

Ch. 4, part 3: Peripheral Nervous System

Objectives:

1. Communication between CNS & PNS:
afferent (sensory) pathway versus efferent (motor) pathway of information

This will be VERY important to learn for nursing pharmacology!!

Much of this chapter is review of Ch 4 part 1:

- > Voluntary muscle movement
- > Autonomic regulation of body under sympathetic & parasympathetic control.

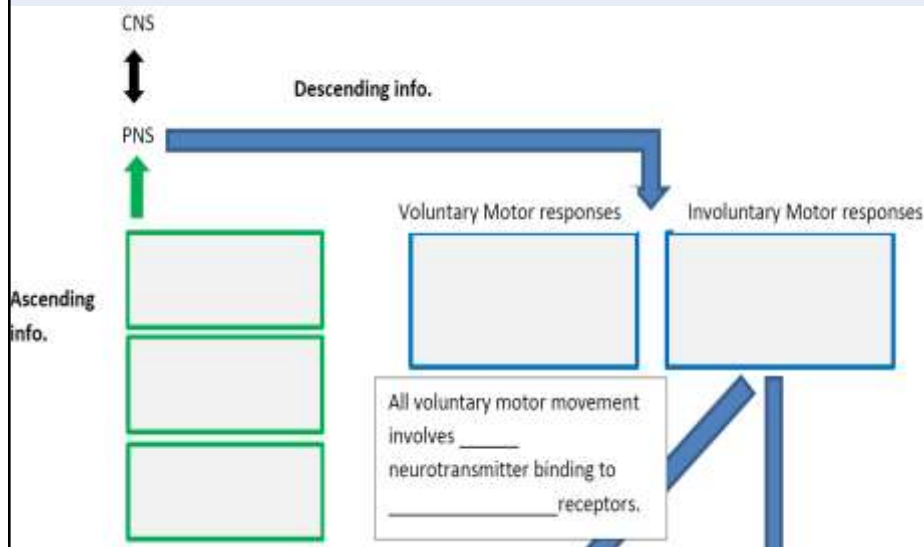
1. Junction between CNS and PNS (cranial nerves & spinal nerves)



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Part 1: Communication between CNS & PNS

Pg 69 Wiki text



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Pg 69 – 73 Wiki text – my comments

Rest & Digest
Fight/Flight

Parasympathetic Motor responses	Sympathetic Motor responses
<p>_____ nerves</p> <p>heart rate _____</p> <p>BP _____</p> <p>bronchioles _____</p> <p>GI peristalsis _____</p> <p>GI secretions _____</p> <p>GI arterioles _____</p>	<p>_____ nerves</p> <p>heart rate _____</p> <p>BP _____</p> <p>bronchioles _____</p> <p>GI peristalsis _____</p> <p>GI secretions _____</p> <p>GI arterioles _____</p> <p>skeletal muscle arterioles _____</p>
<p>_____ nerves</p> <p>urination _____</p> <p>defecation _____</p>	<p>_____ nerves</p> <p>urination _____</p> <p>defecation _____</p>
<p>All parasympathetic motor responses work by _____ neurotransmitter binding to _____ receptors.</p>	<p>All sympathetic motor responses work by _____ neurotransmitter binding to _____ what 3 types of adrenergic receptors?</p> <p>_____ - which controls what?</p> <p>_____ - which controls what?</p> <p>_____ - which controls what?</p>

