibular joint.
- Apply gradually increasing pressure for **10 to 20 seconds** to elicit a response.
- Note: Apply with caution in patient with increased intracranial pressure (ICP), as this may increase ICP if venous return is compromised due to compression of jugular vein.

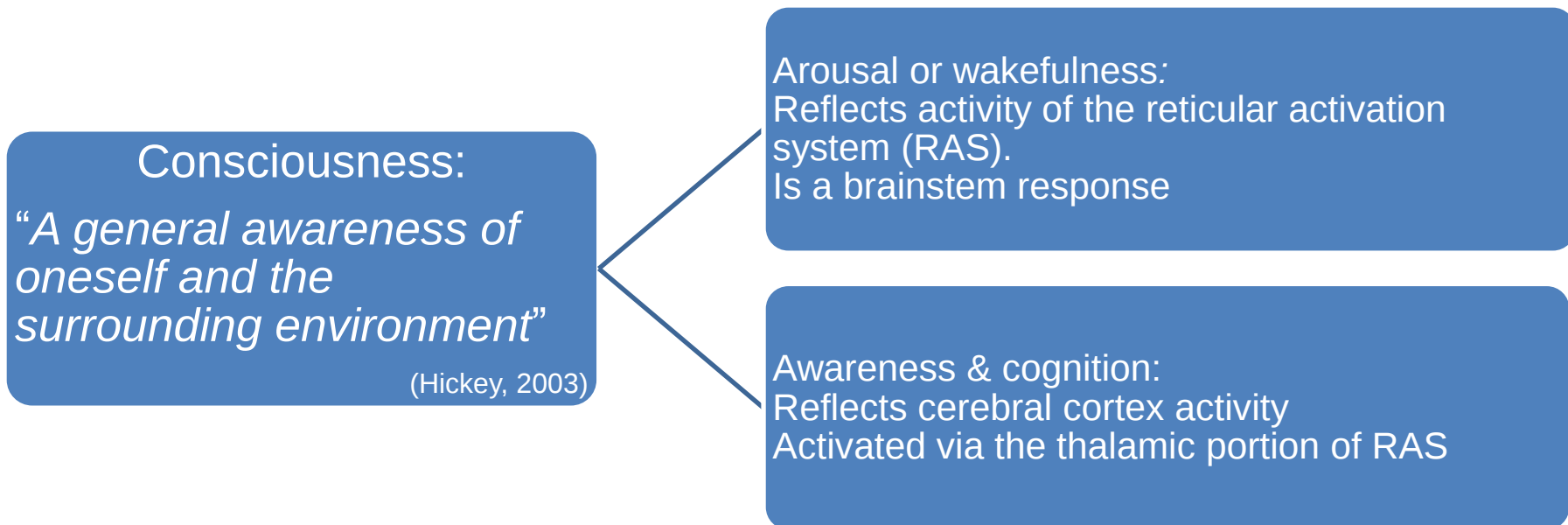


Note: Sternal rub is NOT recommended due to potential for severe bruising and residual pain and discomfort.



Level of Consciousness Assessment

- LOC is the most sensitive indicator of neurological condition
- Consciousness consists of two components



Glasgow Coma Scale (GCS)

