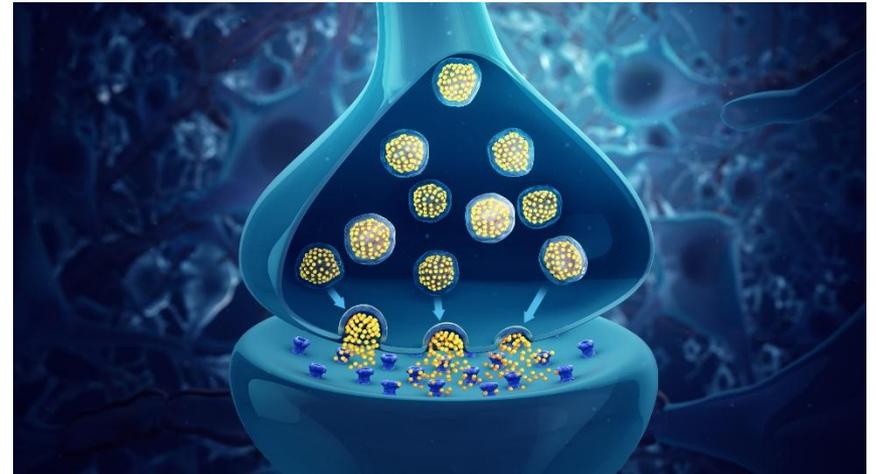




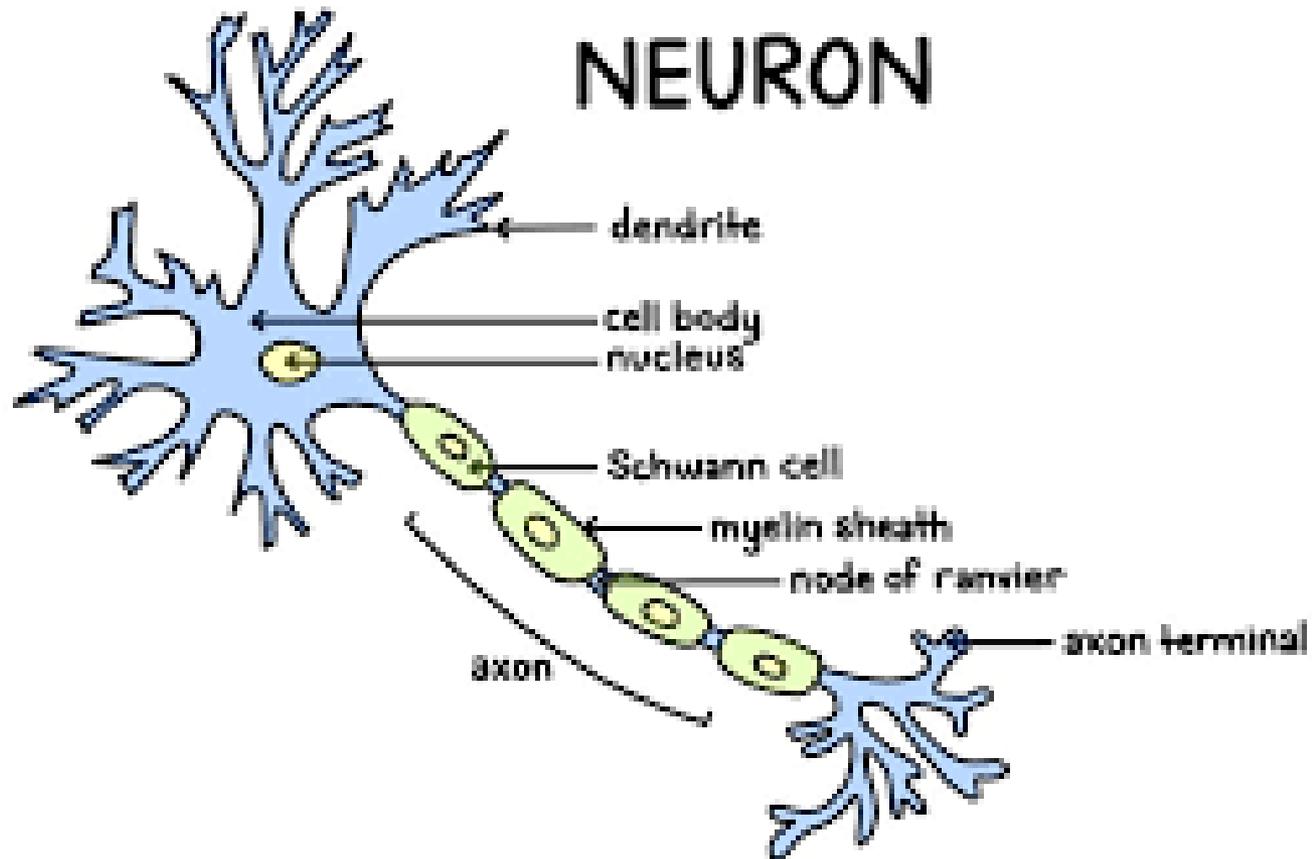
Sedation Dental Nursing:
Part 2: applied anatomy and physiology
(dental sedation)