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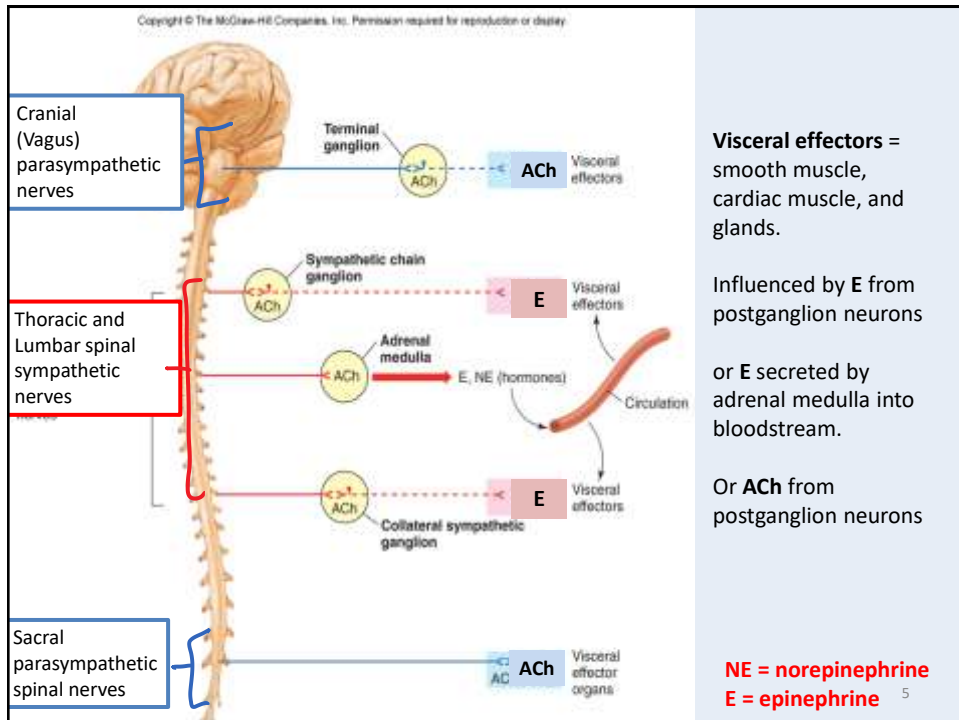
Part 1: Communication between CNS & PNS

Click [HERE](#) for blank PNS flow chart.

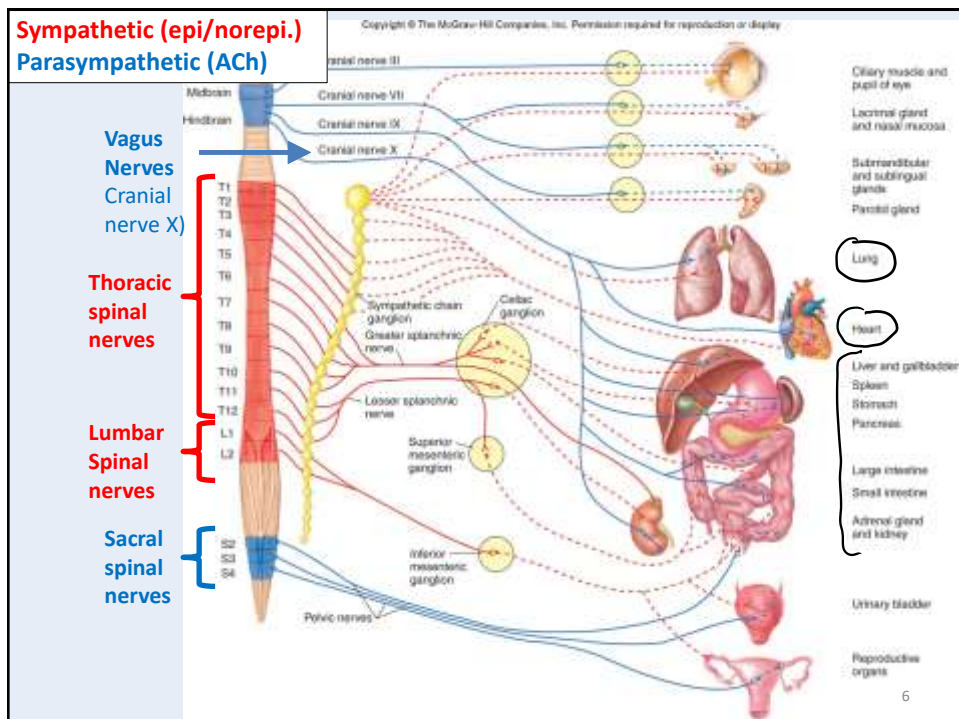
Click [HERE](#) for KEY PNS flow chart.

