Odontogenic Infection, Pain Control and Prescribing

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Learning Outcomes

Describe common causes of odontogenic infections and their spread.

Discuss indications and contraindications for antibiotic prescribing regimens.

Explain what pain is and common theories for propogation.

Assess a patient in pain and manage their pain effectively.

Construct a basic formulary for common prescriptions.

Quiz Question 1

What is an odontogenic infection?

An infection that originates from the tooth OR its surrounding structures

Quiz Question 2

In Australia, what percentage of all adult dental emergency visits to public hospital emergency departments are due to dental infections?

Approximately 37%

Quiz Question 3

What is a cause of an odontogenic infection?

- Caries
- Failed endodontic therapy
- Pericoronitis
- Periodontal disease
- Trauma

Quiz Question 4

What are the most common pathogens associated with an odontogenic infection?

- Streptococci Viridians
- Streptococci Anginosis
- Prevotella Specia
- Fusobacterium Species

Quiz Question 5

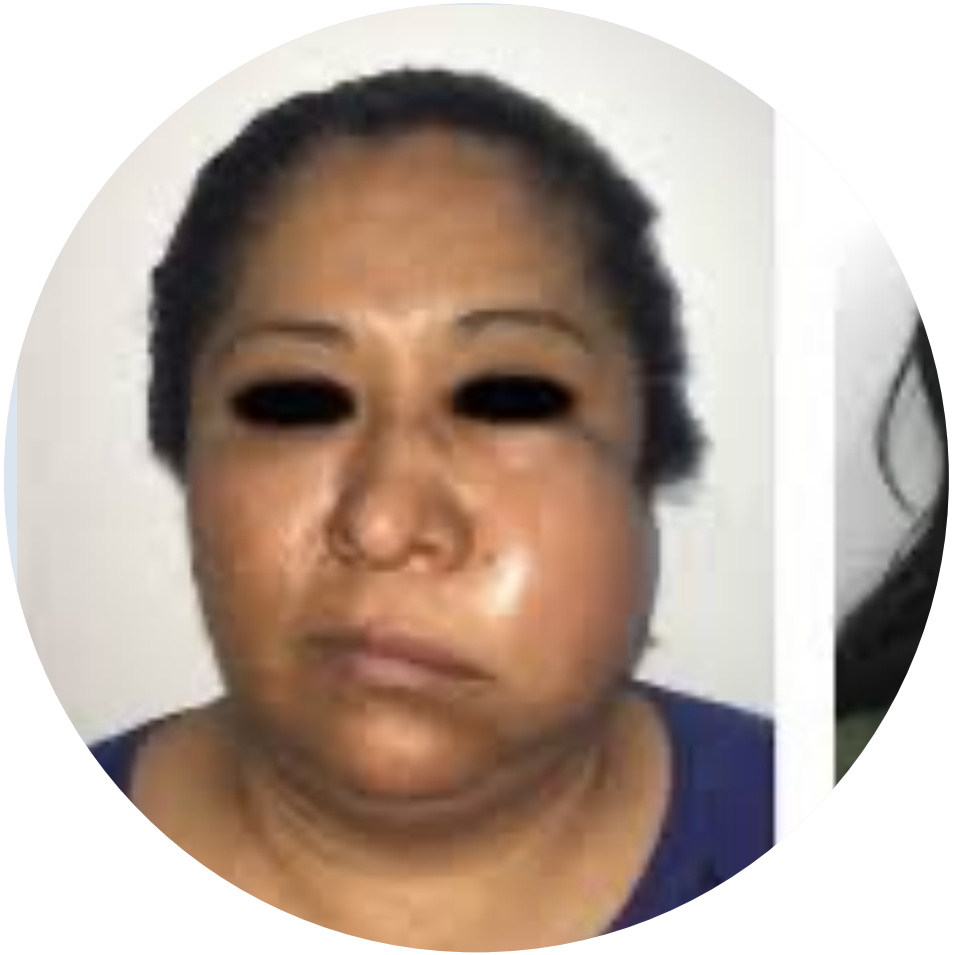
Bacterial species causing periapical abscesses predominantly:

Anaerobic

Quiz Question 6

What are types of odontogenic infection?

- All of the above
- Periapical abscess
- Periodontal abscess
- Cellulitis
- Osteomyelitis
- Odontogenic Sinusitis
- Ludwig’s Angina



Diagnosing Odontogenic Infections

The subtle and the not so subtle.

As always...

Start with the basics and take a history

- SOCRATES

As always...

Start with the basics and take a history

S

SITE

As always...

Start with the basics and take a history

- Site
- O

Onset

As always...

Start with the basics and take a history

- Site
- Onset
- C

Character

As always...

Start with the basics and take a history

- Site
- Onset
- Character
- R

Radiation

As always...

Start with the basics and take a history

- Site
- Onset
- Character
- Radiation
- A

Associated Symptoms

As always...

Start with the basics and take a history

- Site
- Onset
- Character
- Radiation
- Associated symptoms
- T

Timing

As always...

Start with the basics and take a history

- Site
- Onset
- Character
- Radiation
- Associated symptoms
- Timing
- E

Exacerbating/ Relieving Factors

As always...

Start with the basics and take a history

- Site
- Onset
- Character
- Radiation
- Associated symptoms
- Timing
- Exacerbating / Relieving Factors
- S

Severity

As always...

Start with the basics and take a history

- Site
- Onset
- Character
- Radiation
- Associated symptoms
- Timing
- Exacerbating / Relieving Factors
- Severity

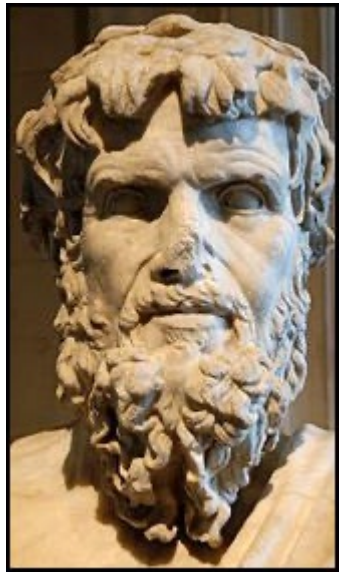
What are we expecting?

- Taking a history is not just chatting to a patient.
- We are asking a series of questions to narrow down our focus and generate differential diagnoses prior to examining the patient.
  - Reversible pulpitis?
  - Irreversible pulpitis?
  - Non odontogenic:
    - Salivary glands - ‘mealtime syndrome’
    - Tonsillar
    - Other

What are we expecting?

- Whilst taking the history we are also performing our first ‘distant’ examination.
  - Looking for any swelling
  - Watching for difficulty swallowing or speaking
  - Watching for wincing in pain in certain movements
  - Observing perfusion

What are signs of inflammation?



Aulus Celsus (30BCE-38CE)

Rubor (redness)

Tumor (swelling)

Dolor (pain)

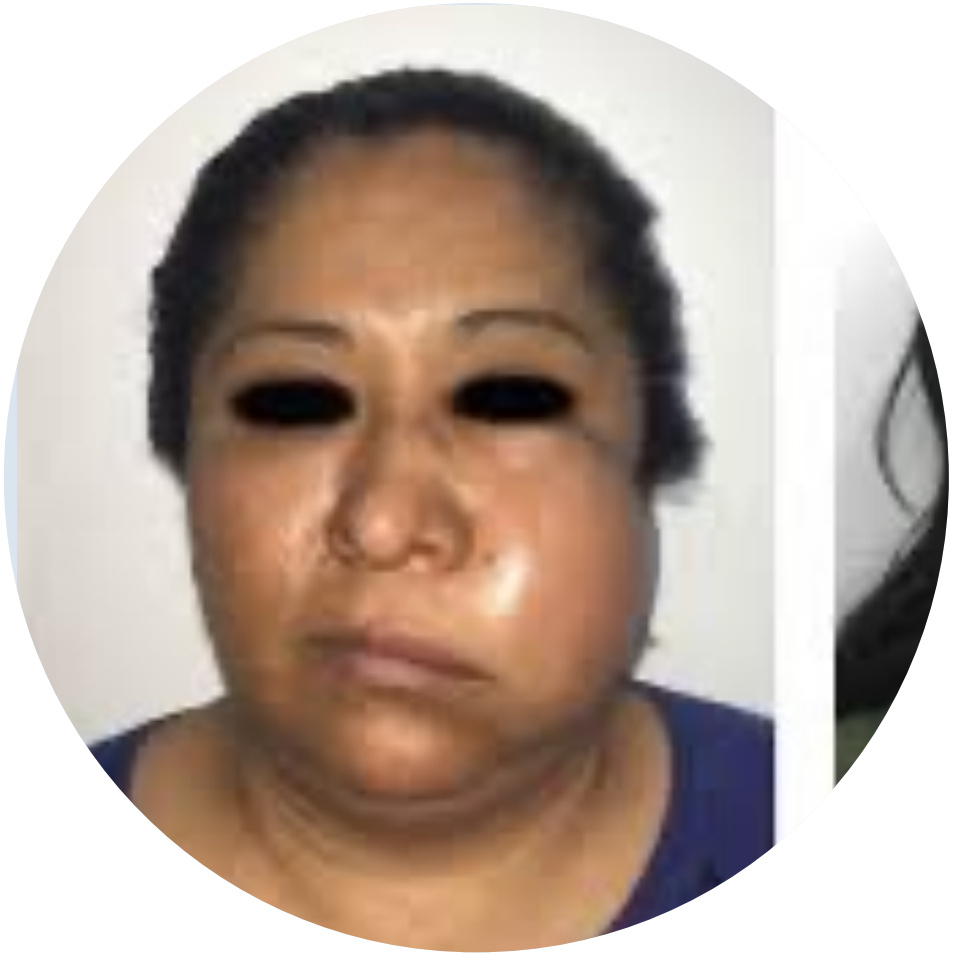
Calor (heat)

What are local signs of (bacterial) infection?

- Erythema?
- Swelling?
- Pain?
- Heat?
- Purulence?

What systemic signs of (bacterial) infection?

- Elevated Heart Rate
- Elevated Respiratory Rate
- Elevated Blood Pressure
- Elevated temperature (fever)
- Confusion
- Malaise
- Shivers/Shakes/Rigors



Lets talk about spreading infection

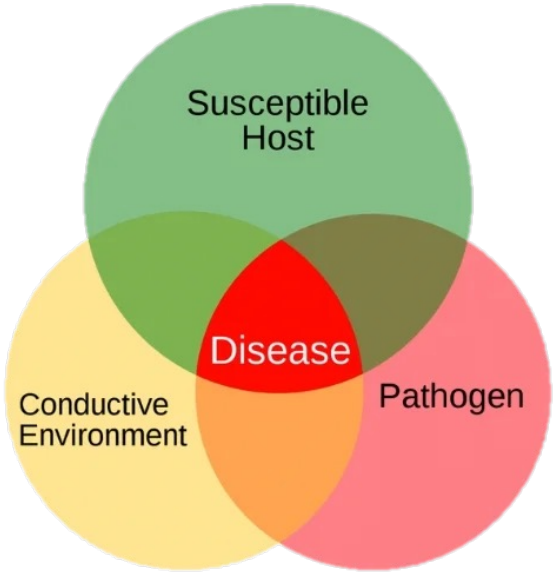
The importance of assessment.

Spread of infection

Once established, the infection might spread...

In the head and neck, this can get dangerous:

- Airway obstruction (bad)
- Intracranial spread (bad)
- Septicaemia (bad)



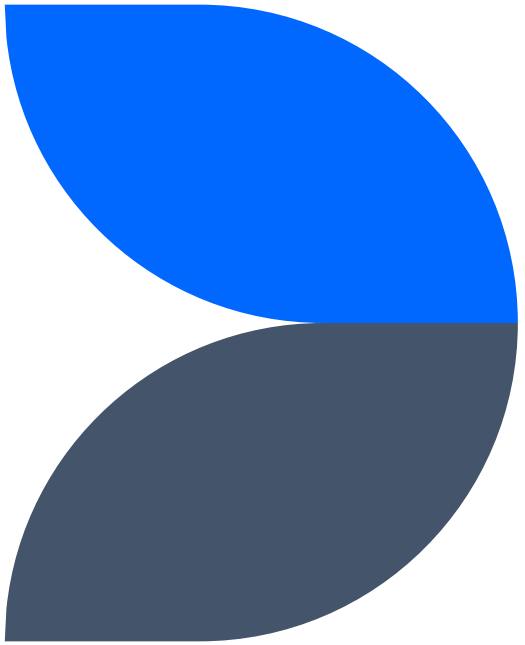
If an organsism moves from where it is usually found, it can cause infection. E.g. from the oral cavity to bone.

Infections can be as a result of disruption to the normal flora or defence mechanisms such as giving antibiotics or immunosuppressants.

How might it spread?

- Fascial spaces / tissue planes
- Lymphatics
- Blood

A quick side quest



Quiz Question 7

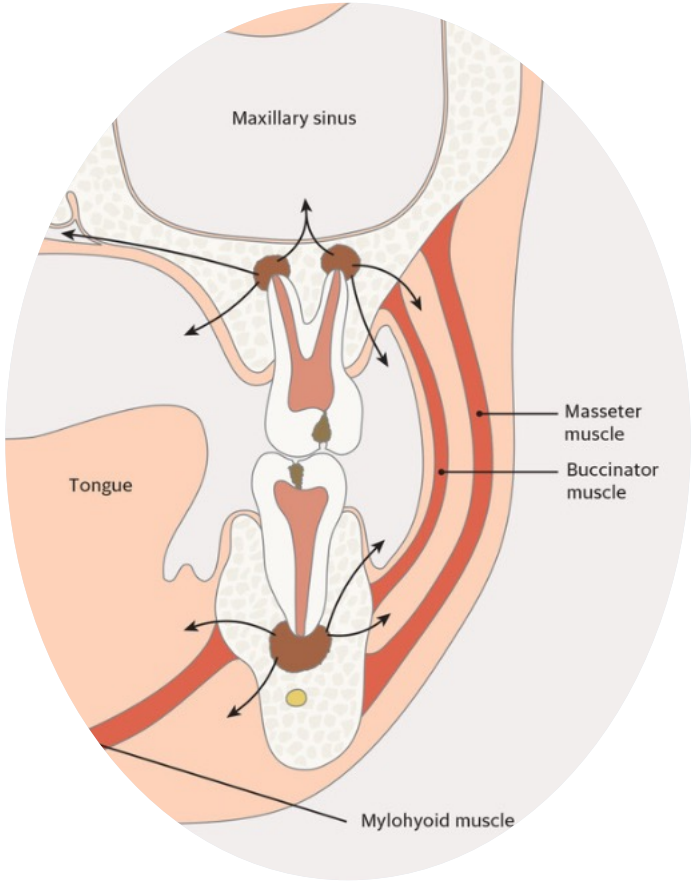
What is a periapical abscess?