Structure

- Nerve function
- How do benzodiazepines and nitrous oxide work
- Respiratory depression
- Anatomy of intravenous access
- Revision questions

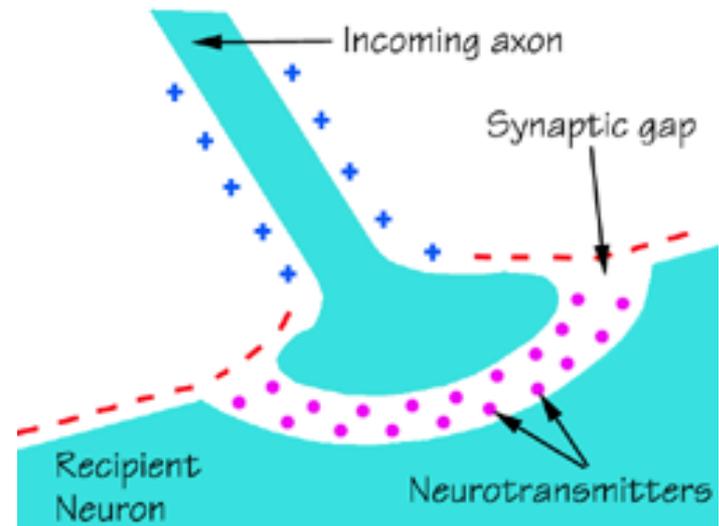
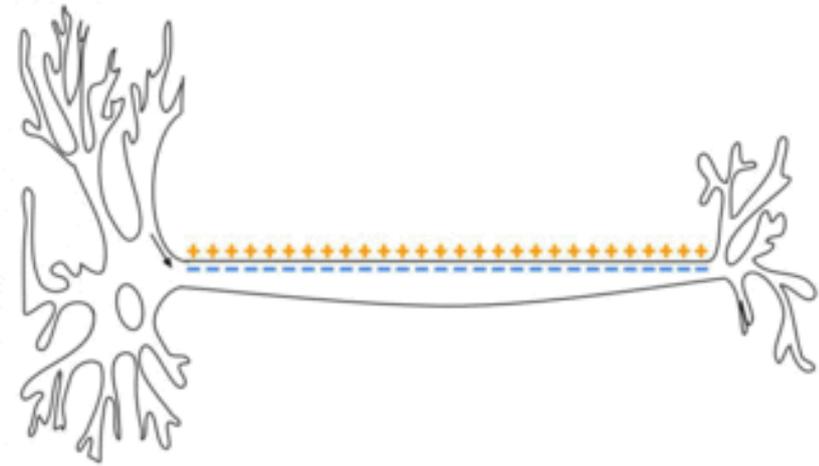


Neuron (nerve cell)