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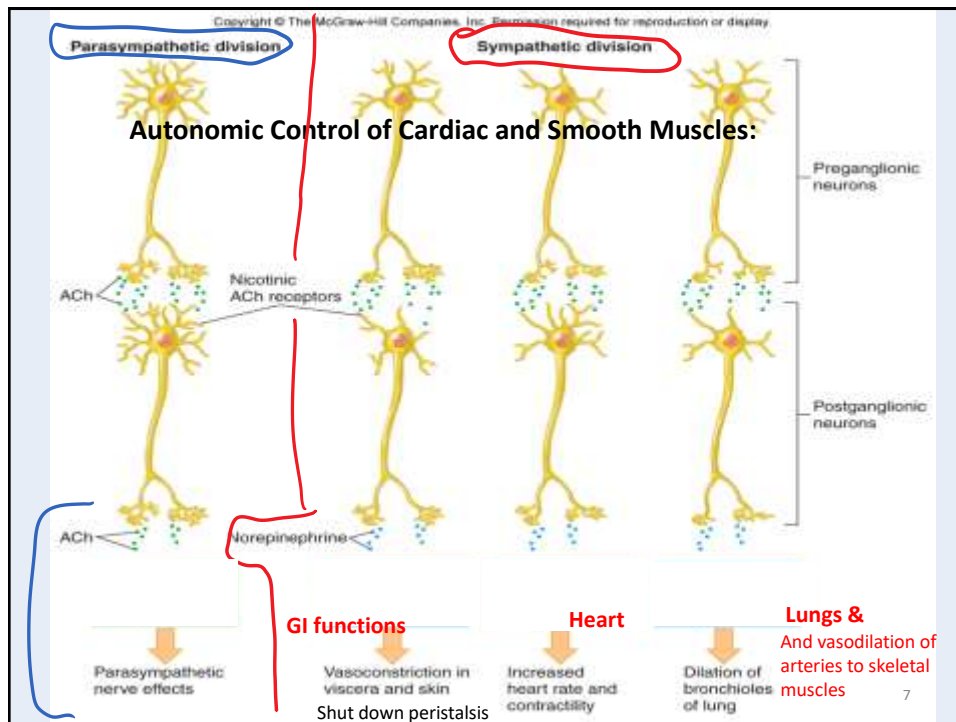
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For ACh and its receptors: Pg 69 – 73 Wiki text – my comments

TABLE 6.4 Effects of Acetylcholine (ACh) in the PNS

Neurons Releasing ACh	Location	Type of ACh Receptor	Response	Physiological Effect
Somatic motor	Skeletal muscles	Nicotinic	Depolarization, producing action potentials	Muscle contraction
Preganglionic neurons of ANS	Autonomic ganglia	Nicotinic	Depolarization, producing action potentials	Stimulates postganglionic neurons of the ANS
Postganglionic parasympathetic neurons	Smooth muscles, glands	Muscarinic	Depolarization, producing action potentials	Contraction of smooth muscles; secretion of glands
Postganglionic parasympathetic neurons	Heart	Muscarinic	Hyperpolarization, slowing the rate of automatic production of action potentials	Slowing of heart rate

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Pg 69 – 73
Wiki textMy
comments

TABLE 6.2 Examples of Sympathetic and Parasympathetic Effects of the Autonomic Nervous System

Organ or Function Affected	Sympathetic Effects	Parasympathetic Effects
✗ Heart rate	Increased	Decreased
✗ Blood pressure	Increased	Slightly decreased
✗ Urinary bladder	Increased sphincter tone	Decreased sphincter tone (for urinating)
✗ Intestinal contractions	Decreased	Increased
✗ Lungs	Dilation of bronchioles	Constriction of bronchioles
✗ Parotid glands	Decrease	Salivation

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TABLE 6.3 Selected Adrenergic Effects in Different Organs		
Organ	Adrenergic Effects of Sympathoadrenal System	Adrenergic Receptor
Eye	Contraction of radial fibers of the iris dilates the pupils	α_1
Heart	Increase in heart rate and contraction strength	β_1 primarily
Skin and visceral vessels	Arterioles constrict due to smooth muscle contraction	α_1
Skeletal muscle vessels	Arterioles dilate due to hormone epinephrine	β_2
Lungs	Bronchioles (airways) dilate due to smooth muscle relaxation	β_2
Stomach and intestine	Contraction of sphincters slows passage of food	α_1
Liver	Glycogenolysis and secretion of glucose	α_1, β_2

See [Clinical App ONLINE](#):
Beta blockers.