A collection of purulence at the apex of the tooth

Quiz Question 8

What is a lateral periodontal abscess?

A localized accumulation of purulence within the gingival wall of a periodontal pocket of a tooth



What is a fascial space?

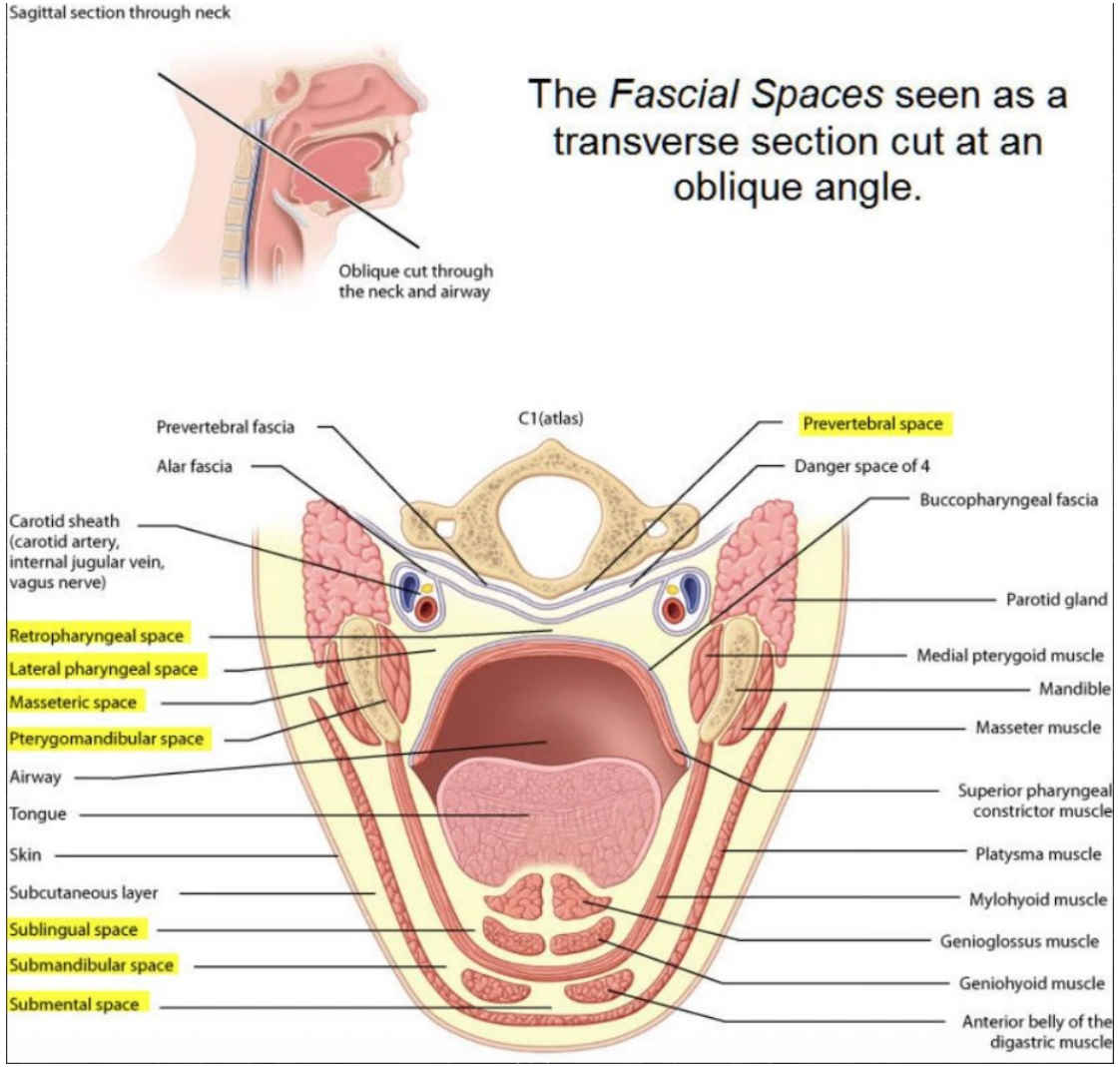
- Loose fibrous connective tissue envelopes, and in the head and neck divided into superficial and deep.

- It is important to note that these ‘spaces’ don’t exist in health. They are filled with ground substance.

- In spreading infection this gets broken down and enlarged. Spread occurs via hydrostatic pressure.

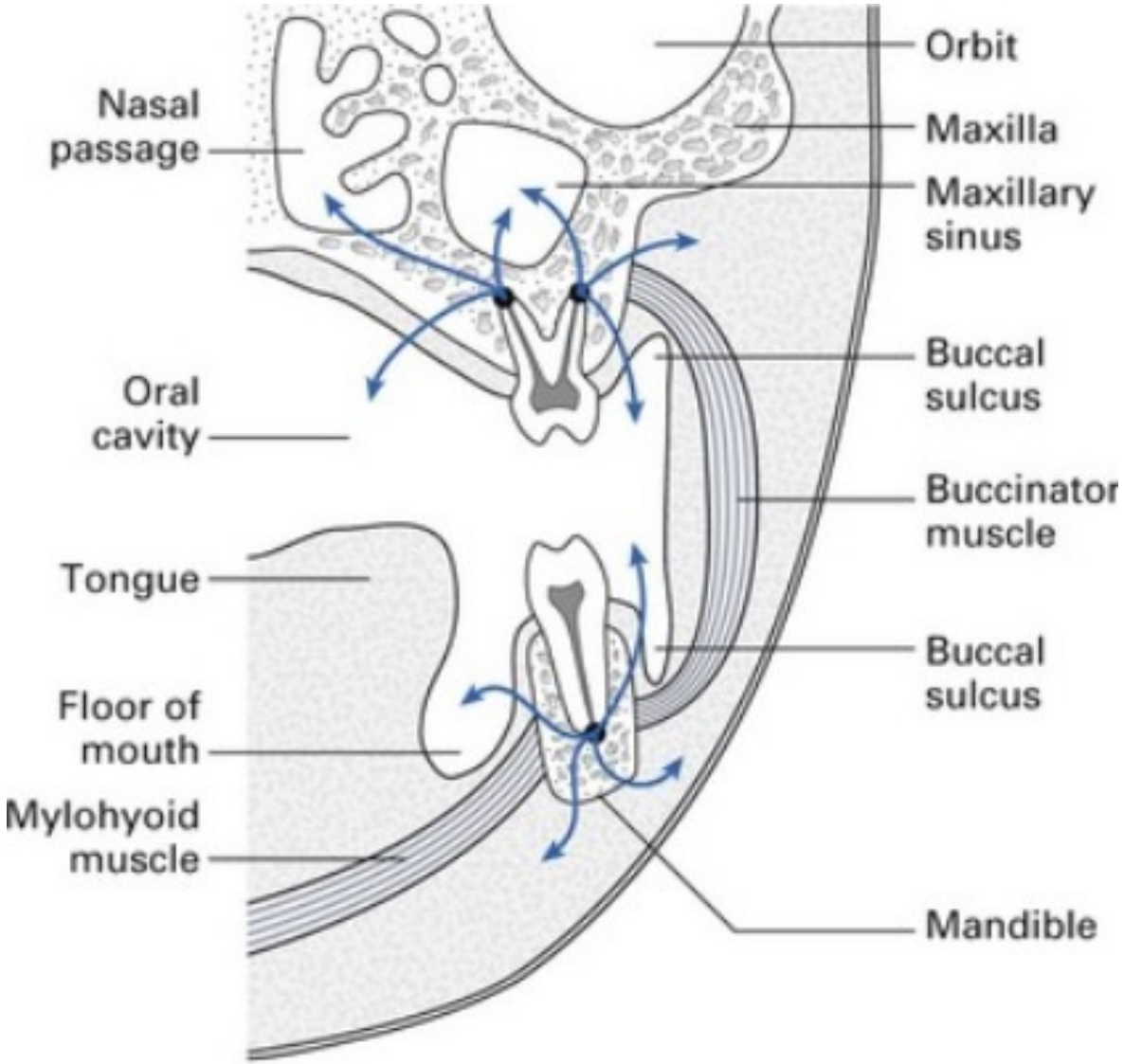
Fascial Spaces – 4 Subtypes

Fascial Space Subtype	Subtype components
Fascial spaces of the face	Canine, Buccal, Parotid, Infratemporal Masticatory: Masseteric, Pterygomandibular and Temporal
Suprahyoid fascial spaces	Sublingual, Submental, Submandibular, Lateral Pharyngeal, Peritonsillar
Infrahyoid fascial spaces	Pretracheal
Fascial spaces of the Neck	Retropharyngeal Danger Carotid Sheath

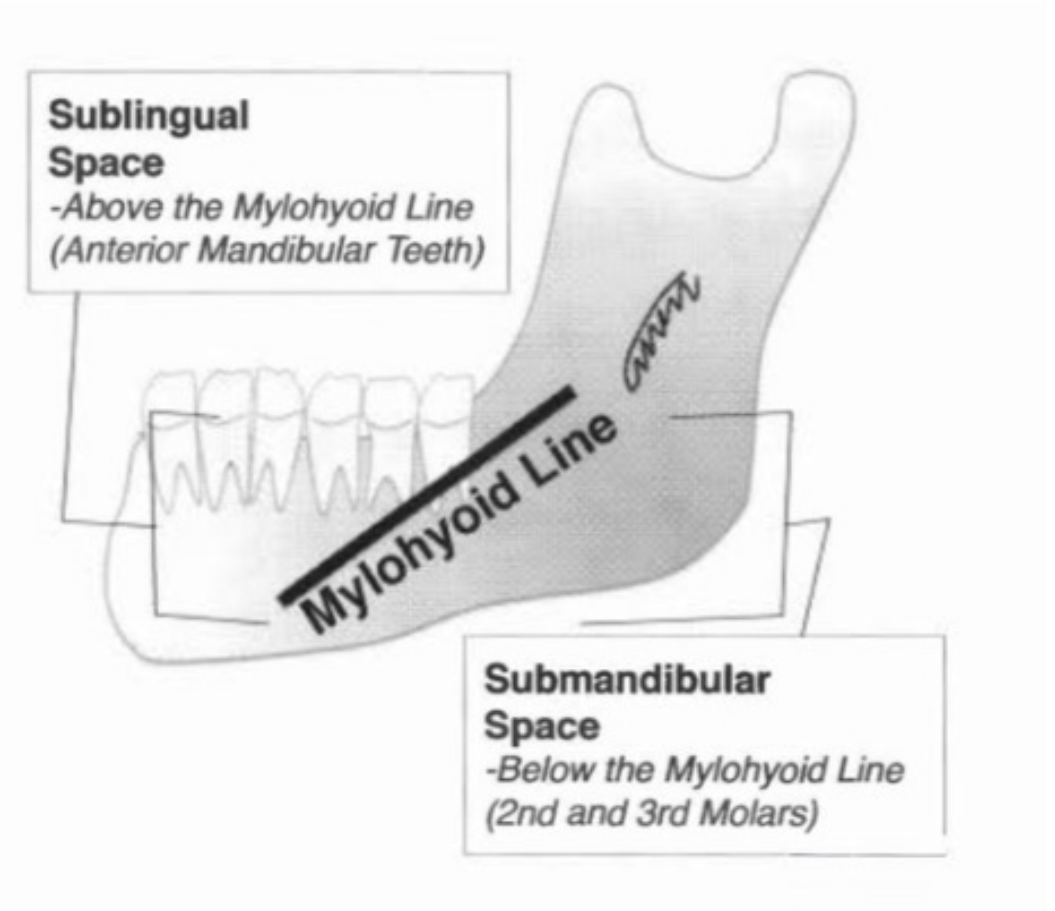


- Spread of the infection between different spaces depends on anatomic location.
- Where we see the swelling and the associated symptoms might be able to tell us in which space this infection is in.

Where might the infection go?



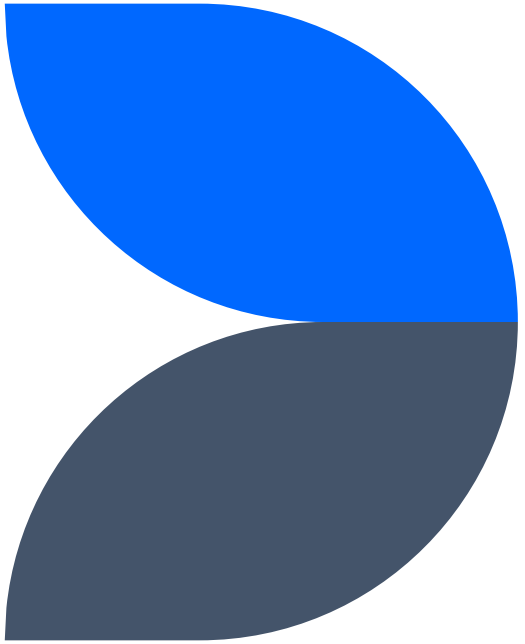
Where might the infection go?



Back to school

^Anatomy school

The following slides courtesy of Dr Helen Grady

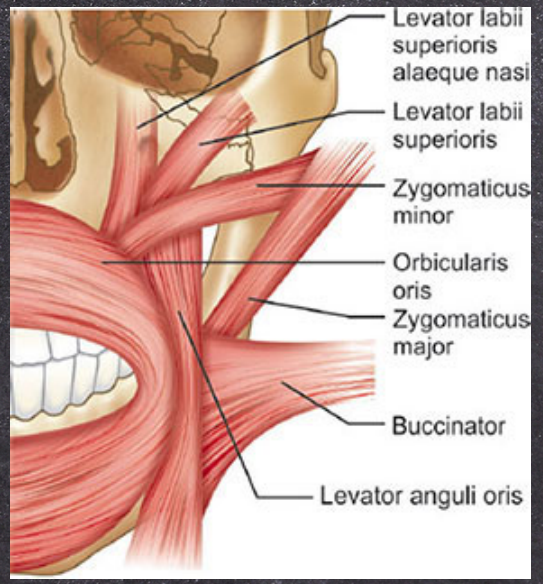


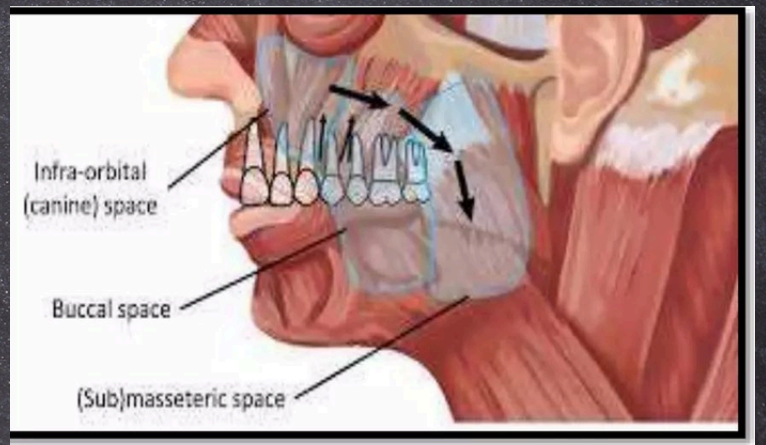
CANINE SPACE

Swelling of cheek, lower eyelid and upper lip.
Drooping of angle of mouth.
Nasolabial fold obliterated
Oedema of lower eyelid

Is the region between the anterior surface of the maxilla and overlying levator muscles of upper lip.