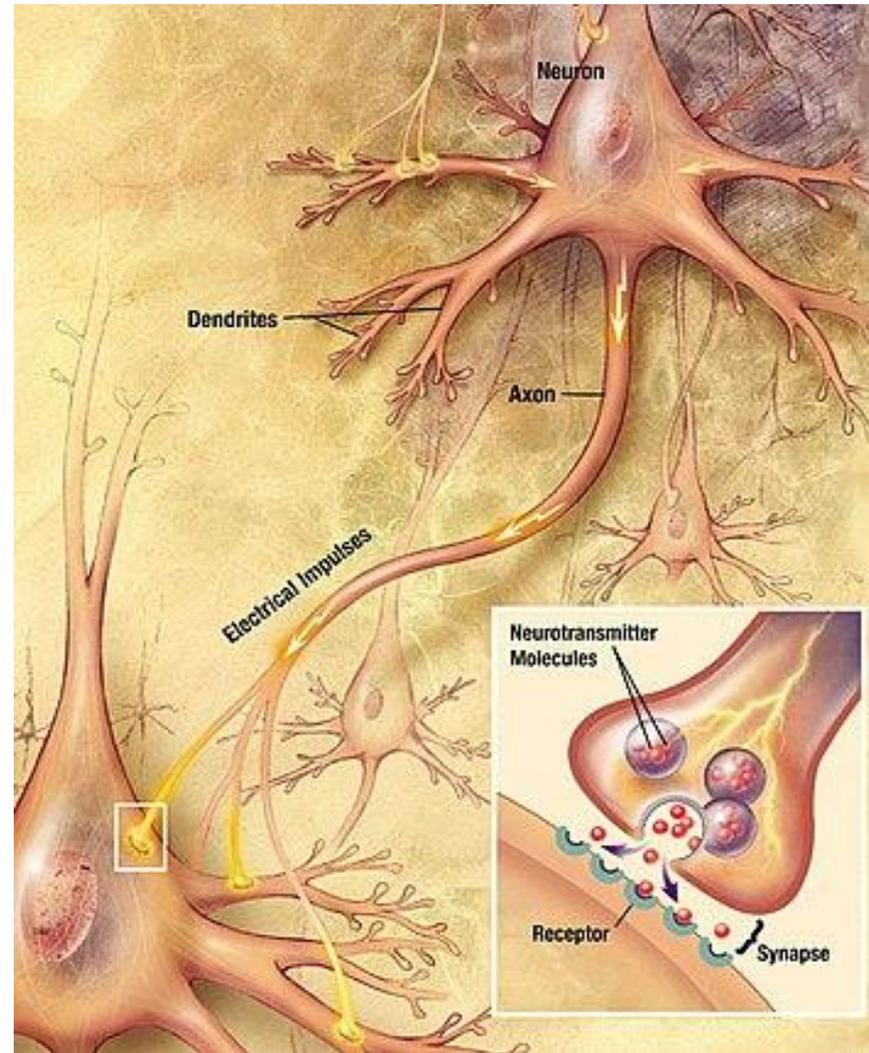
How nerves work

- **Action potential-** nerve impulse *along* a nerve axon
- **Synapse-** *between* nerves, uses “neurotransmitters”
- Nerve-to-nerve communication, important for many neural functions



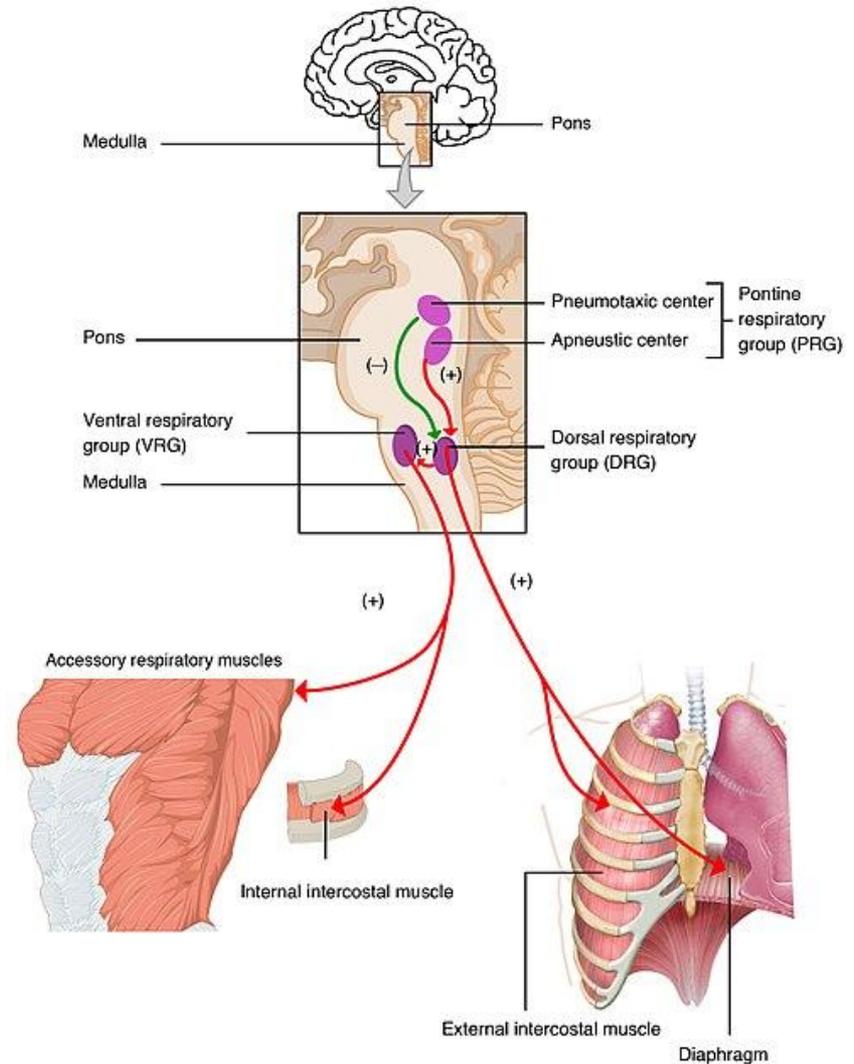
How benzodiazepines work

- Neurotransmitters can be excitatory or inhibitory
- Main *Inhibitory* neurotransmitter: “**GABA**”
- Midazolam *increases* effectiveness of this inhibitory neurotransmitter
- **Decreases** neural functions generally: anxiolysis, sedation, muscle relaxation, memory, anticonvulsant