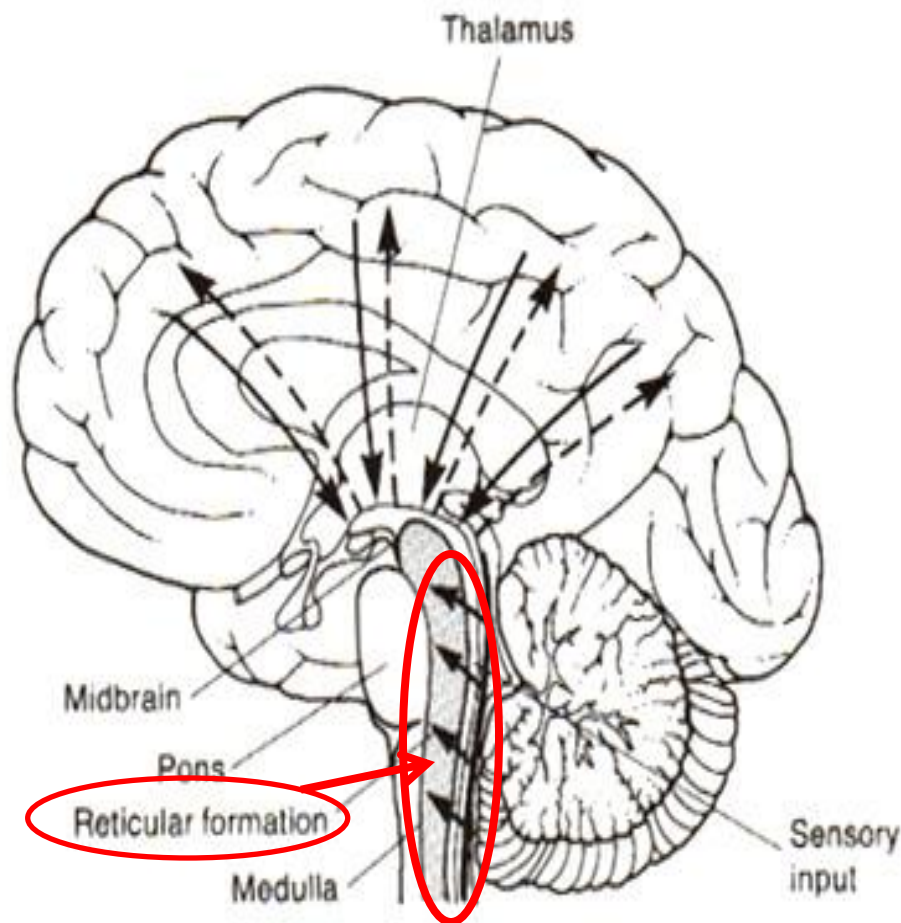
- Most widely used tool to assesses Level of Consciousness (LOC)
- Developed in Glasgow 1974
- Provides global measure of depth & duration of impaired consciousness and/or coma

Glasgow Coma Scale	
EYE-OPENING RESPONSE	SCORE
Spontaneously	4
To speech	3
To pain	2
None	1
BEST VERBAL RESPONSE	SCORE
Oriented	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
None	1
BEST MOTOR RESPONSE	SCORE
Obeys commands	6
Localizes to pain	5
Flexion/withdrawal	4
Abnormal flexion to pain	3
Extension to pain	2
None	1



GCS: Eye Opening Response

- Eye opening assesses the function of the reticular activating system (RAS) extending from the brainstem through the thalamus to the cerebral cortex.



GCS: Eye Opening Response

Feature	Scale Response	SCORE	Behavior
Eye Opening Response	Spontaneously	4	Patient's eyes open spontaneously no prompting from the nurse as he or she approaches the patient.
	To speech	3	Patient's eyes open to a verbal stimulus only Use normal to louder voice. Consider hearing impairments/medications/status fluctuations
	To pain	2	Patient's eyes open to a painful stimulus only Use peripheral stimulation Interphalangeal joint pressure is recommended
	None	1	Patient's eyes do not open to any stimuli



GCS: Eye Opening Response

- If eyes are closed due to swelling or surgery and are unable to be opened:
 - Score 1 and indicate with a “1C” or a “C” in the “no response/none” section.
- If one eye is closed
 - Document the response from the functioning eye.



GCS: Best Verbal Response

Helps identify if the patient is orientated

Verify that the patient is able to correctly answer ALL the following:

- His/her identity/Name
 - Where they are located
 - Current year/season/month /date
- Person
Place
Time
x3

GCS: Best Verbal Response

Feature	Scale Response	SCORE	Behavior
Best Verbal Response	Orientated	5	Patient correctly answers questions to person, place & time
	Confused	4	Patient incorrectly answers 1 or more questions to person, place & time
	Inappropriate	3	Patient answers to the questions are not relevant. Speech is still intact and understandable.
	Incomprehensible	2	Patient answers by moaning or groaning
	None	1	No response



GCS: Best Verbal Response

- If a patient has an artificial airway, verbal responses cannot be accurately tested:
 - Score 1 and indicate with a “1T” or a “T” in the “no response/none” section.
 - Document in your notes
- If a patient is able to communicate though writing or mouthing of words
 - Describe the response in the notes
 - Still document as 1- writing does not qualify as orientated verbally.