- Contains the angular artery and angular vein and the infra-orbital nerve

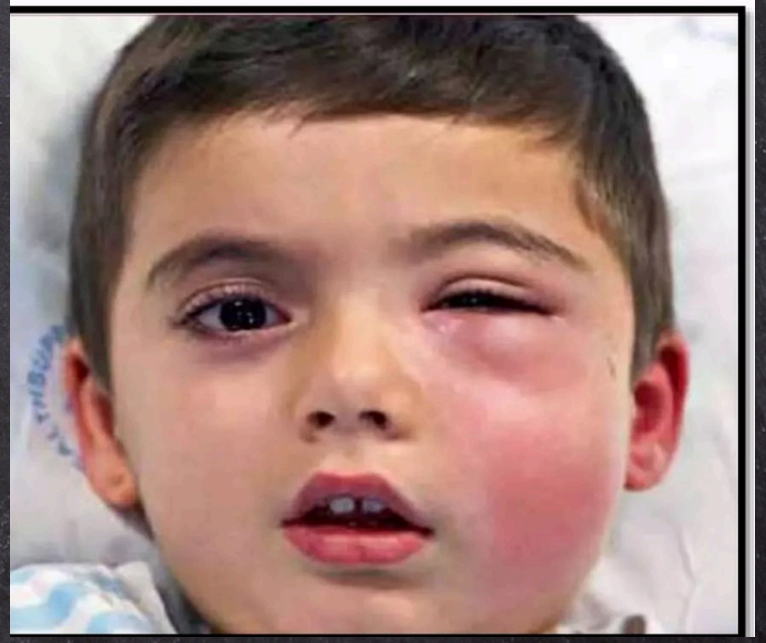




Maxillary canine, Ist premolar and sometimes mesiobuccal roots of Ist molar.

Boundaries:

- Superiorly: the quadratus labii superioris muscle (levator labii superioris)
- Inferiorly: Caninus muscle
- Medially: Anterolateral surface of maxilla
- Posteriorly: Buccinator muscle
- Anteriorly: Orbicularis oris



BUCCAL SPACE

- Contains the buccal fat pad, the parotid duct (Stensen duct), the anterior facial artery and vein, the transverse facial artery and vein.

Maxillary/Mandibular premolars and molars

Boundaries:

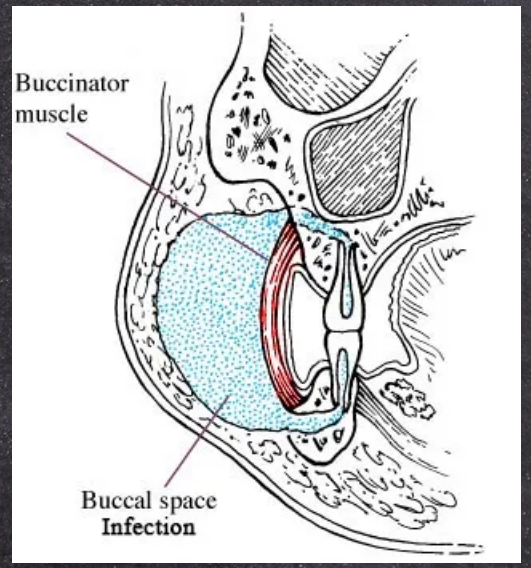
- Superiorly: Zygomatic arch
- Inferiorly: Inferior border of mandible
- Medially: Buccinator muscle
- Laterally: skin and subcutaneous muscle
- Posteriorly: Anterior edge of masseter muscle
- Anteriorly: posterior border of zygomaticus major and depressor anguli oris

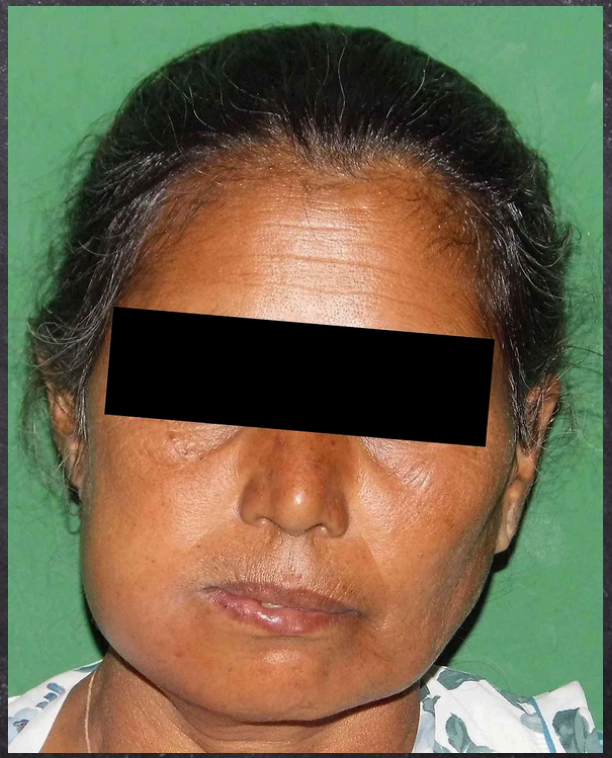
Swelling of cheek extending to corner of mouth

Angle of mouth may be shifted to other side

Nasolabial fold obliterated

Associated with temporal space - Dumb-bell shaped due to lack of swelling over zygomatic arch

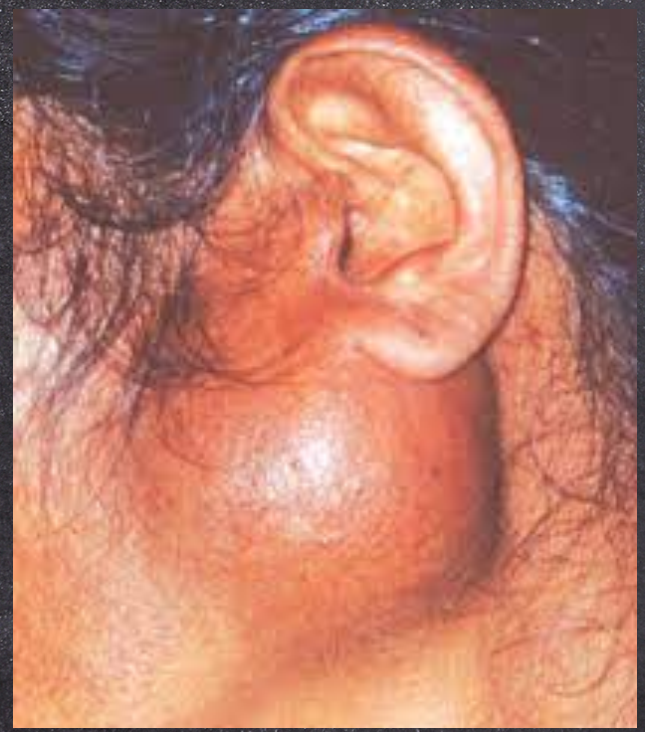


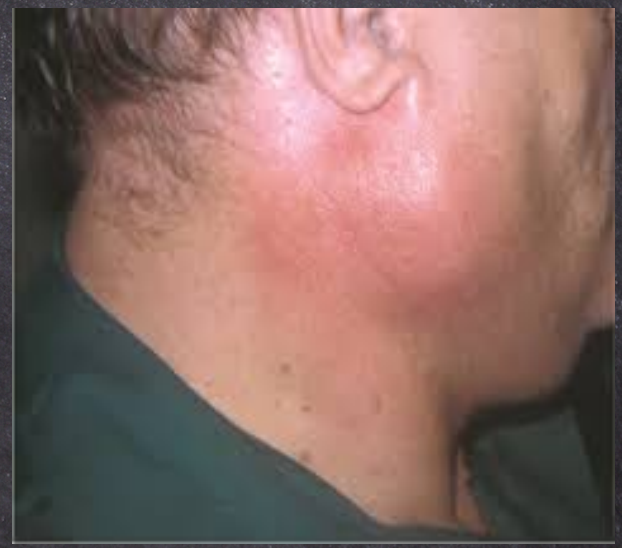


PAROTID SPACE

Swelling everts the lobule of ear
Presents with severe pain, espcially when eating
Intraorally, pus may be drained from the parotid duct

Contains the Parotid gland, branches of facial nerve, the external carotid artery and the retro-mandibular vein.





Mandibular molars

Boundaries:

- The parotid space is circumscribed by the superficial layer of the **deep cervical fascia**
- Superior margin: external auditory canal; apex of the mastoid process
- Inferior margin: inferior mandibular margin (although the parotid tail can extend further inferiorly below the angle of the mandible)
- Anterior margin: masticator space

INFRATEMPORAL SPACE

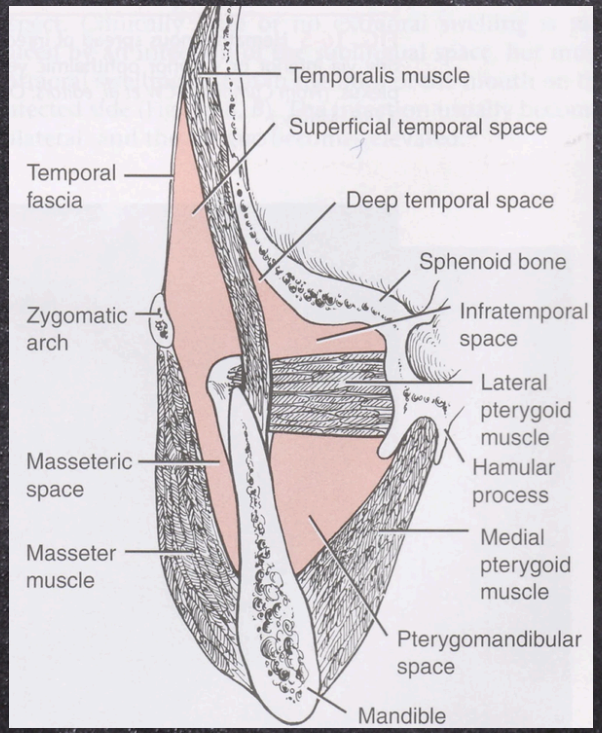
- Contains the pterygoid plexus of veins, internal maxillary artery, mandibular nerve and its branches

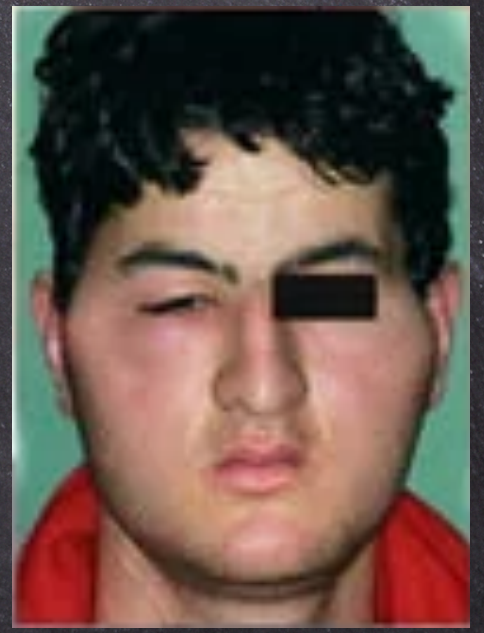
Maxillary 3rd molars

Boundaries:

- Superiorly: Infratemporal surface of greater wing of sphenoid
- Inferiorly: Lateral pterygoid muscle
- Medially: Lateral pterygoid plate and lateral pharyngeal wall
- Laterally: temporalis tendon and coronoid process
- Posteriorly: Condyle and lateral pterygoid muscles
- Anteriorly: Infratemporal surface of maxilla and posterior surface of zygomatic bone

Extra-oral swelling over sigmoid notch
Intra-oral swelling in tuberosity area
Trismus
Eye may be closed and often proptosed
Can spread to Temporal space or via pterygoid plexus to cause Cavernous Sinus Thrombosis





TEMPORAL SPACE

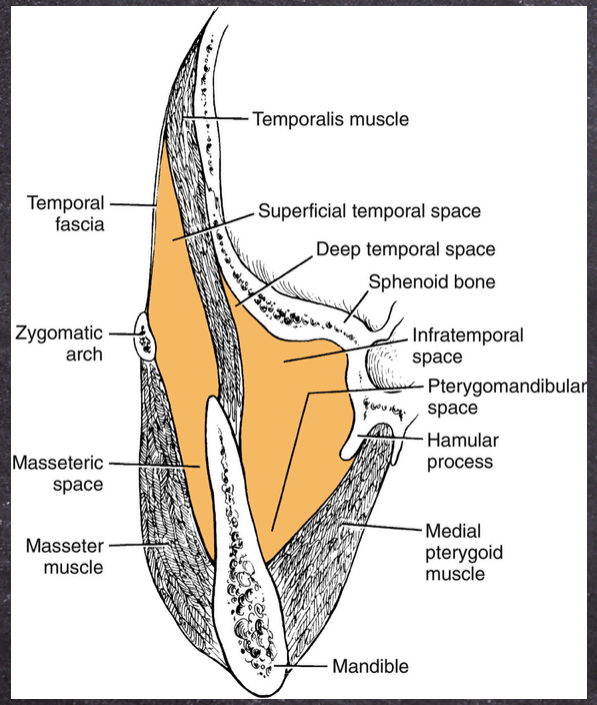
Superficial: swelling limited by outline of temporalis fascia. Trismus. Severe pain.
Deep: Less swelling. Difficult to diagnose. Trismus.