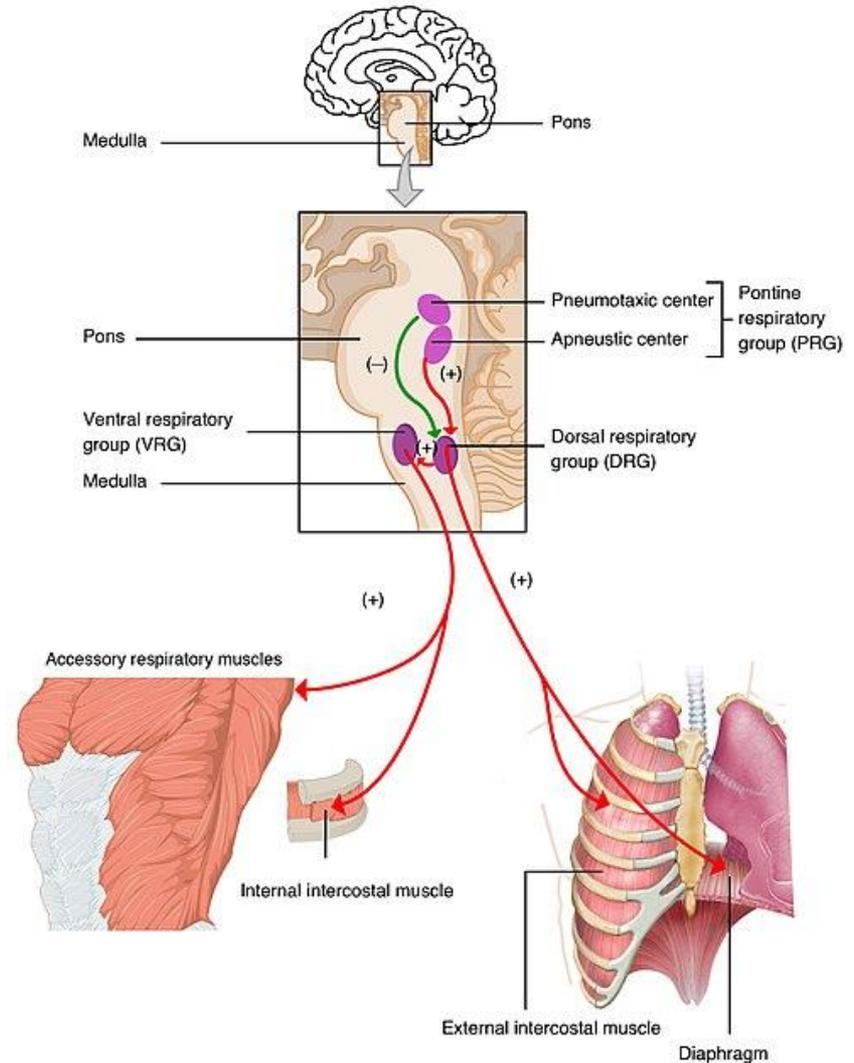
Respiratory Centres in Brain

- Pons and Medulla oblongata (in brainstem) control breathing
- Affect diaphragm and other respiratory muscles (especially intercostal muscles)



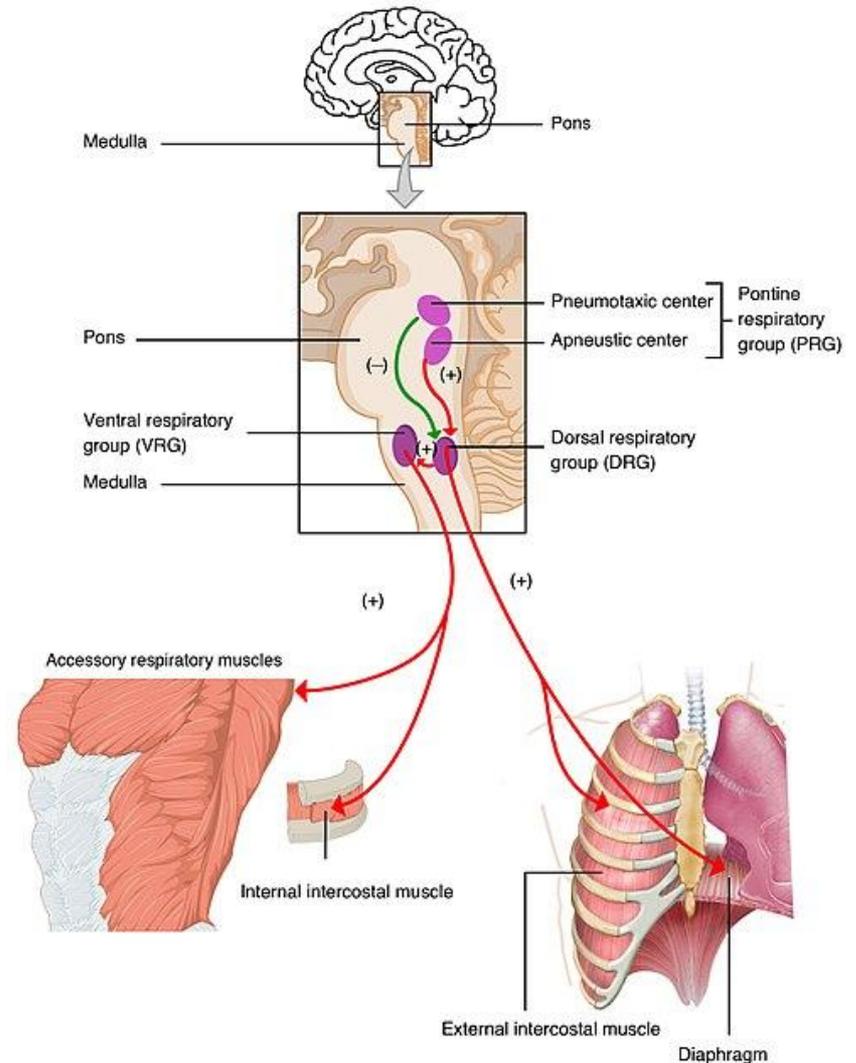
Respiratory Centres in Brain

- Control mainly by “**autonomic**” nervous system (automatic or involuntary)
- Can be overcome by voluntary (conscious or “somatic”) part of nervous system to some degree (e.g. “take a big breath!”)