GCS: Best Motor Response

- Assesses area of brain, which identifies and translates sensory input into a motor response.
- Use central pain if needed to elicit a response & avoid a spinal reflex
- **DO NOT** use pain if patient localizing spontaneously
e.g. attempting to remove tubes or triggers such as suctioning



GCS: Best Motor Response

Feature	Scale Response	Score	Behavior
Best Motor Response	Obey commands	6	Patient understands and obeys verbal/ written/gestured commands: stick your tongue out
	Localize pain	5	Purposefully moves limb to locate/remove source of pain: i.e. to chin or across the midline
	Withdrawal	4	Flexes at the elbow/knee with the limb drawn away from the trunk (recoil)
	Flexion to pain	3	Flexes at the elbow with shoulder adduction, wrist flexion and the making of a fist. Slow movement
	Extension to pain	2	Extends limb with shoulder adduction, wrists flexion & fingers either in a fist or extended
	None	1	No response or movement



GCS: Best Motor Response

Feature	Scale Response	Score	
Best Motor Response	Obey commands	6	Patient written/g
	Localize pain		
	Withdrawal		
	Flexion to pain		
	Extension to pain		
	None		

It is not acceptable to ask a patient to squeeze one's hand unless he/she is also asked to release it.

If unable to obey commands:

- Place the patient in a supine position
- Hands at the groin area, if possible
- Apply a central painful stimulus

If applicable, loosen any limb restraints while performing assessment.



GCS – Best Motor Response

Localizes Pain: Score of 5

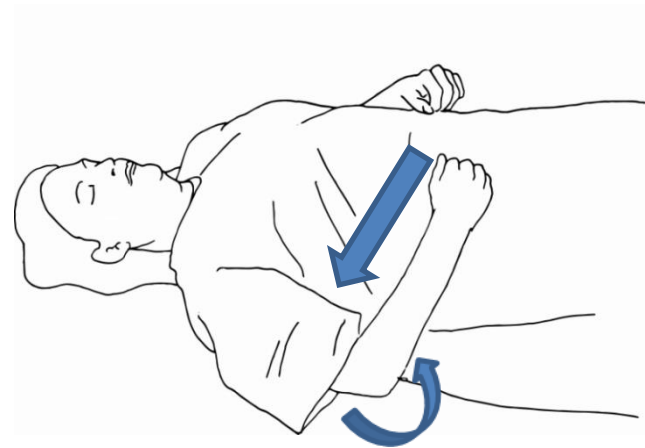
- The patient purposefully moves a limb in an attempt to locate and remove the source of the applied central painful stimulus.
- The hand must move toward the source in an attempt to remove the painful/noxious stimulus i.e. to the chin or across the midline of the body.



GCS – Best Motor Response

Flexion/Withdrawal: Score of 4

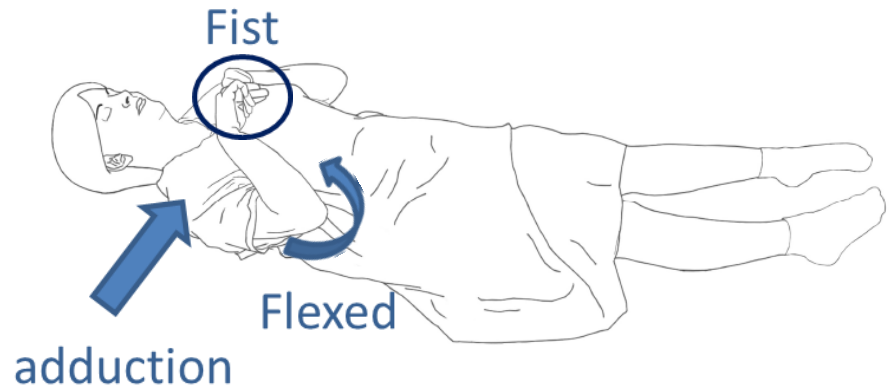
- The patient withdraws the limb in response to a central painful stimulus by flexing at the elbow/knee with the limb drawn away from the trunk (recoil). There is no direct attempt to remove the source of the painful stimuli.



GCS – Best Motor Response

Abnormal Flexion to Pain: Score of 3

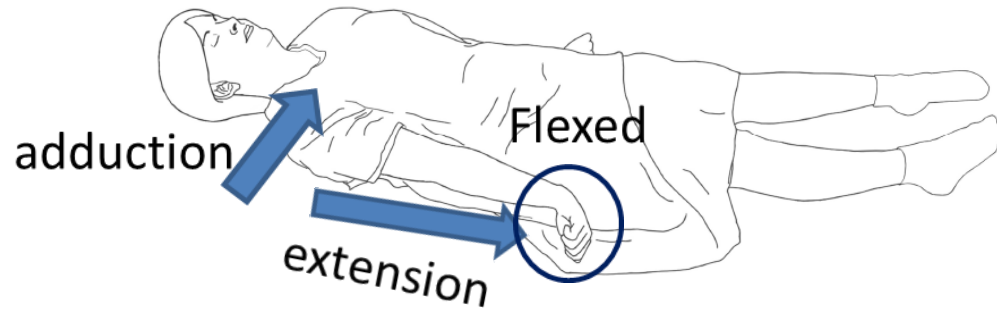
- The patient flexes the limb at the elbow in response to central painful stimuli.
- Accompanying this movement is shoulder adduction, wrist flexion and the making of a fist.
- Flexion to pain is usually a slow movement, with no attempt to remove the painful stimuli.