B1 & B2 blocker =

↓ HR and BP & bronchoconstrict
good for hypertension BUT not people w/respiratory prob. (it will cause bronchoconstriction!)

B1-specific blocker =

↓ HR and BP
no effect on bronchioles
good For hypertension WITH respiratory problems (won't cause bronchoconstriction)

B1 agonist =

↑ HR and cardiac output
good for heart failure patients)

B1 & B2 agonist =

↑ HR and cardiac output &
Bronchodilate

B2 agonist =

Bronchodilates
good for people w/respiratory problems

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Review

- Communication between CNS & PNS.
 1. Sensory division of PNS (special senses, visceral senses, somatic senses)
 2. Motor division of PNS
 - > Somatic motor division
 - = voluntary control skeletal muscles with ACh & nicotinic cholinergic receptors
 - > Autonomic motor division
 - Sympathetic regulation (epinephrine & adrenergic receptors) can speed some things up and slow other things down.
 - Parasympathetic regulation (ACh and muscarinic cholinergic receptors) can slow some things down and speed other things up.

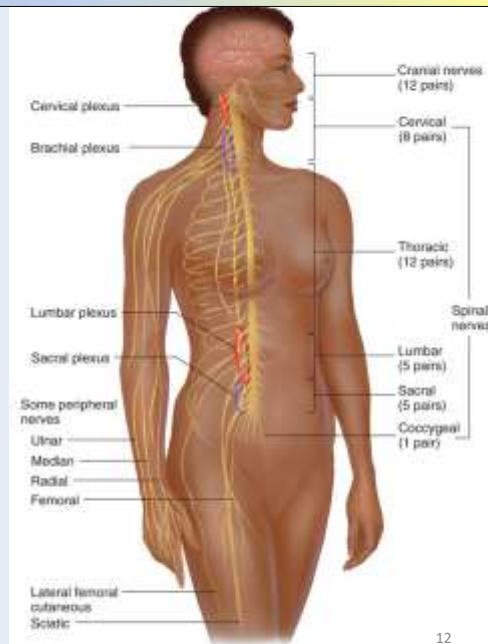
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Part 2: Junction between CNS (spinal cord) and PNS

Objectives:

- Understand how the PNS communicates between the CNS, and the rest of the body.
- Know / Review:
 - 12 pairs cranial nerves
 - 11 cranial nerves are part of the PNS.
(*Optic cranial nerve is part of the CNS*)
 - 31 pairs spinal nerves



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Review of Cranial Nerves:

What is the mnemonic devices for remember the **list of 12 pairs cranial nerves**?

Oh _____ Very _____
 Once _____ Good _____
 One _____ Vacations _____
 Takes _____ Are _____
 The _____ Heavenly _____
 Anatomy _____
 Final _____

What is the mnemonic devices for remember **which cranial nerves are sensory (S), motor (M), or both (B)?** *X = mistake in text!*

Some _____ Says _____
 Say _____ Big _____
 Marry _____ Brains _____
 Money _____ Matter _____
 But _____ Most _____
 My _____
 Brother _____

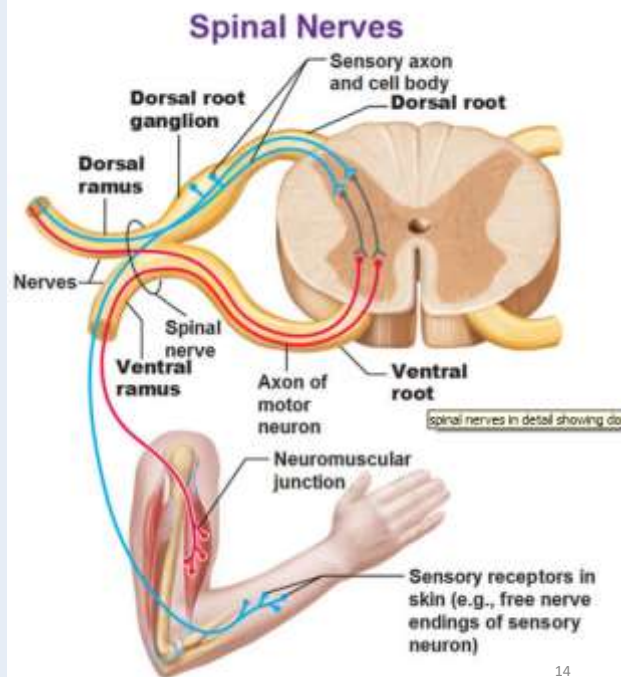
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TABLE 6.1 The Cranial Nerves