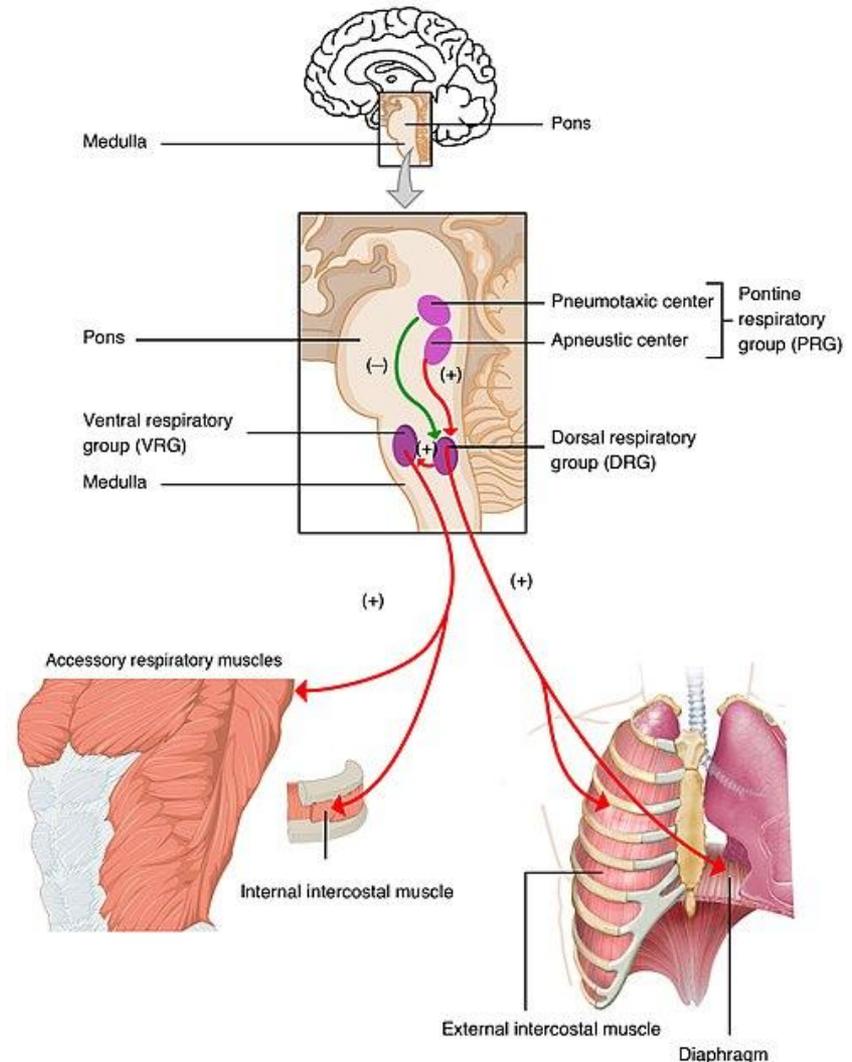
Respiratory Centres in Brain

- Reacts to:
 - chemicals and pH (acidity) in the blood
 - stretch in the lungs
- CO₂ makes the blood more acidic
- Respiratory centre reacts to increase breathing rate
- This reduces the level of CO₂ in blood (feedback loop)