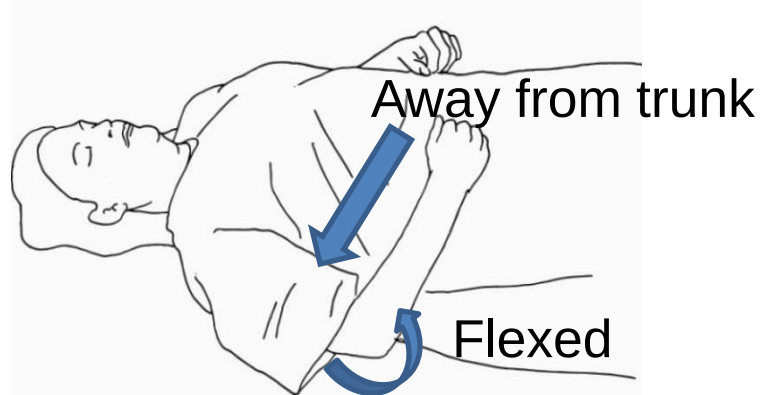
GCS – Best Motor Response

Extension to Pain: Score of 2

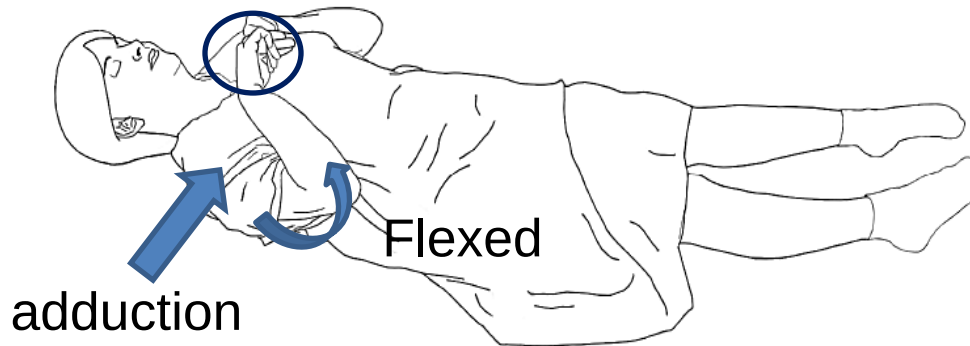
- The patient extends the limb at the elbow in response to central painful stimuli.
- Accompanying this movement is adduction of the shoulder; flexion of the wrist while the fingers either make a fist or extend.