Nerve Number and Name	Composition	Some Functions
I Olfactory	S Sensory only	Olfaction (smell)
II Optic	S Sensory only	Vision
III Oculomotor	M Motor and sensory	Serves muscles of the eye
IV Trochlear	M Motor and sensory	Serves the superior oblique eye muscle
V Trigeminal	B Motor and sensory	Sensory from face and mouth; motor to muscles of mastication (chewing)
VI Abducens	M Motor and sensory	Serves the lateral rectus eye muscle
VII Facial	B Motor and sensory	Serves the muscles of facial expression, lacrimal glands, and salivary glands
VIII Vestibulocochlear	S Sensory only	Equilibrium and hearing
IX Glossopharyngeal	B Motor and sensory	Serves the pharynx (throat) for swallowing, posterior third of tongue, parotid salivary gland
X Vagus	B Motor and sensory	Sensations from visceral (internal) organs, and parasympathetic motor regulation of visceral organs
XI Accessory	M Motor and sensory	Serves muscles that move head, neck, and shoulders
XII Hypoglossal	M Motor and sensory	Serves muscles of the tongue

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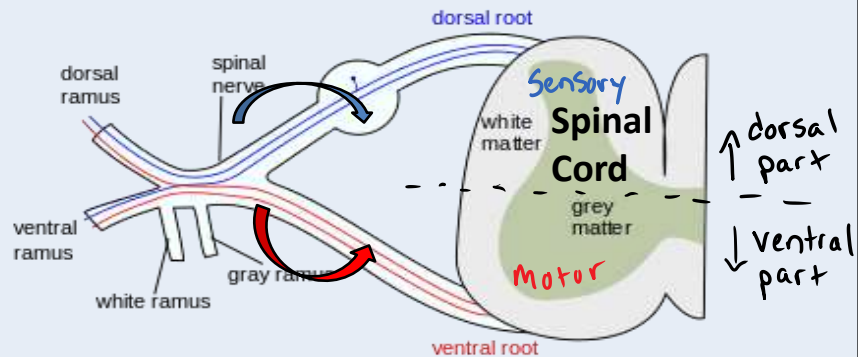
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31 Pairs of Spinal Nerves in PNS

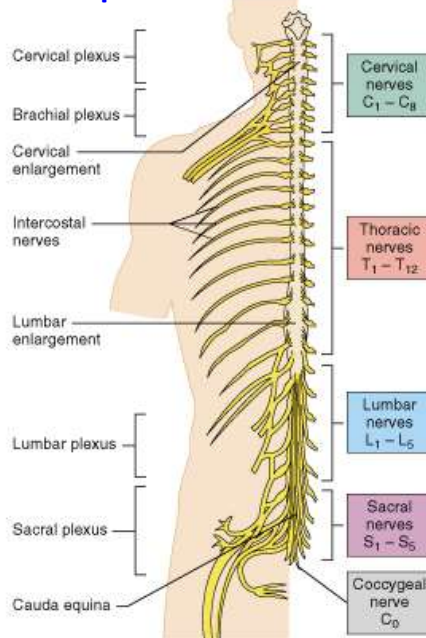
- **Sensory tracts** (axons) enter spinal cord at dorsal side.
- **Motor tracts** (axons) exit spinal cord at ventral side.



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31 Pairs of Spinal Nerves in PNS



31 Spinal Nerve Pairs divided into:

1. Cervical spinal nerves (C1-C8)
2. Thoracic spinal nerves (T1-T12)
3. Lumbar spinal nerves (L1-L5)
4. Sacral spinal nerves (S1-S5)
5. Coccygeal spinal nerve (Co1)

These spinal nerves branch out into dorsal & ventral rami, and form a nerve plexus.

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Review

- Organization of the PNS.
 - 1) 12 pairs cranial nerves
 - 2) 31 pairs spinal nerves (divided into 5 vertebral regions)

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