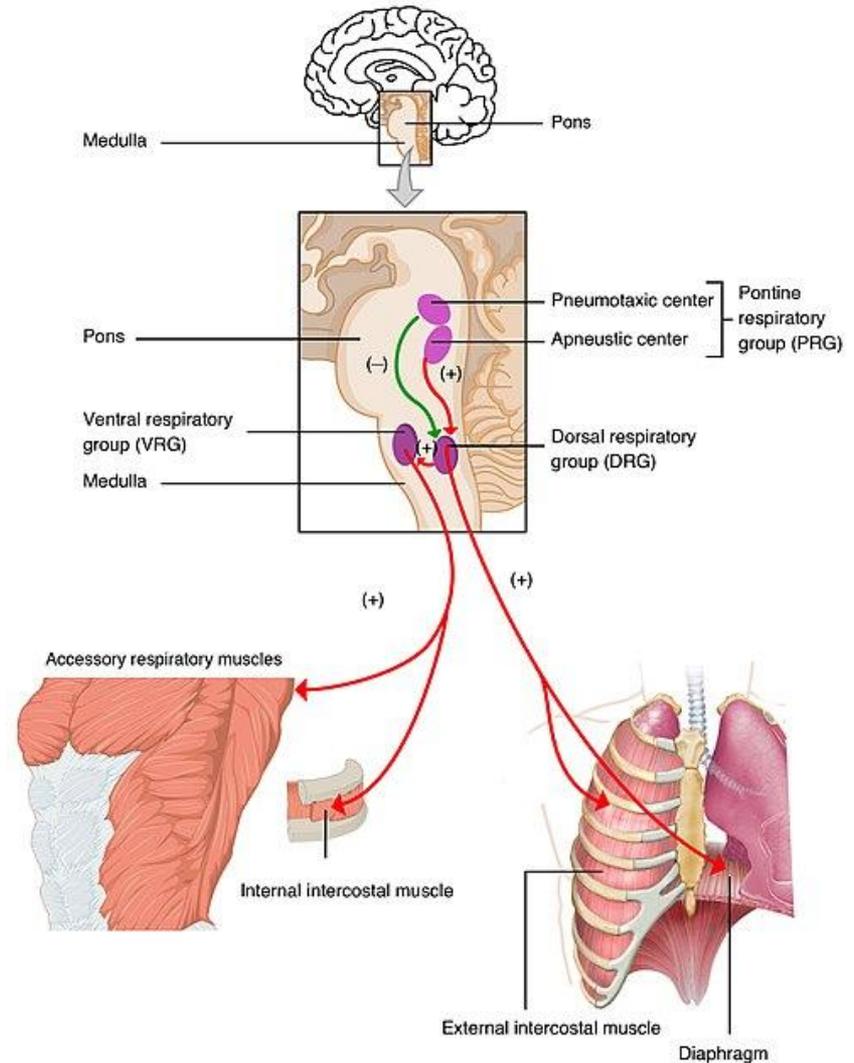
Respiratory Centres in Brain

- This sensitivity to CO₂ and other stimuli is **depressed** by **drugs** such as benzodiazepines (e.g. midazolam)
- Sedative drugs such as benzodiazepines are therefore “**respiratory depressants**”
- **AVOID IV sedation** in respiratory disease e.g. COPD



Effect of age

- Older people less efficient drug metabolism
- May be **more sensitive** to drugs, including respiratory depressants like midazolam
- Older people more easily **over-sedated, CAUTION-avoid, or use lower dose**



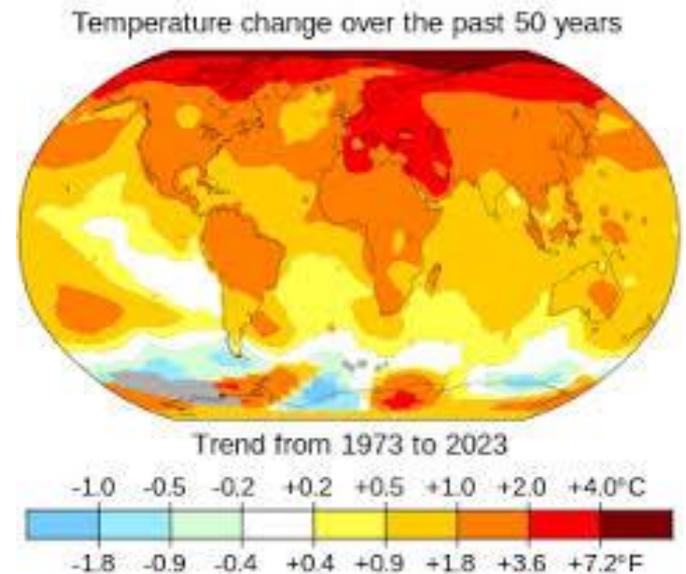
Nitrous oxide N₂O

- Complex neural actions, and not well understood
- Analgesic and anxiolytic effects different pathways
- NMDA and dopaminergic pathways, also some effect on GABA (like midazolam)



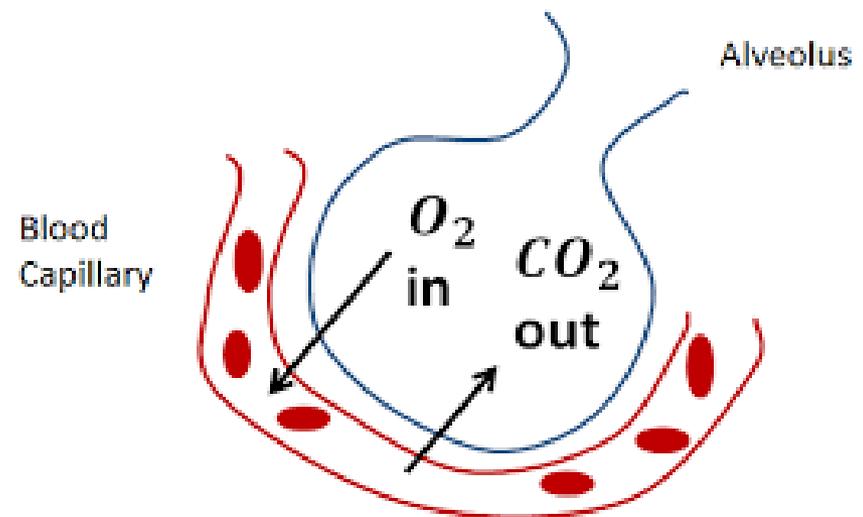
Nitrous oxide

- Also a greenhouse gas!
- “Penthrox” possible future alternative, less environmental impact



Nitrous oxide: Diffusion Hypoxia

- After inhalational sedation procedure finished:
- N₂O crosses from bloodstream into alveoli, can dilute O₂ in the lungs causing hypoxia
- Give a couple of minutes of 100% O₂ after N₂O switched off, this reduces the risk of **Diffusion Hypoxia**