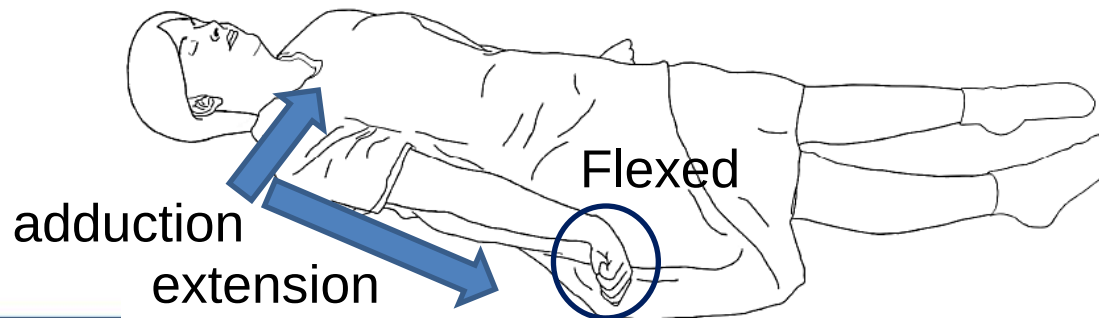
GCS: Best Motor Response



Flexion withdrawal



Abnormal flexion to pain



Abnormal extension to pain



GCS – Best Motor Response

None: Score of 1

**No movement of the limbs occurs
in response to painful central stimuli**



Components of a Basic Neuro Assessment

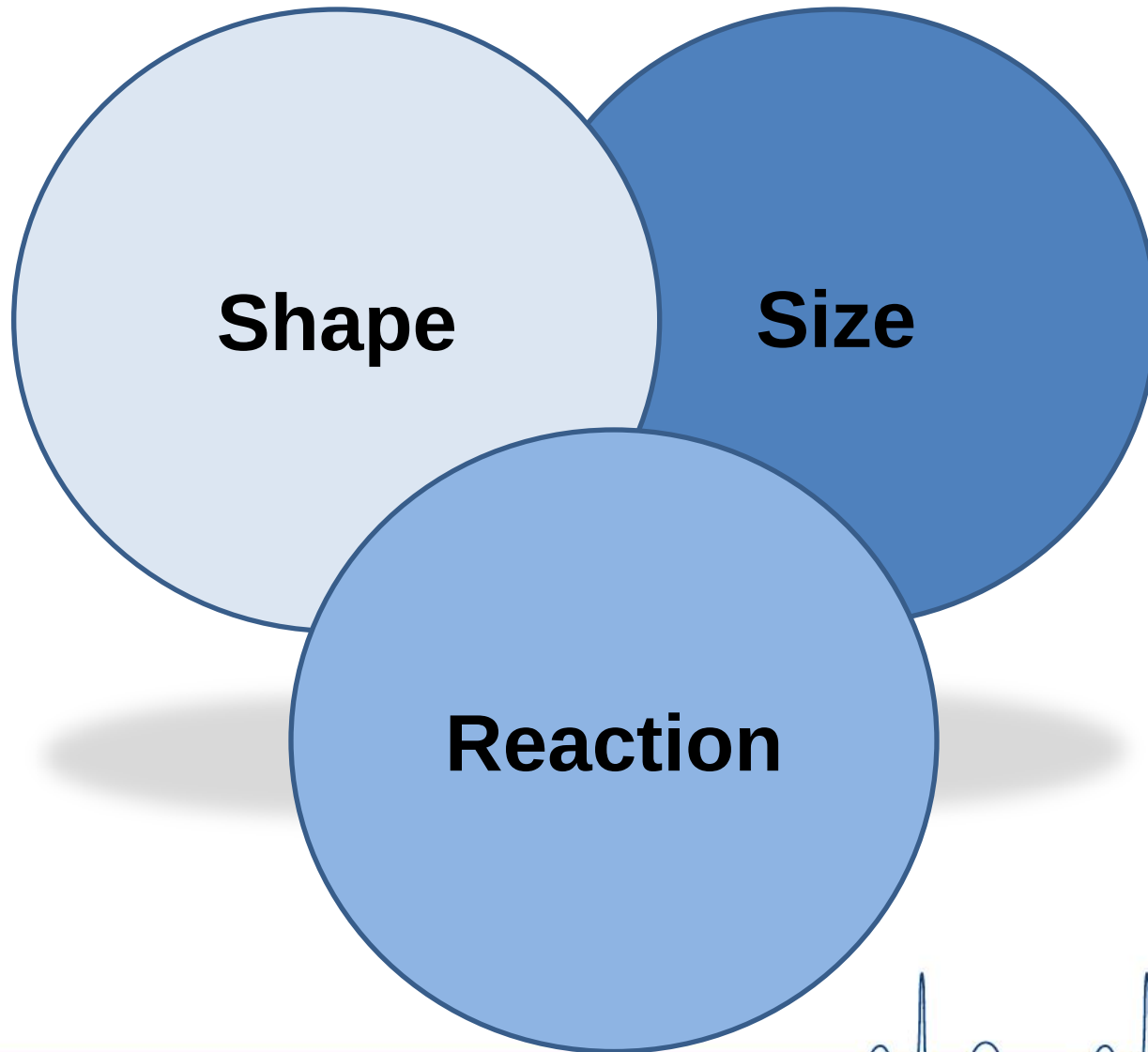
- Level of consciousness (LOC)
 - using the Glasgow Coma Scale (GCS)

- **Pupillary response**

- Limb movement/ strength
- Vital signs



Pupil Assessment



Shape

Why Assess Pupil Shape?

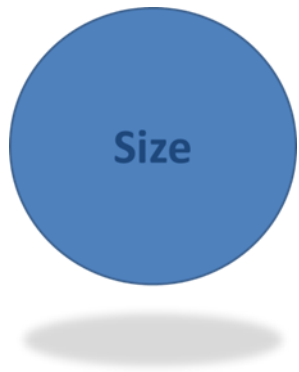
- Many neurosurgical patients are at risk of increased ICP.
- Early detection of the signs and symptoms may make interventions more effective.
- The baseline neurological assessment and ongoing assessments are the best indicators of changing ICP
- Subtle neurological changes, such as changes in pupil shape, may indicate rising ICP



Pupil Assessment: WHY?