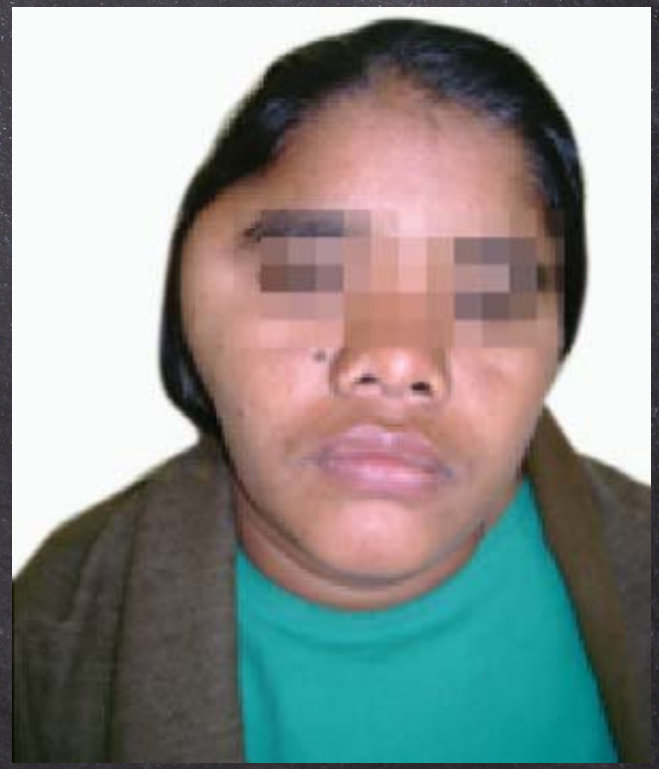
Has two compartments:
Superficial Temporal and Deep Temporal
Contains superfical temporal vessels, auriculotemporal nerve

Spreads from infratemporal or pterygomandibular space

Boundaries:

- Superficial: Lateral-temporalis fascia, Medially - temporalis muscle
- Deep: Lateral -temporalis muscle, Medially- temporal bone and greater wing of sphenoid





PTERYGOMANDIBULAR SPACE

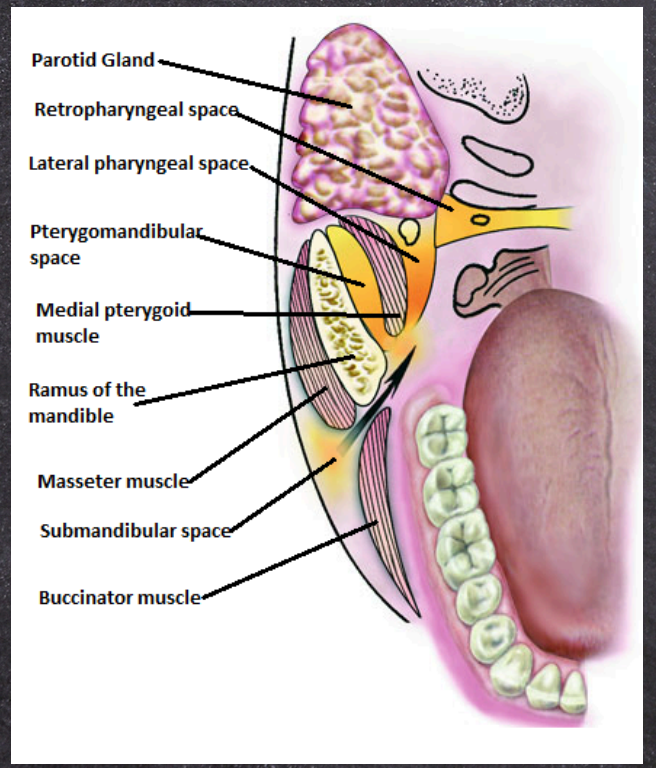
- Contains the the IAN, artery and vein, the lingual nerve (LN), the nerve to mylohyoid, the sphenomandibular ligament

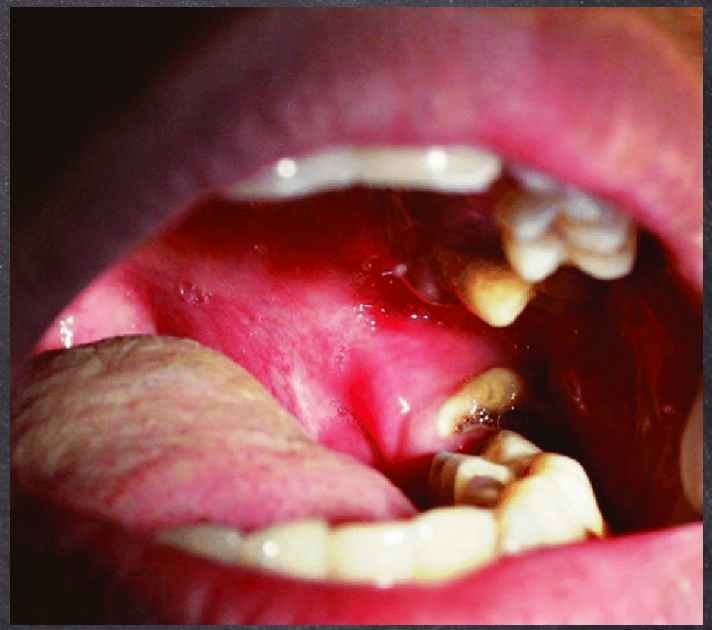
Mandibular third molars, pericoronitis, infected needles or contaminated LA solution

Boundaries:

- Superiorly: Lower head of lateral pterygoid muscle
- Inferiorly: Inferior border of mandible (lingual surface)
- Medially: Medial pterygoid muscle
- Laterally: Medial surface of ramus
- Posteriorly: Parotid gland
- Anteriorly: Pterygomandibular raphe/buccal space

Often absence of extra oral-swelling
Severe Trismus
Difficulty in Swallowing
Anterior bulging of half of soft palate and tonsillar pillars with deviation of uvula to unaffected side

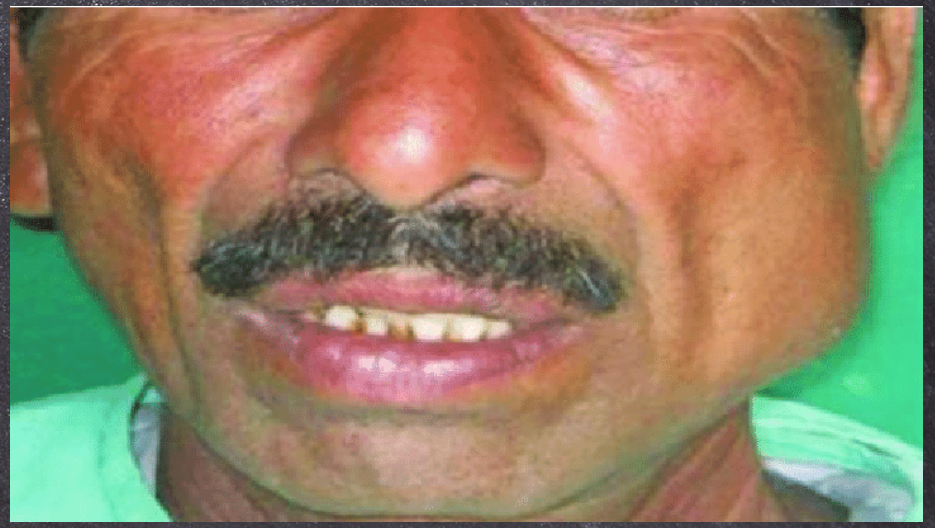




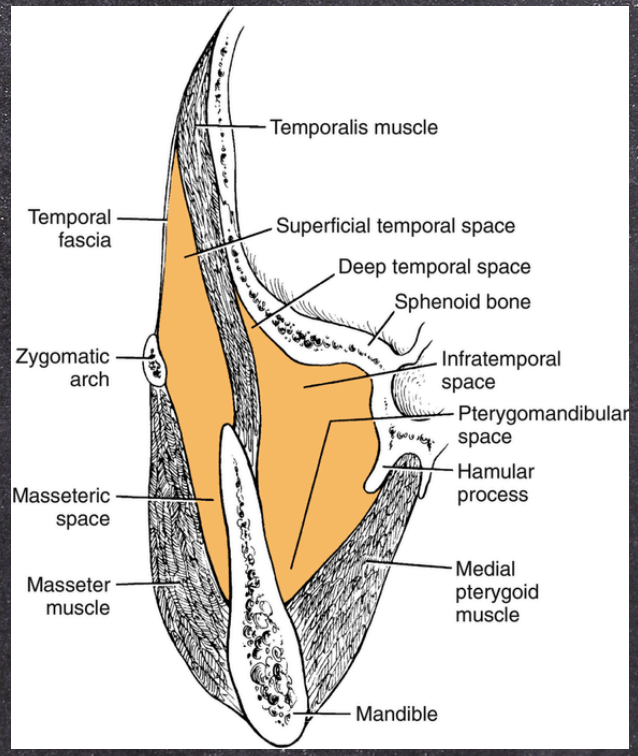
MASSETERIC SPACE

Swelling is seen mainly over angle of mandible

Severe trismus and throbbing pain



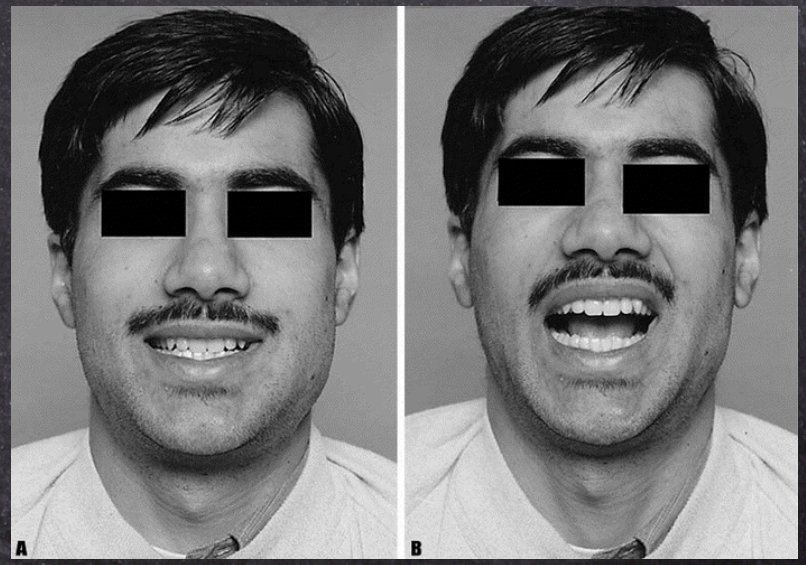
Contains the Masseteric artery and vein



Mandibular third molars, pericoronitis,

Boundaries:

- Superiorly: Zygomatic arch
- Inferiorly: Inferior border of mandible
- Medially: Ramus of mandible
- Laterally: Masseter muscle
- Posteriorly: parotid gland and its fascia
- Anteriorly: Buccal space and buccopharyngeal fascia



SUBLINGUAL SPACE

Contains the deep part of the submandibular gland, Wharton's duct, Sublingual gland, Lingual and hypoglossal nerves, terminal branches of the lingual artery.

Mandibular premolar and lst molar

Boundaries:

- Superiorly: Mucosa of floor of mouth
- Inferiorly: Mylohyoid muscle
- Medially: Geniohyoid, styloglossus and genioglossus muscle
- Laterally: Mandibular body
- Posteriorly: Body of hyoid
- Anteriorly: Mandibular body

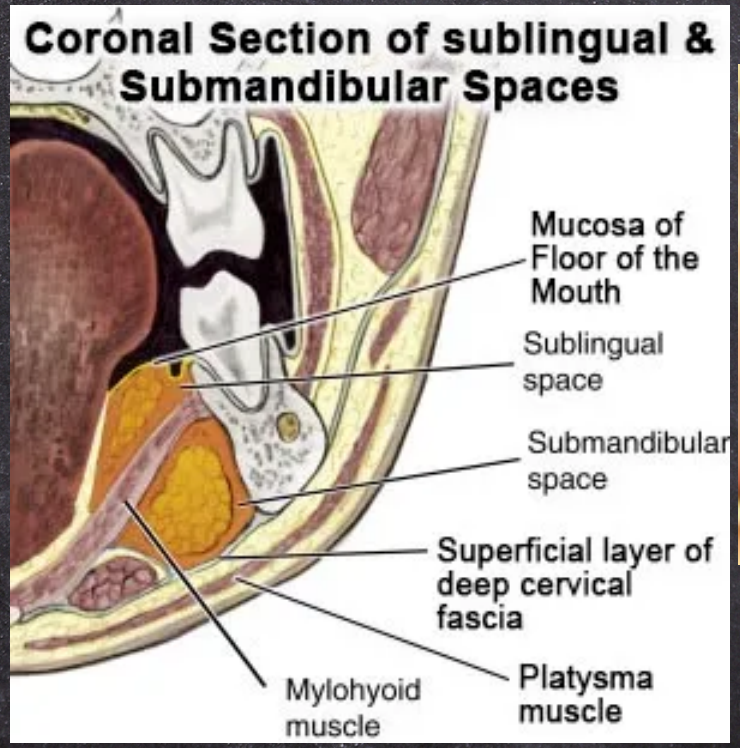
Usually NO extra-oral swell although lymph nodes may be tender

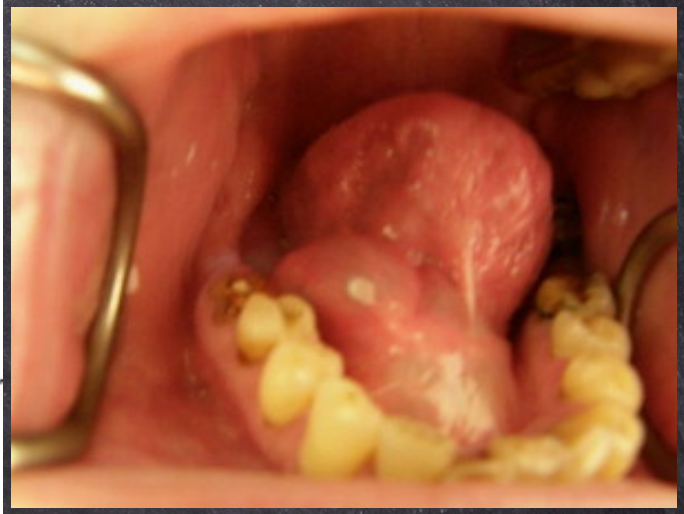
Swelling of floor of mouth

Elevated tongue

Pain and discomfort on swallowing

Ability to protrude the tongue beyond the vermillion border of upper lip may be affected