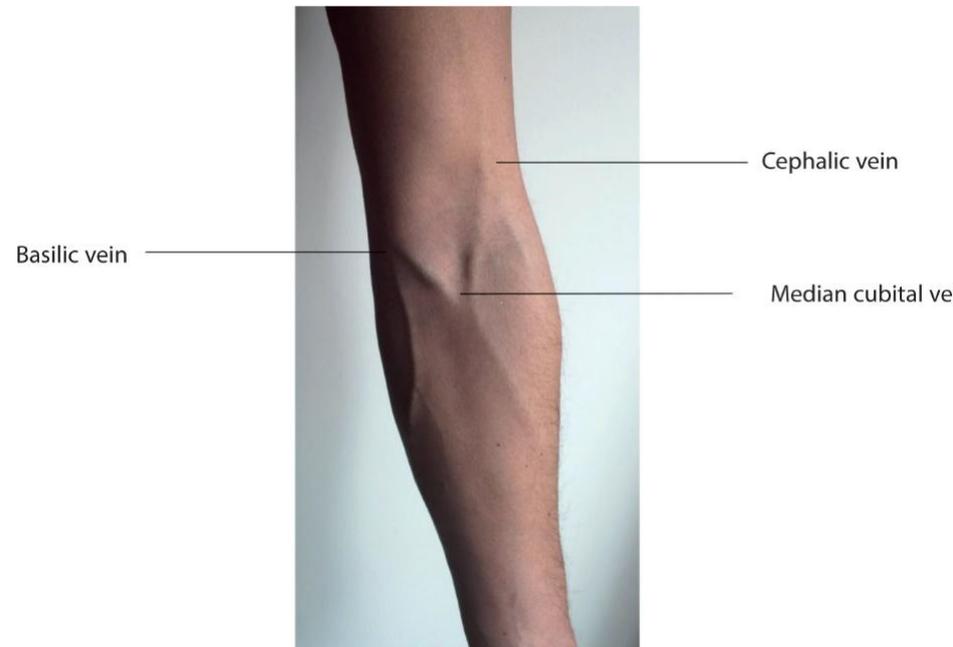
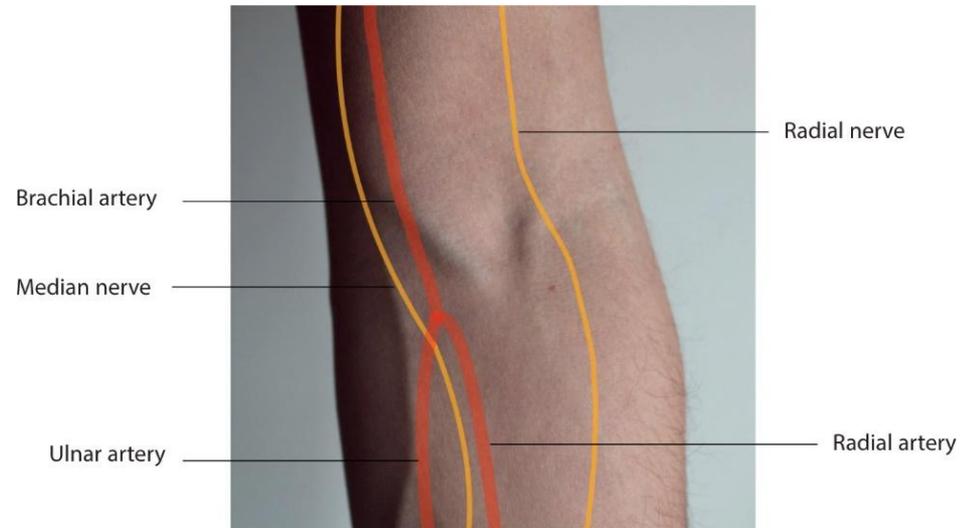
Anatomy of Intravenous Access

- Tourniquet:
- aim to compress superficial veins but not arteries
- blood can come into the arm (in arteries), but harder to leave (in veins), superficial veins dilate (get bigger) so easier to cannulate