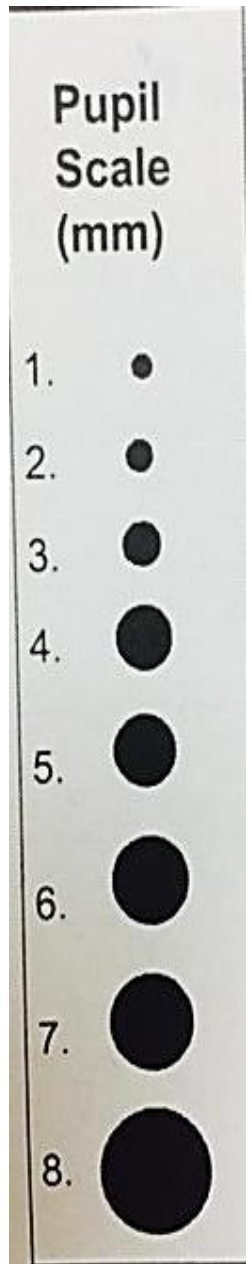
- Indication of changes in ICP:
 - Compression of the oculomotor nerve results in changes in pupillary size, shape and reaction to light
 - May be related to increasing intracranial pressure (ICP) brainstem damage, cerebral anoxia, cerebral ischemia or oculomotor nerve compression.
- **Monitor & detect for early changes to allow for early management or treatment of the cause**

P U P I L	Rt.	Size	3	3	3
		Reaction	+	+	+
	Lt.	Size	3	3	7
		Reaction	+	+	-



Pupil Assessment: Size

- Assess size after the eyes have opened & the pupils have accommodated to room light
- Size is documented in mm with normal range from 2-6 mm
- A difference of 1.5 mm between pupils should be reported to MD





Size

Pupil Assessment: Size

Size of the pupil can denote changes in neurological status. Sizes can be described as:

- Pinpoint
- Small
- Mid-position
- Large
- Dilated

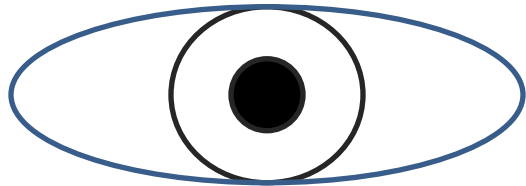
NOTE: Pupil changes in size may be LATE sign of rising intracranial pressure and neurological deterioration



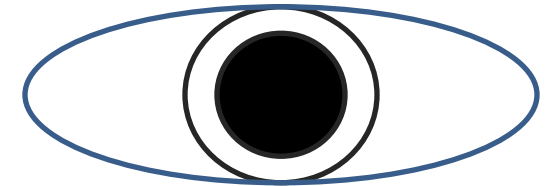
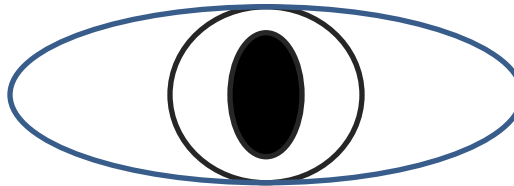
Shape

Pupil Assessment: Shape

Normal



Abnormal



Elderly patients may have irregular margins

- May indicate ↑ ICP
- Usually same side (ipsilateral)
- Sign of impending brain herniation

- Fixed + dilated
- Signs of ICP ↑
- Cranial Nerve 3 compression
- Brain herniation and brain death

Abnormal variations in pupil shapes may be related to:

- Cataracts and cataract surgery may distort pupil shape
- Disease processes: glaucoma
- Trauma or iris inflammation
- Congenital defects



Reaction

Pupil Assessment: Reaction

- Inform patient to look forward & dim room lights
- Move a concentrated light source from the outer aspect of the eye inwards:
 - Direct constriction: pupil with light source constricts
 - Repeat for other eye
 - Consensual constriction: Pupil constricts in response to light directed in opposite eye
- **Record a “+” symbol if the pupil reacts, a “–” symbol if the pupil does not react**

If eyes closed by swelling, open gently otherwise record a “C”