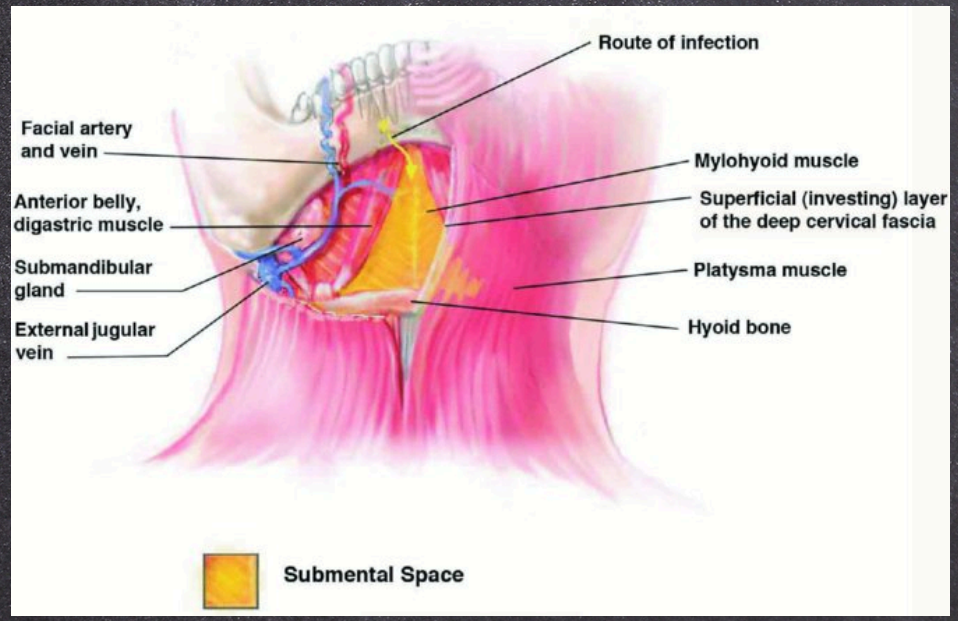


SUBMENTAL SPACE

Extra-oral firm swelling beneath chin
Pain from swelling

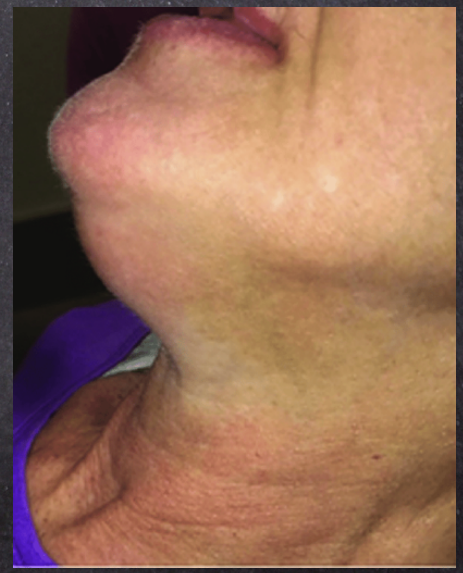
Contains lymph nodes and anterior jugular veins

Mandibular incisors, can also get a spread from submandibular space



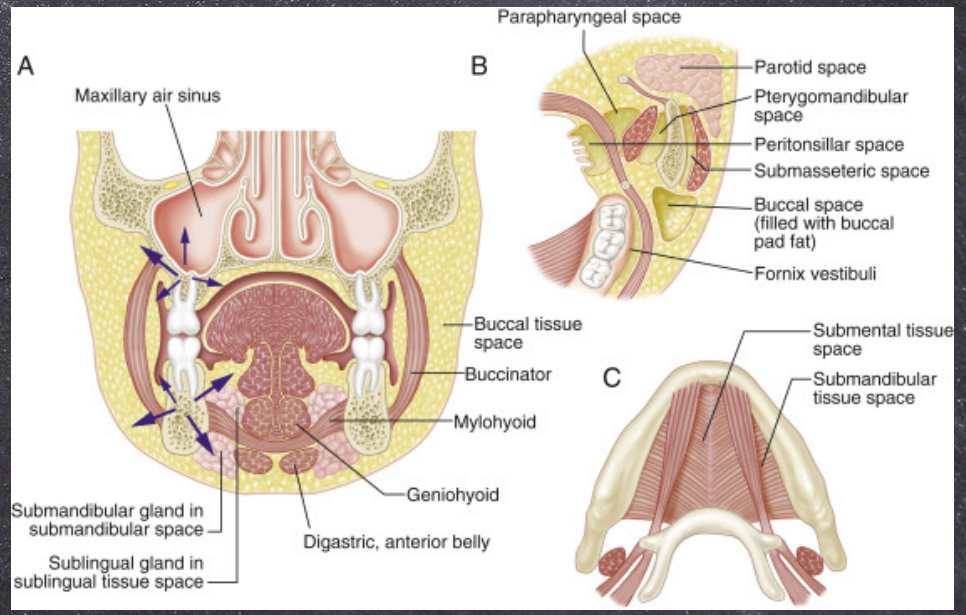
Boundaries:

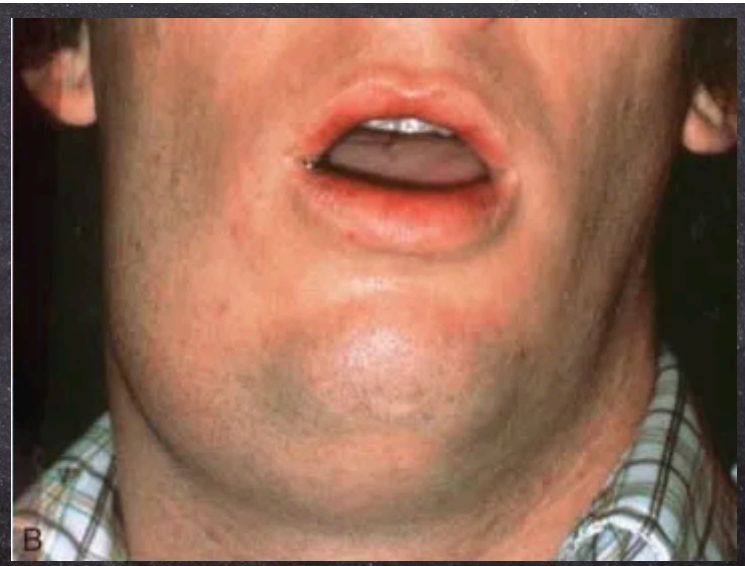
- Superiorly: Mylohyoid muscle
- Inferiorly: Deep cervical fascia, platysma and skin
- Laterally: Anterior belly of digastric
- Posteriorly: Hyoid bone/submandibular space
- Anteriorly: Mandible



SUBMANDIBULAR SPACE

Extra-oral firm swelling in submandibular region, below inferior border of mandible





Contains submandibular salivary gland, lingual and hypoglossal nerves, bracnches of facial artery- palatine, tonsillar, glandular, submental

Mandibular 2nd and 3rd molars, also spread from submental and sublingual spaces

Boundaries:

- Superiorly: Mylohyoid muscle and inferior boarder of mandible
- Inferiorly: Anterior and posterior belly of digastric
- Medially: Mylohyoid, hyoglossus, superior constrictor, styloglossus muscles
- Laterally: Deep cervical fascia, platysma, and skin
- Posteriorly: Hyoid bone
- Anteriorly: Submental space

LATERAL PHARYNGEAL SPACE

Contains carotid sheath, cranial nerves IX-XII and lymph nodes

Mandibular 3rd molars, also tonsillar infections.

Boundaries:

- Superiorly: Skull base
- Inferiorly: Hyoid bone
- Medially: Buccopharyngeal fascia on lateral surface of superior constrictor muscle
- Laterally: Medial pterygoid muscle and capsule of parotid gland
- Posteriorly: Prevertebral fascia
- Anteriorly: Superior and middle pharyngeal constrictor

Severe pain on affected side of throat and dysphagia present

Four cardinal signs: Trismus, induration and swelling at angle of jaw, fever and pharyngeal budging

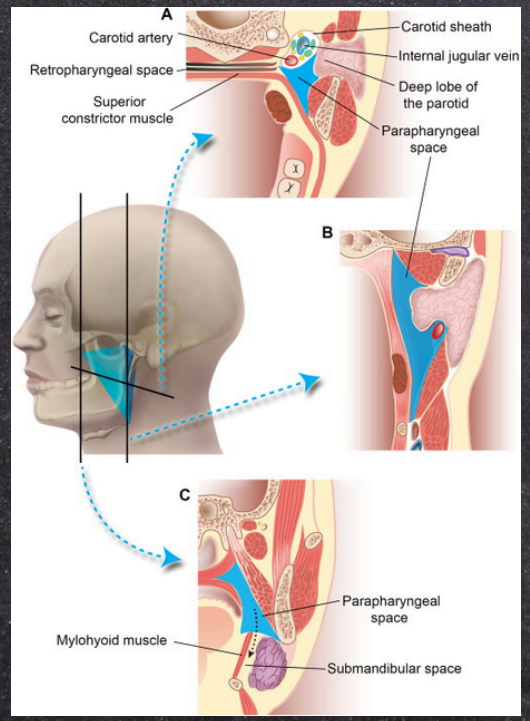
Rotation of neck away from side of swelling causes severe pain

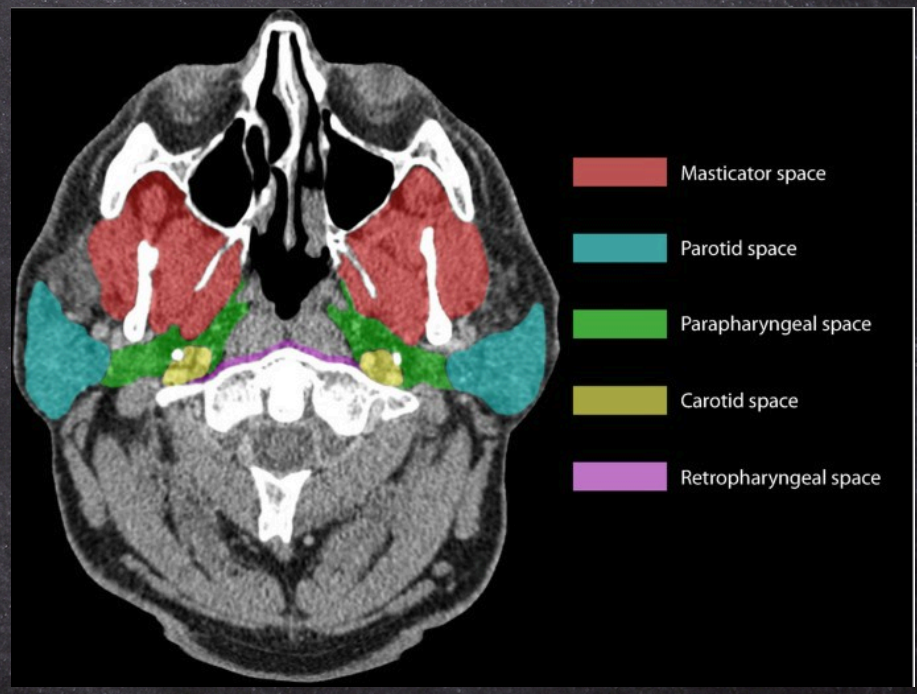
Can spread up causing Cavernous Sinus Thrombosis

Can spread down into retropharyngeal space

Can cause carotid artery erosion

Can have neurological involvement-pupils of eye

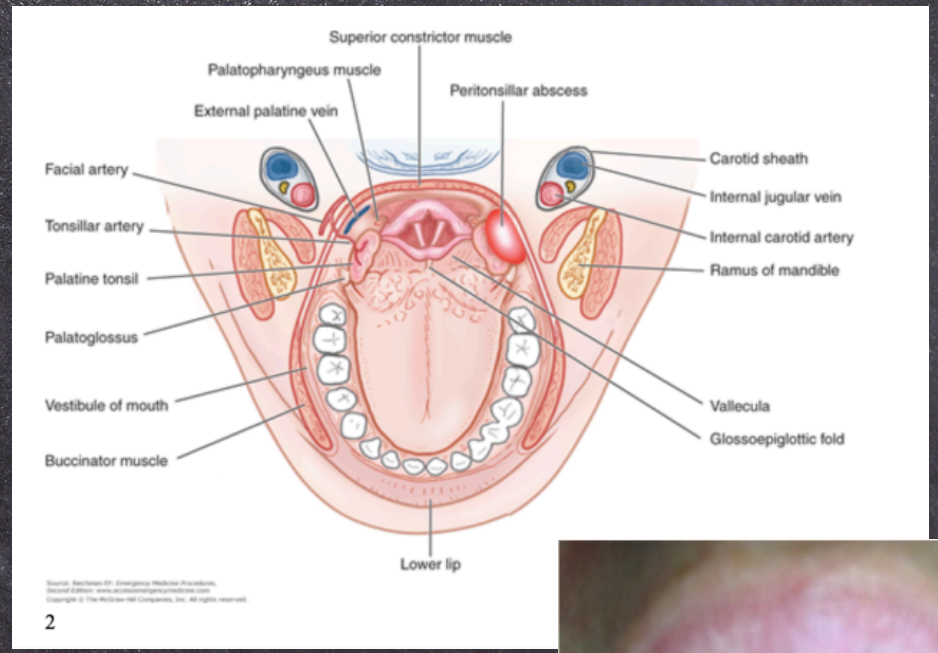




PERITONSILAR (QUINSY)

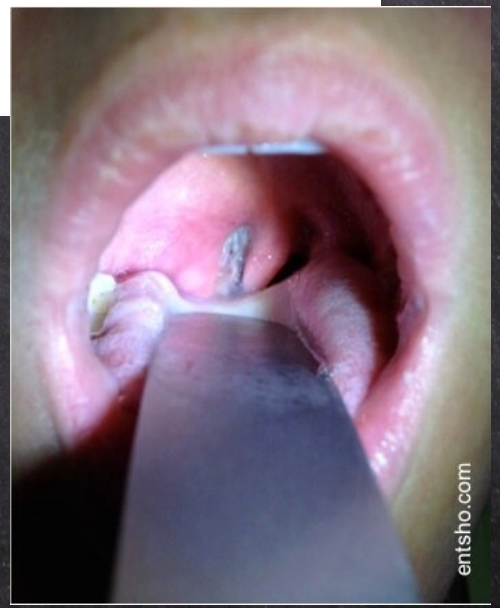
Swelling of tonsil
Uvular displacement
Trismus and at times, a muffled voice

Usually secondary to contiguous spread from the local site or due to a complication of acute tonsillitis



Boundaries:

- Superiorly: Torus tubarius or level of hard palate
- Inferiorly: Pyriform sinus
- Posteriorly: Palatopharyngeus muscle and posterior tonsillar pillar
- Anteriorly: Palatoglossus muscle and anterior tonsillar pillar

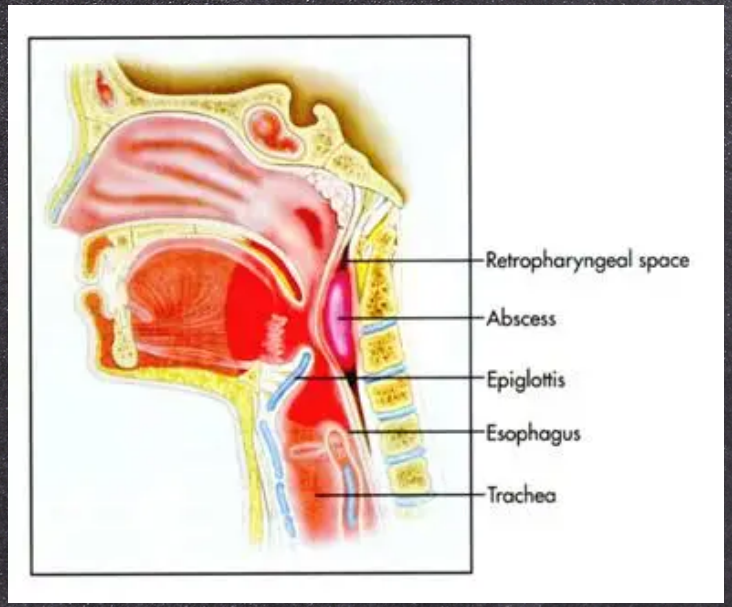


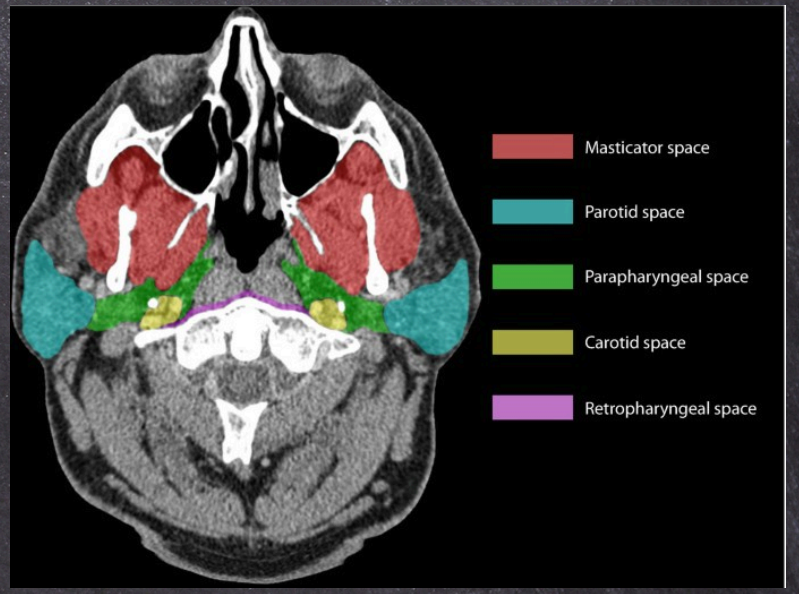
RETROPHARYNGEAL SPACE

Stiffness of neck
Dysphagia and sometimes drooling
Dyspnea
Bulging of posterior pharyngeal wall

Contains lymph nodes

Spread from odontogenic infection or nasal and pharyngeal infections



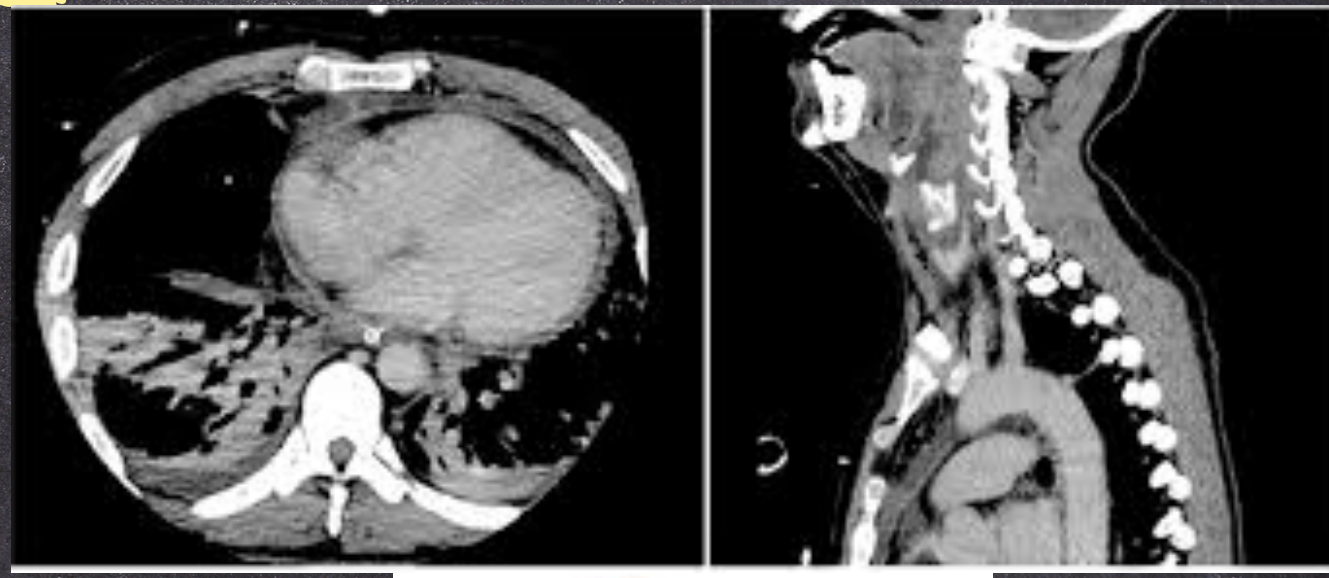


Boundaries:

- Superiorly: Skull base
- Inferiorly: Mediastinum
- Laterally: Lateral pharyngeal space
- Posteriorly: Prevertebral fascia
- Anteriorly: Posterior pharyngeal wall

PRETRACHEAL SPACE

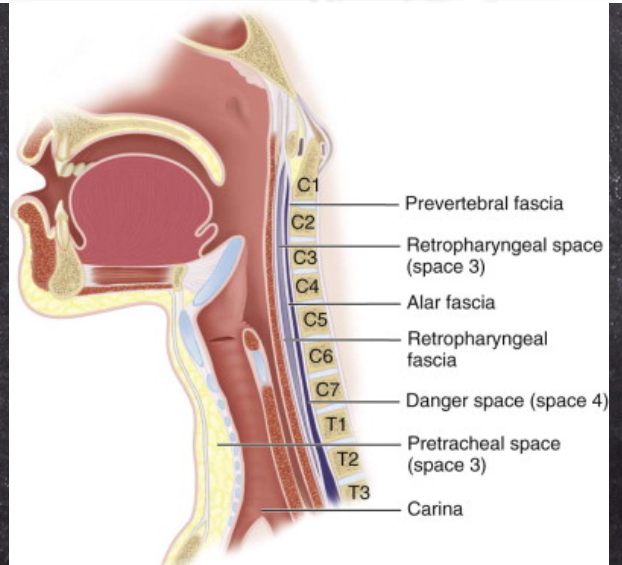
Stiffness of neck
Neck swelling
Dysphagia and sometimes drooling/odynophagia
Dyspnea



Spread from odontogenic infection or trauma

Boundaries:

- Superiorly: Thyroid Cartilage
- Inferiorly: Superior Mediastinum
- Laterally: Thyroid gland
- Posteriorly: Retropharyngeal space
- Anteriorly: Sternothyroid fascia



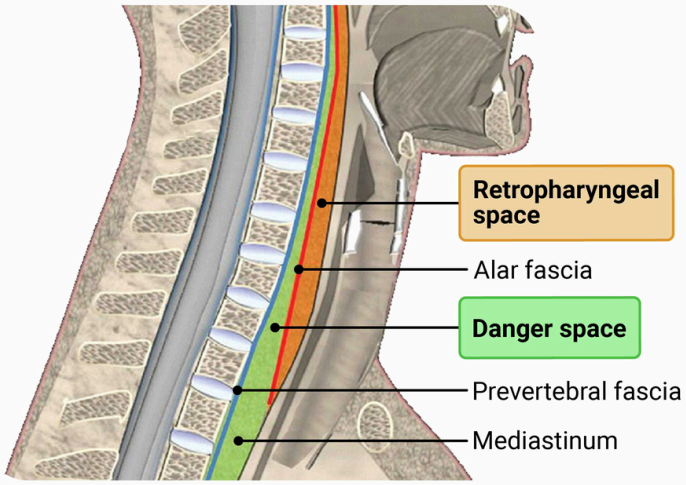
DANGER SPACE

Can spread to the thorax

Boundaries:

- Superiorly: Skull base
- Inferiorly: Diaphragm
- Posteriorly: Prevertebral fascia
- Anteriorly: Alar Fascia

Retropharyngeal Infection Abscess



Danger space

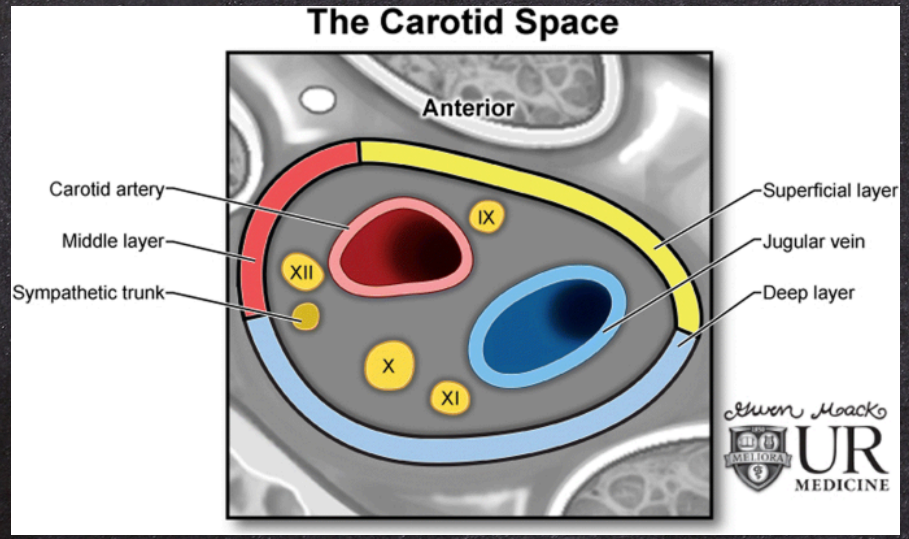
- Posterior to retropharyngeal space
- Bound by alar fascia (anteriorly) and prevertebral fascia (posteriorly)
- Extends from the base of skull to mediastinum where fascia fuse
- Provides route for contiguous spread of infection between neck and chest

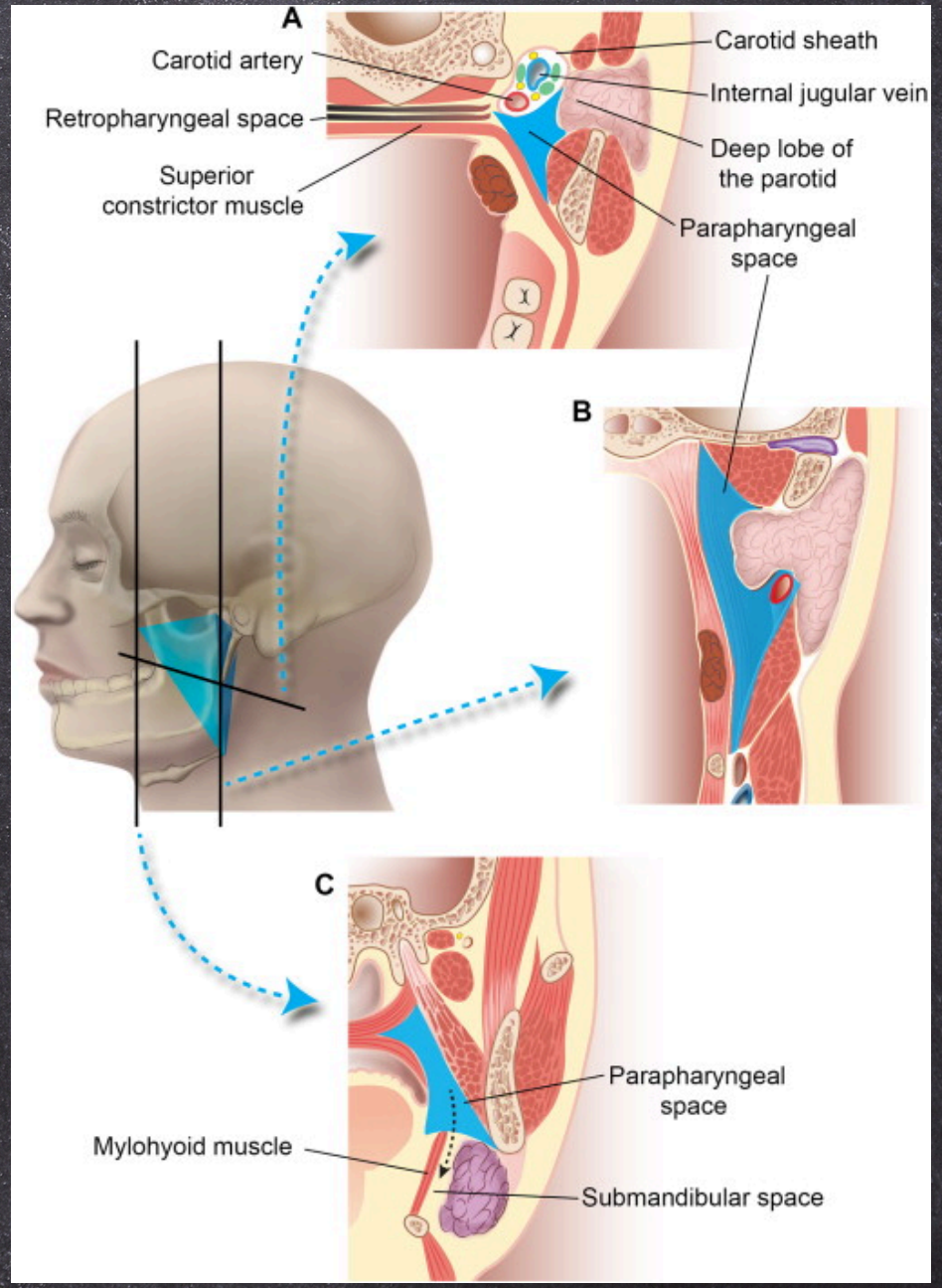
Retropharyngeal infection

- Can extend into mediastinum
- Penetrating trauma (chicken bone, instrumentation)
- Most common in children 3 to 5 years old
- Fever, sore throat
- Dysphagia, trismus, stridor
- Nuchal rigidity