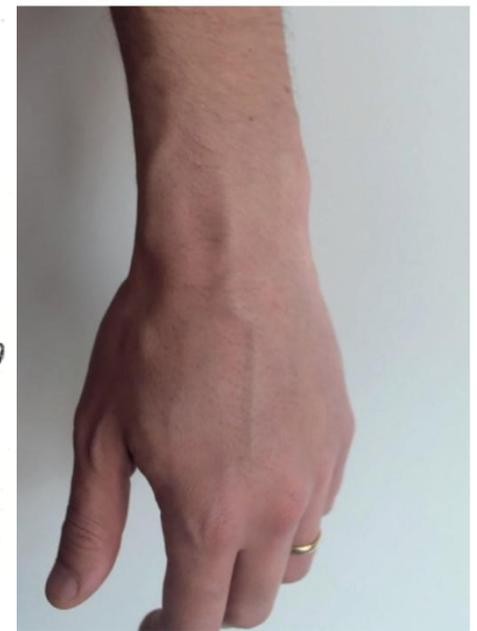
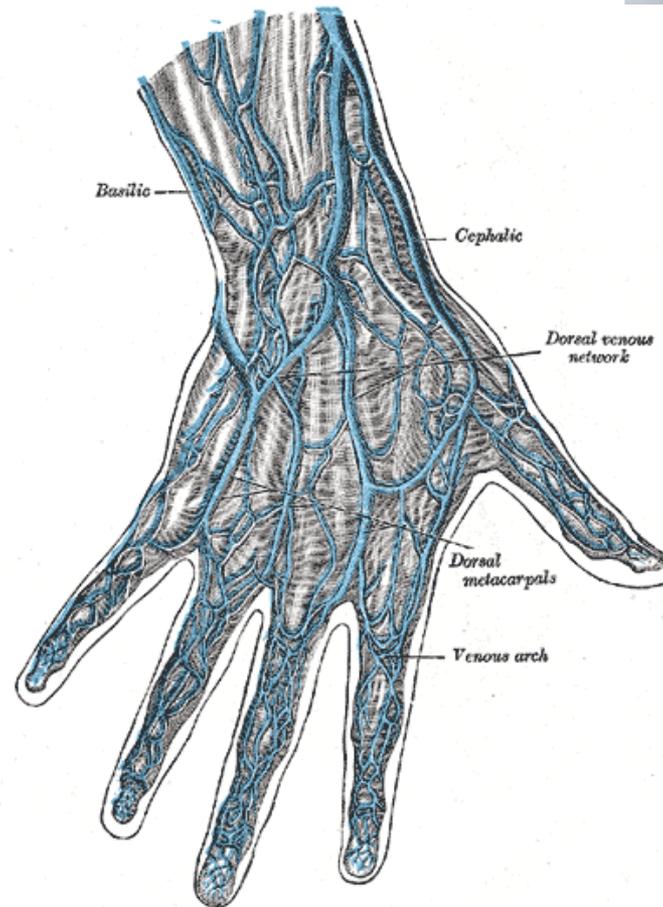
Anatomy of Intravenous Access

- Antecubital fossa in upper limb
- Brachial artery and median nerve : medial (toward body side)
- IV access **lateral** (away from body side) safer
- Superficial veins used, often median cubital vein



Anatomy of Intravenous Access

- Dorsum of hand
- Network superficial veins: “Dorsal Venous Network”
- Pro’s and Con’s of each site



Questions

- Into which heart chamber does blood from the body *arrive*?
- Blood in the aorta comes from which chamber of the heart?
- Name the blood vessels which supply the heart muscle itself:
- Name the very small blood vessels which usually connect arteries with veins:
- What are the 2 components of blood pressure called?

Questions

- Into which heart chamber does blood from the body *arrive*?
 - Blood in the aorta comes from which chamber of the heart?
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 - Name the very small blood vessels which usually connect arteries with veins:
 - What are the 2 components of blood pressure called?
- **Right atrium**
 - **Left ventricle**
 - **Coronary arteries**
 - **Capillaries**
 - **Systolic / Diastolic**

Questions

- What is the main function of heart valves?
- Name 2 pathological structural conditions that can affect heart valves
- Name the serious infection which can affect heart valves (sometimes antibiotic cover is given to prevent this):
- What is the SA (sino-atrial) node, and where is it?
- Aspirin is often given to patients with heart disease- what sort of drug is aspirin?

Questions

- What is the main function of heart valves?
- Name 2 pathological structural conditions that can affect heart valves
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- What is the SA (sino-atrial) node?
- Aspirin is often given to patients with heart disease- what sort of drug is aspirin?
- **To prevent backflow from one chamber or vessel to the previous chamber**
- **Stenosis (stiffness) and Incompetence (leakiness)**
- **Infective endocarditis**
- **The electrical “pacemaker” of the heart muscle (initiates contraction); in right atrium near the opening of the superior vena cava**
- **Anti-platelet (helps stop clots from propagating)**

Questions

- What is the name of the small sacs in the lung where gas exchange takes place?
- How does the diaphragm enable breathing?
- Which nerves controls the diaphragm?
- What is the pathological term which includes chronic bronchitis and emphysema?
- Intravenous sedation is safe in patients with COPD: True or False?

Questions

- What is the name of the small sacs in the lung where gas exchange takes place?
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- **Alveoli**
- **Contraction causes it to flatten, increasing the volume of the thoracic cavity, and drawing air in (inspiration)**
- **Phrenic nerves (from the neck)**
- **Chronic obstructive pulmonary disease (COPD)**
- **False, sedation should usually be avoided in patients with COPD in primary care**

Questions

- A patient has a resting blood pressure of 145/95, what is this condition?
- A patient has a resting heart rate (pulse) of 50 per minute, what is this condition?
- What is a typical Tidal Volume?

Questions

- A patient has a resting blood pressure of 145/95, what is this condition?
 - **Hypertension**
- A patient has a resting heart rate (pulse) of 50 per minute, what is this condition?
 - **Bradycardia**
- What is a typical Tidal Volume?
 - **500 ml**

References

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