Reaction

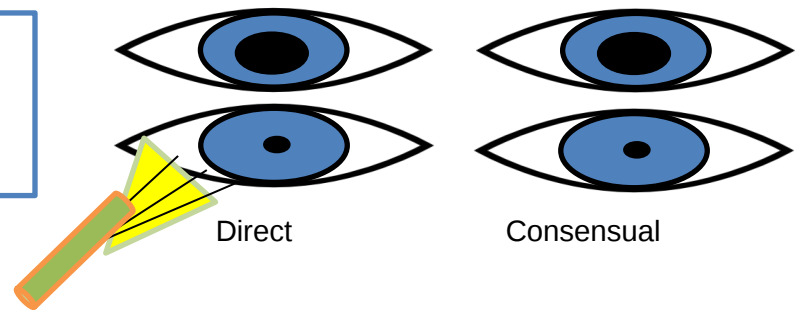
Pupil Assessment: Reaction

Pupil response can be described as:

- Brisk
- Sluggish
- Nonreactive
- Fixed
- Dilated



Pupil Assessment Steps



1

- Note pupil size and shape in ambient lighting

2

- Sweep light onto the pupil, note reaction of the pupil the light is on

3

- Repeat action noting the reaction of pupil the light is **not** shining on
- This is the consensual reaction ... **IT'S IMPORTANT TOO!**

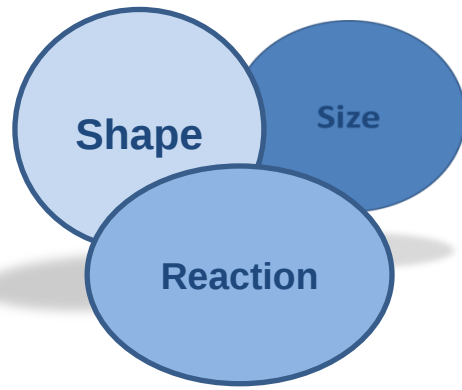
4

- Repeat for the other eye

5

- Document your assessment
- Alert team if concerned





When to be Concerned???

Changes from baseline pupil assessment size shape and/or reaction

Early signs – interventions may still be effective

- Decreased briskness to light (sluggish or no response)
- Changes in size or shape of one pupil (or both)
- Round to ovoid pupils

Late signs – may be too late for effective interventions

- Fully dilated
- Nonreactive to light
- Bilaterally fixed and fully dilated



Limb Movement and Strength

- Test legs and arms
- Compare **left** and **right** sides
- Can't obey or non-compliant?
 - Observe spontaneous movement or central pain response
- Grade the movement and strength **0 to 5**
- Abnormal flexion '**F**'
- Extension to pain '**E**'

NOTE: Assessing Limb movement & strength as part of a Neurological Assessment is NOT considered a replacement for Spinal Cord Assessment in a patient with a suspected Spinal Cord Injury.



