Biomechanics

- Hyperextension + Hyperflexion	- SCM most affected
- Myofascial damage	- Head rotates into hyperextension, anterior cx muscles stretched - muscles at their tension limit - remaining forces put into the ALL and anterior fibres of the annulus fibrosis
- CN affected - 2nd	- Flexion - Damage in suboccipital region of the spine - muscles subocciptal and occipitofrontalis are more traumatised
- PTSD occurs	

Mechanisms of Injury

- Rear end collisions mainly - linear + angular rearward motion of the head to the torso	
Shear, compression, tension and torque	- Shearing is vertical in vertebral column + horizontally on the spine, more likely to occur during the head extension and torso accelerating forward stage, more likely at C5-C7
	- Compression - head is accelerated downward towards the spine/tissues are compression during extension phase. Forced extension - applies compressive forces to posterior structures and tensile forces to anterior structures
	- Tension - Extension phase, anterior neck muscles, compression of posterior neck structures
	- Torque Small force at the end can create a larger force at the base - rotational acceleration of the head on the fulcrum at the top of the cx spine

Classfications - WAD

0 - No Neck complaints and NO physical signs	Rarely presents to clinicians
I - Neck complaints of stiffness, pain or tenderness but with no physical signs	Very minor muscular damage
II - Neck complaints AND MSK signs	Limited ROM and point tenderness
III - Neck complaints AND Neuro signs	Decreased/absent DTR, weakness and sensory loss
IV - Neck complains AND fracture/Dislocation	**REFER IMMEDIATELY**

most patients are Grade II WAD

Injury Severity

- There are factors and variables that could make people susceptible to severe injury:	- Angle of the collision - More of an angle = more susceptible
- Speed & Size of vehicles - Moving rear end collision	- Road conditions - wet/icy roads
- Occupant Head position - pt looking straight forward? Head turned? - Head turn = more severe	- Gender - women more than men, anatomy/seating position
- Occupant awareness of impact - bracing	- Head Restraints - should be at back of the head touches anterior part, low restraints can act as a pivot during hyperextension
- Seat Belts - Body held in place, momentum transferred to head and neck, head twists during flexion phase due to one shoulder being restrained	- Direct body impact - Head or other parts of the body hitting object during collision
- Loss of consciousness - Severe G forces	- Medical Hx - cx spine degeneration, history of HA/chronic soft tissue pain can worse injury
- Pain onset - immediate onset of pain, more likely to have pain post injury	

History

- Neck Pain - myofascial damage	TMD
Dysphagia	Dizziness
Deafness	Tinnitus
Nausea	Fatigue
Visual symptoms	Memory Loss
Poor Concentration	Superficial tenderness of the scalp
Pyschological symptoms - anxiety, depression, anger	PTSD- PTSD questionnaire - 4 or more on a seven point scale, refer to a mental health professional

Examination

- MAKE SURE IT IS SAFE	Cx spine orthopaedic exam
Neurological involvement	Signs of myelopathy
Potential causes of other symptoms	

Prognosis

Higher probability of prolonged disability: Women, Multiple injuries, Older People, Rear end collisions

Delayed functional recovery: High initial pain intensity, More symptoms, Greater initial disability

Psychological S&S Slower recovery - Passive coping style, Depressed mood, fear of movement

Management	
Acute Phase (2wks after injury)	Education - explain, reassure, coping strats
	Rest with mild, gentle ROM
	Exercises should start within 4 days of injury
	Cryotherapy
	NSAIDs - 400-600mg 4 times a day for first 4 days
	Gentle mobilisation (away from painful & restricted ROM)
	Soft Tissue Techniques
	Encourage return to normal activities when possible
	TENS
Subacute phase (>2-12 weeks)	Pain control - 1g Paracetamol four times a day
	Active exercise - DNF + posture training , Isotonic, Isometrc, Ice + Heat after exercise
	Mobilisation - traction/ gentle manipulation
	Modalities (US, TENs)
	Soft Tissue Techniques
	Nutritional Support
	Advice and coping strats
Chronic (>12 weeks)	Manipulation/mobilisation + active Exercise
	Proprioceptive retraining
	Advice and coping strats
	Strengthening exercises
	Extension retraction exercises for cx spine
Late Whiplash	Resist pressure to over treat and over investigate
	Encourage return to normal activities
	Motivational interviewing
	Reduce influence of compensation claims
	CBT