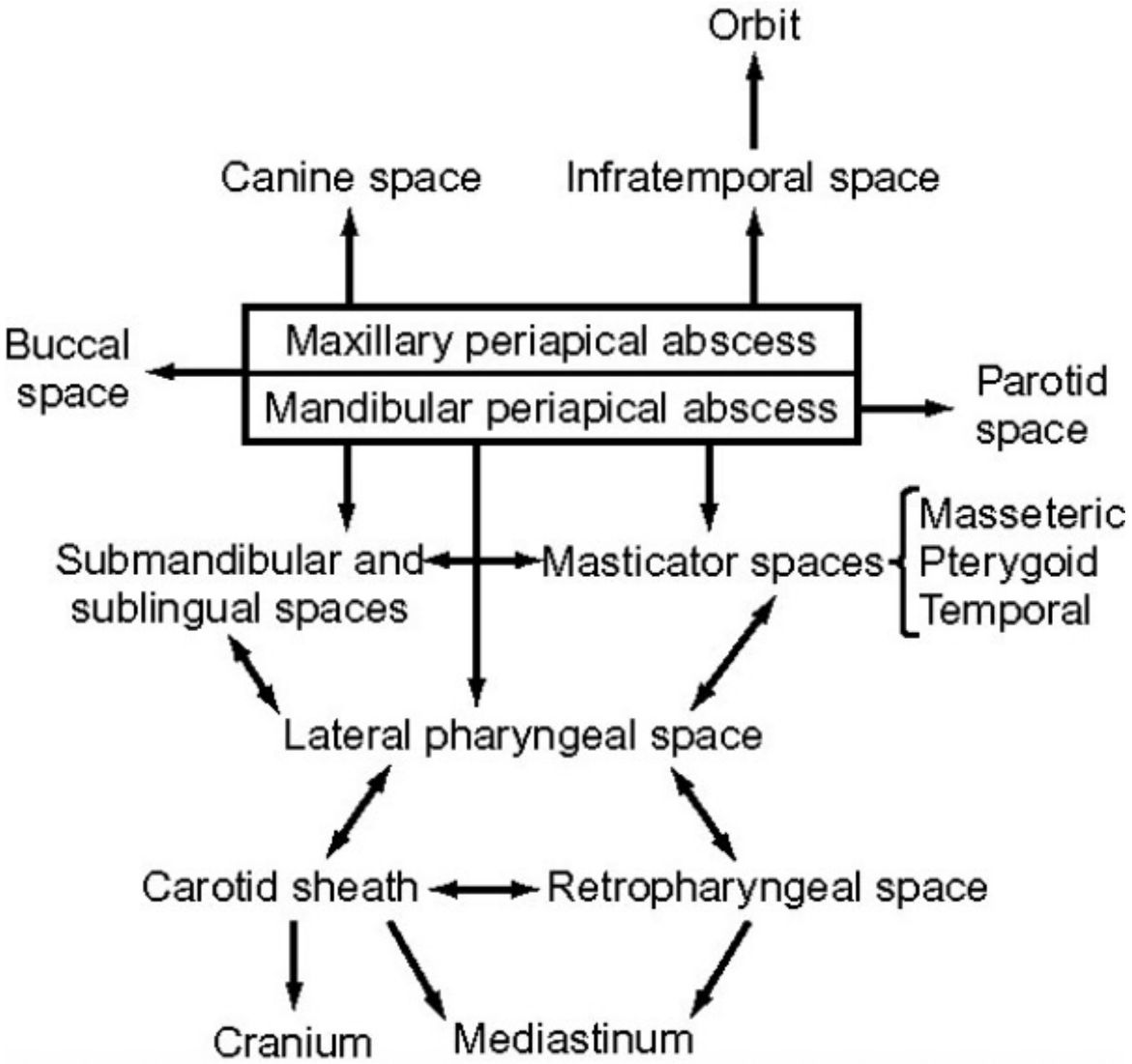
CAROTID SPACE

- Rare due to antibiotics and early diagnosis
- Will present with painful, enlarged neck mass, dysphagia, fever, hoarseness and dysnoea.





In brief...


Orbit
Canine space
Infratemporal space
Buccal space
Maxillary periapical abscess
Mandibular periapical abscess
Parotid space
Submandibular and sublingual spaces
Masticator spaces
Masseteric
Pterygoid
Temporal
Lateral pharyngeal space
Carotid sheath
Retropharyngeal space
Cranium
Mediastinum

Why do these matter?

How bad is it really?

1. Anatomical location (affected spaces)
2. Rate of progression (time to presentation)
3. Associated symptoms

Table 15-3 Severity Scores of Fascial Space Infections

Severity Score	*Anatomic Space*
Severity score = 1 (low risk to airway or vital structures)	Vestibular Subperiosteal Space of the body of the mandible Infraorbital Buccal
Severity score = 2 (moderate risk to airway or vital structures)	Submandibular Submental Sublingual Pterygomandibular Submasseteric Superficial temporal Deep temporal (or infratemporal)
Severity score = 3 (high risk to airway or vital structures)	Lateral pharyngeal Retropharyngeal Pretracheal
Severity score = 4 (extreme risk to airway or vital structures)	Danger space (space 4) Mediastinum Intracranial infection

The severity score for a given patient is the sum of the severity scores for all of the spaces involved by cellulitis or abscess, based on clinical and radiographic examination.

Taken from Peterson's Principles of Oral and Maxillofacial Surgery, adapted from Flynn TR, Odontogenic infections. Oral Maxillofacial Surg Clin North Am 1991;3:311-29

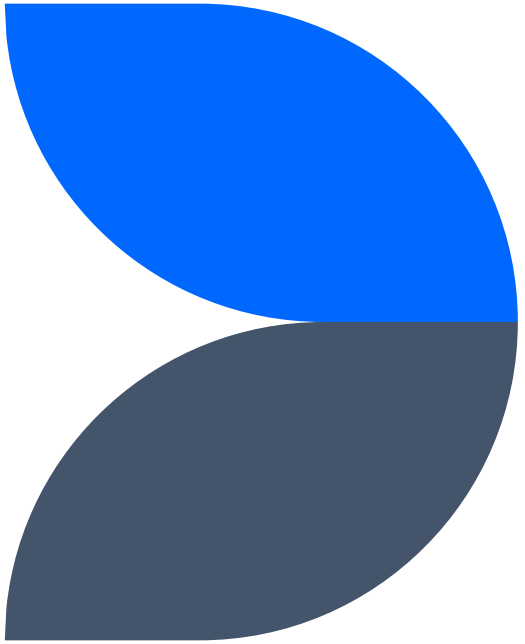
Table 15-4 Stages of Infection

Characteristic	*Inoculation*	*Cellulitis*	*Abscess*
Duration	0–3 days	3–7 days	Over 5 days
Pain	Mild–moderate	Severe and generalized	Moderate–severe and localized
Size	Small	Large	Small
Localization	Diffuse	Diffuse	Circumscribed
Palpation	Soft, doughy, mildly tender	Hard, exquisitely tender	Fluctuant, tender
Appearance	Normal coloration	Reddened	Peripherally reddened
Skin quality	Normal	Thickened	Centrally undermined and shiny
Surface temperature	Slightly heated	Hot	Moderately heated
Loss of function	Minimal or none	Severe	Moderately severe
Tissue fluid	Edema	Serosanguineous, flecks of pus	Pus
Level of malaise	Mild	Severe	Moderate–severe
Degree of seriousness	Mild	Severe	Moderate–severe
Predominant bacteria	Aerobic	Mixed	Anaerobic

Adapted from Flynn TR.[29]

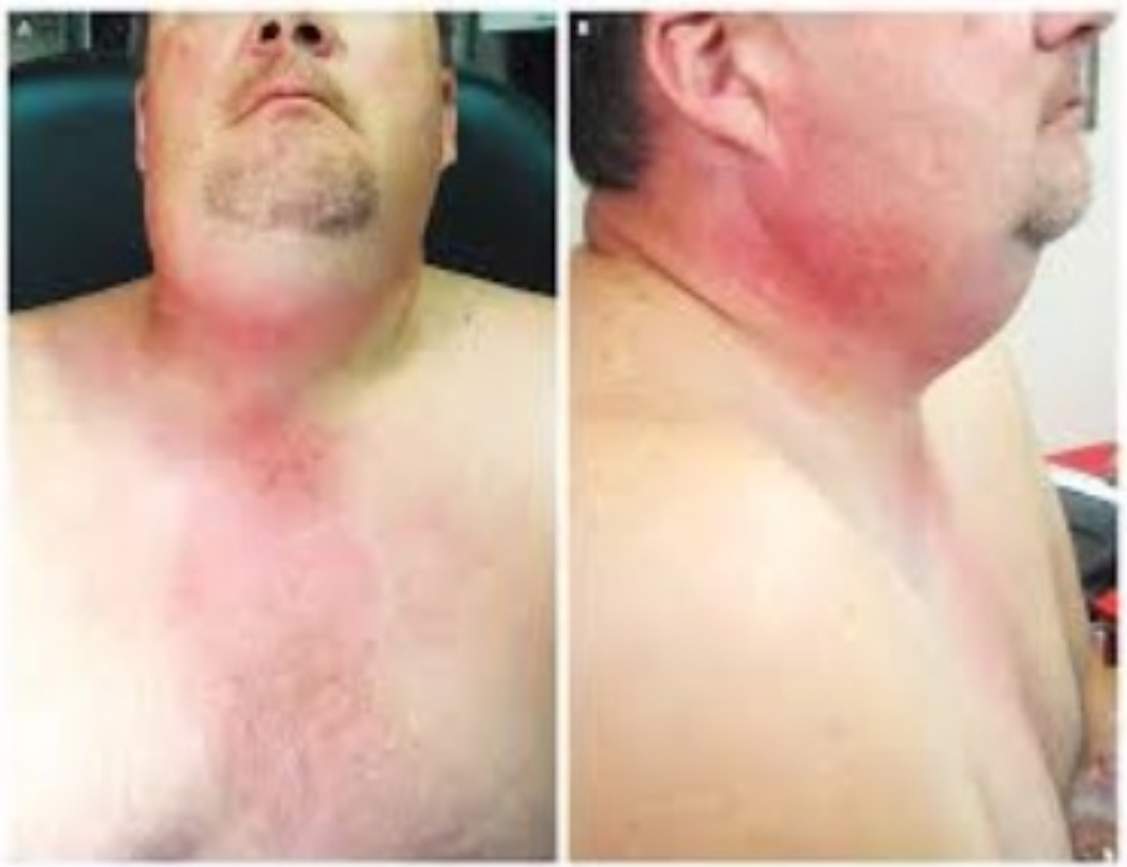
Taken from Peterson's Principles of Oral and Maxillofacial Surgery, adapted from
Flynn TR, Piecuch JF, Topazian RG. Infections of the oral cavity. In: Feigin RD, Cherry JD, editors. Textbook of pediatric infectious diseases. Vol 1. 4th Ed. Philadelphia (PA): WB Saunders Co.; 1998. p. 134–48.

When it starts to get REALLY BAD...



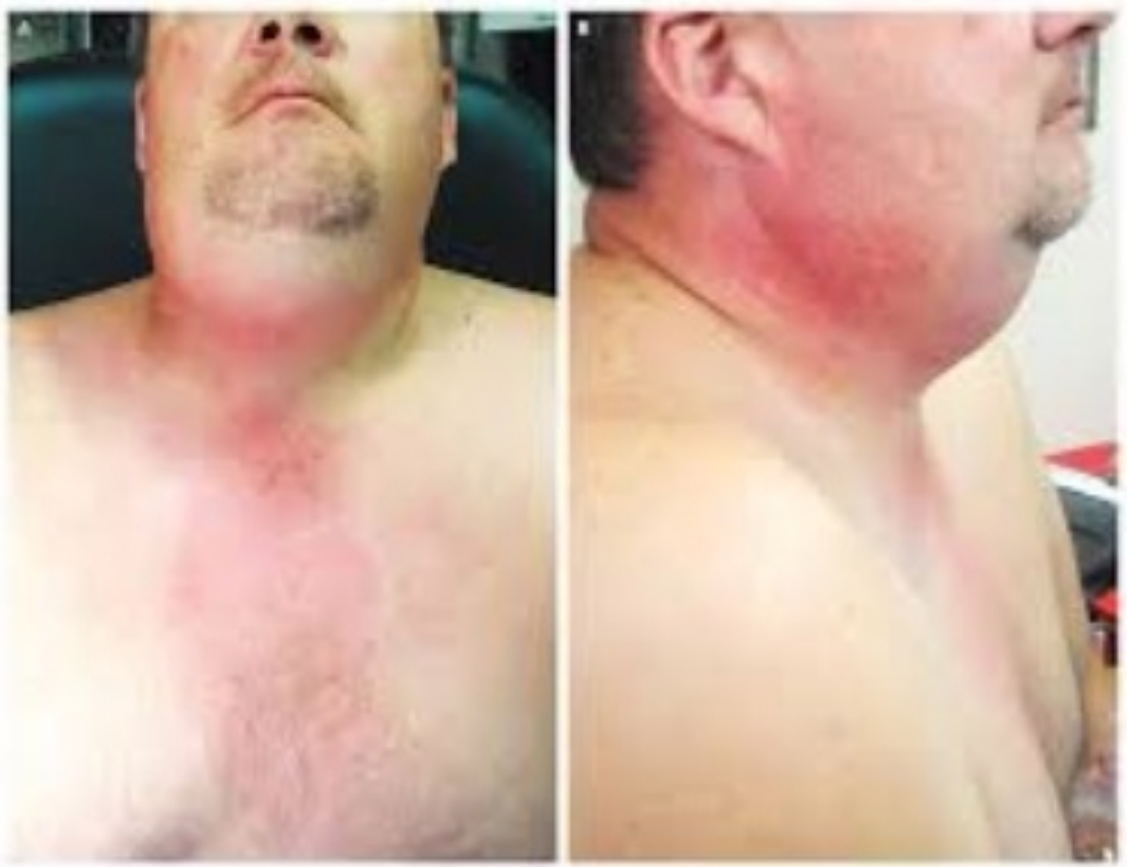
Ludwig’s Angina

- BILATERAL
- Cellulitis affecting submandibular and sublingual spaces.
- Usually Strep Viridans and Staph Aureus.
- Commonly from third molars but can be from other odontogenic infections, trauma or osteomyelitis