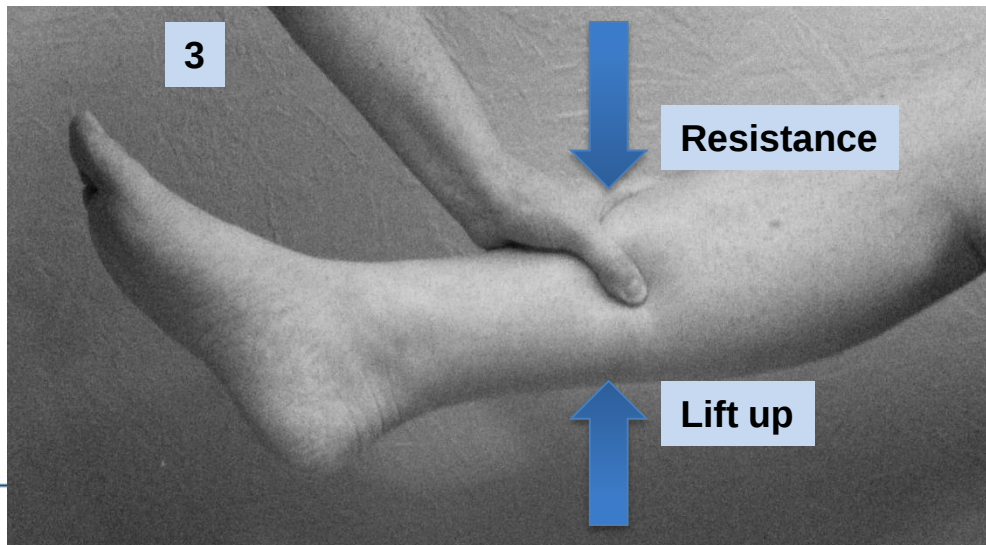
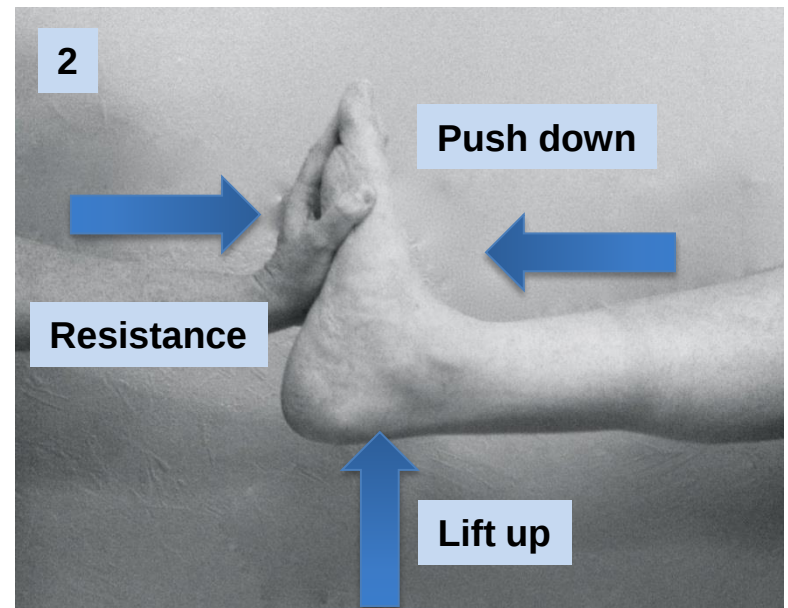
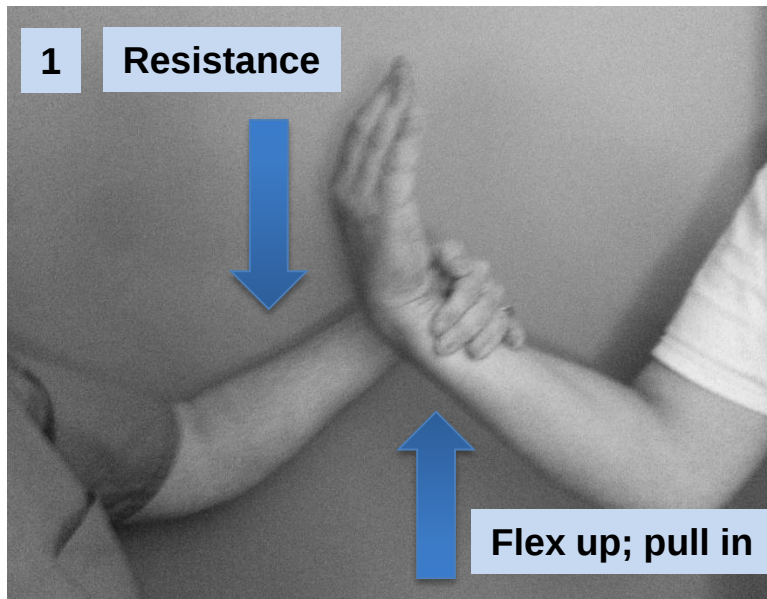
Grade	Description	What the movement means	What the movement looks like
5	Limb moves against full resistance	Normal Power	The patient has normal limb power
4	Limb moves against moderate resistance, but strength is diminished	Contraction- against Gravity and Resistance	The patient is able to lift the limb off the bed against resistance (pushing on your hand), but is not normal limb power
3	Limb may move against minimal resistance or gravity. E.g., If the patient lifts the arm off a surface and it immediately drops back down	Contraction- against Gravity	The patient is able to lift the limb off the bed (against gravity)
2	Limb moves on a horizontal surface with the inability to lift against gravity	Contraction- Gravity eliminated	The patient is able to move the limb but cannot lift it off the bed
1	Limb or muscle flickers	Flicker of muscle contraction	The patient is attempting to move the limb
0	No movement is observed		

Not Applicable for:

- Spinal Cord Pathology – Use ASIA scoring or facility specific policy and procedure and associated documentation
- If unable to assess limb movement/strength due to limb Fractures/Limb Traction. Document not applicable on patient care record, and document reason in interdisciplinary notes



Some Examples of Applying Gravity and Resistance



Bring Limb off surface for gravity
- then apply counter resistance



Vital Signs

- Increasing fluctuations in vital signs including blood pressure, heart rate and respiratory rate coupled with a deteriorating GCS and Neurological status can indicate rising intracranial pressure.
- This can be a emergency and should be communicated and addressed **IMMEDIATELY** by a physician.



Questions and Answers

THANK YOU!