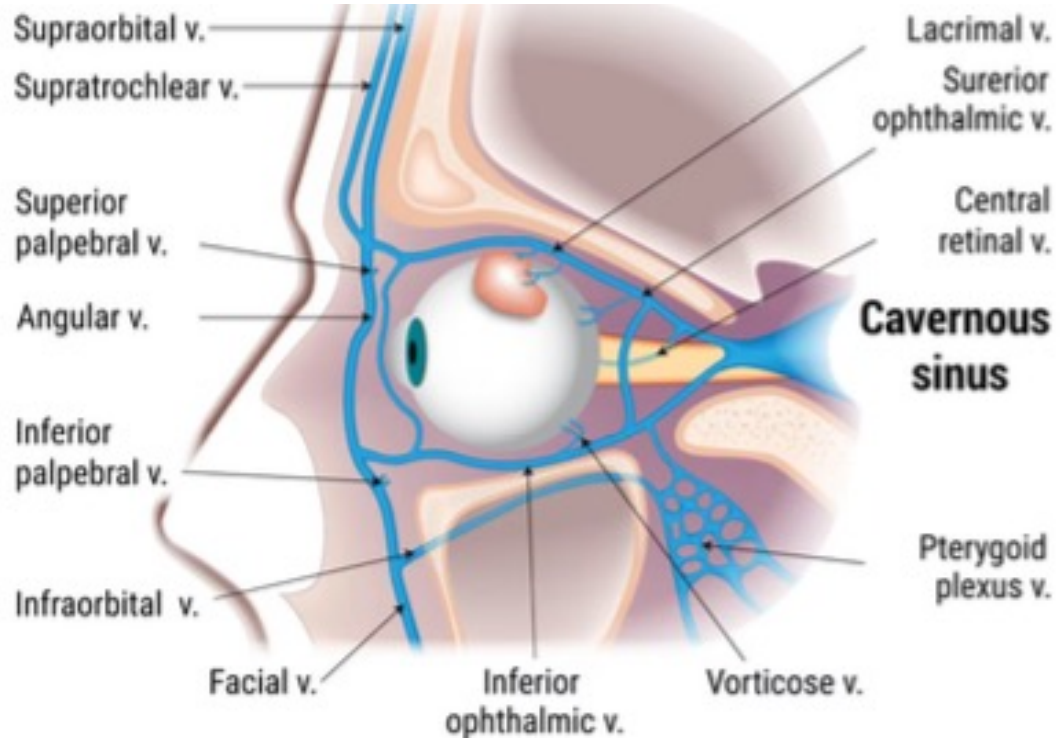
Ludwig’s Angina

- Hard/firm swelling
- Pyrexia
- Erythema
- Dyspnoea
- Dysphagia
- Difficulty closing mouth



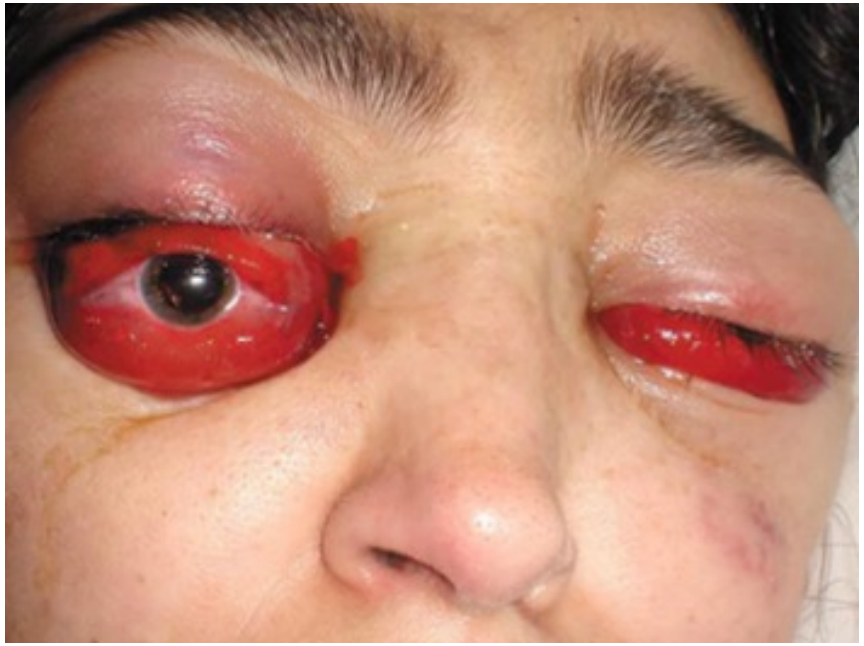
Cavernous Sinus Thrombosis

- A blood clot that forms in the cavernous sinus due to an infection from a fascial space
- Staph Aureus and Streptococcus are often found



Cavernous Sinus Thrombosis

- Fever, rigors, severe frontal and pre-oribital pain
- Exopthalmos
- Oedema of the eyelid and chemosis of the conjunctiva
- Opthalmoplegia (weakness of the eye muscles)
- Ptosis
- Dilated pupil with loss of accommodation

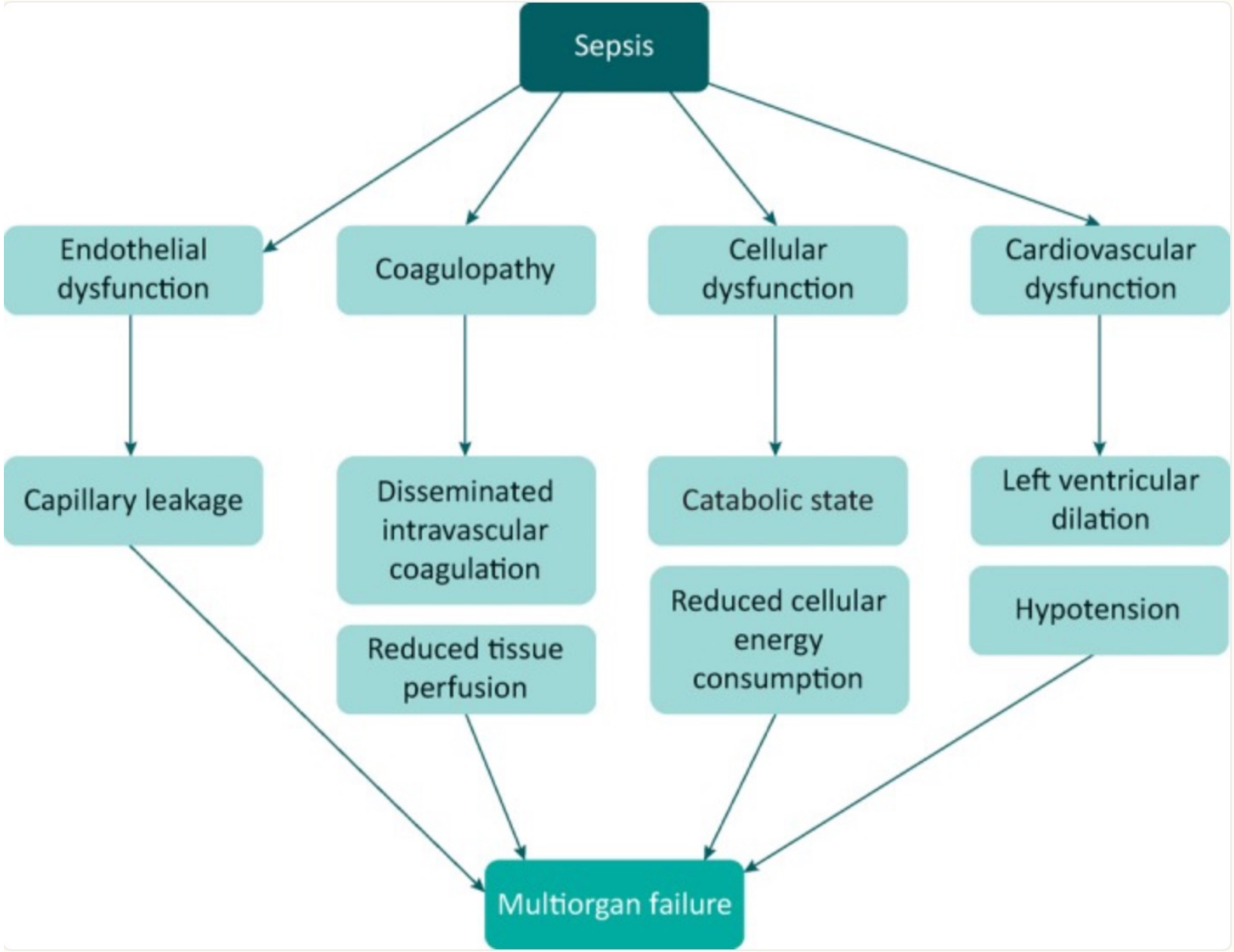


SIRS and Sepsis

- Systemic inflammatory response syndrome (SIRS) is an inflammatory response due to an infection or non-infectious clinical insult.
- When it is known as a result of infection it is SEPSIS.
- “life-threatening organ dysfunction caused by a dysregulated host response to infection”[1]
- Sepsis is the worlds leading cause of death[2]

1. Seymour CW, Liu VX, Iwashyna TJ, et al. (2016) Assessment of Clinical Criteria for Sepsis: For the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA 315(8): 762–774.

2. Rudd KE, Johnson SC, Agesa KM, et al. (2020) Global, regional, and national sepsis incidence and mortality, 1990-2017: analysis for the global burden of disease study. Lancet 395: 200–211



Evans T. Diagnosis and management of sepsis. Clin Med (Lond). 2018 Mar;18(2):146-149. doi: 10.7861/clinmedicine.18-2-146. PMID: 29626019; PMCID: PMC6303466.

Diagnosis of SIRS

2 or more of the following criteria are met:

- Body temperature <36 or >38 Celsius
- Heart rate >90bpm
- Respiratory rate >20breaths/min or PaCO2 <32mmHg
- Leukocyte count >12,000 or <4000microlitres or >10% immature forms

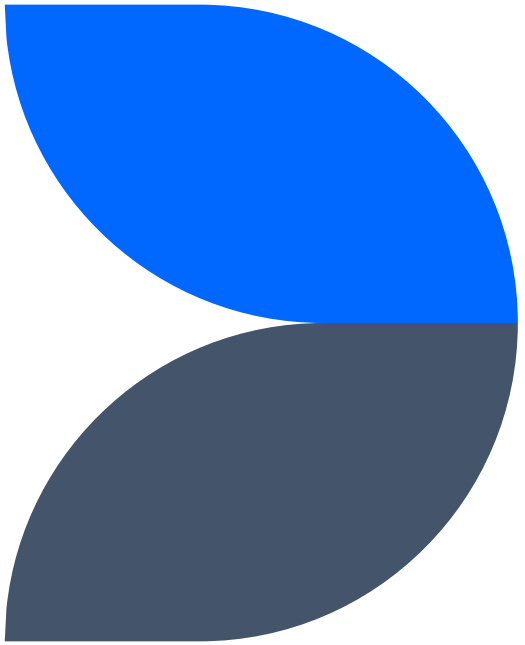
Diagnosis of severity of SIRS

Fundamentally organ failure is the issue so new assessment proposed in 2016, simplified sequential organ failure assessment (qSOFA)

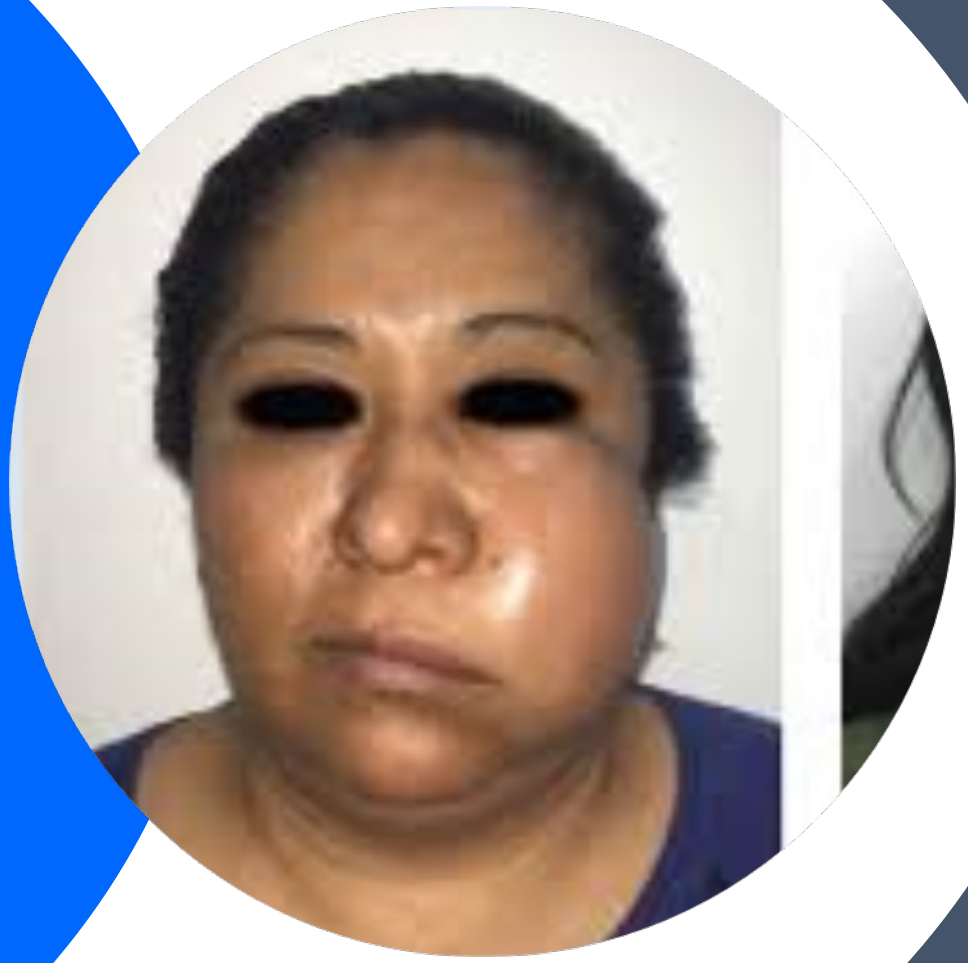
- Systolic blood pressure ≤100mmHg
- Respiratory rate of ≥22breaths/min
- GCS <15

2 or more of these will indicate poorer outcomes

Break?

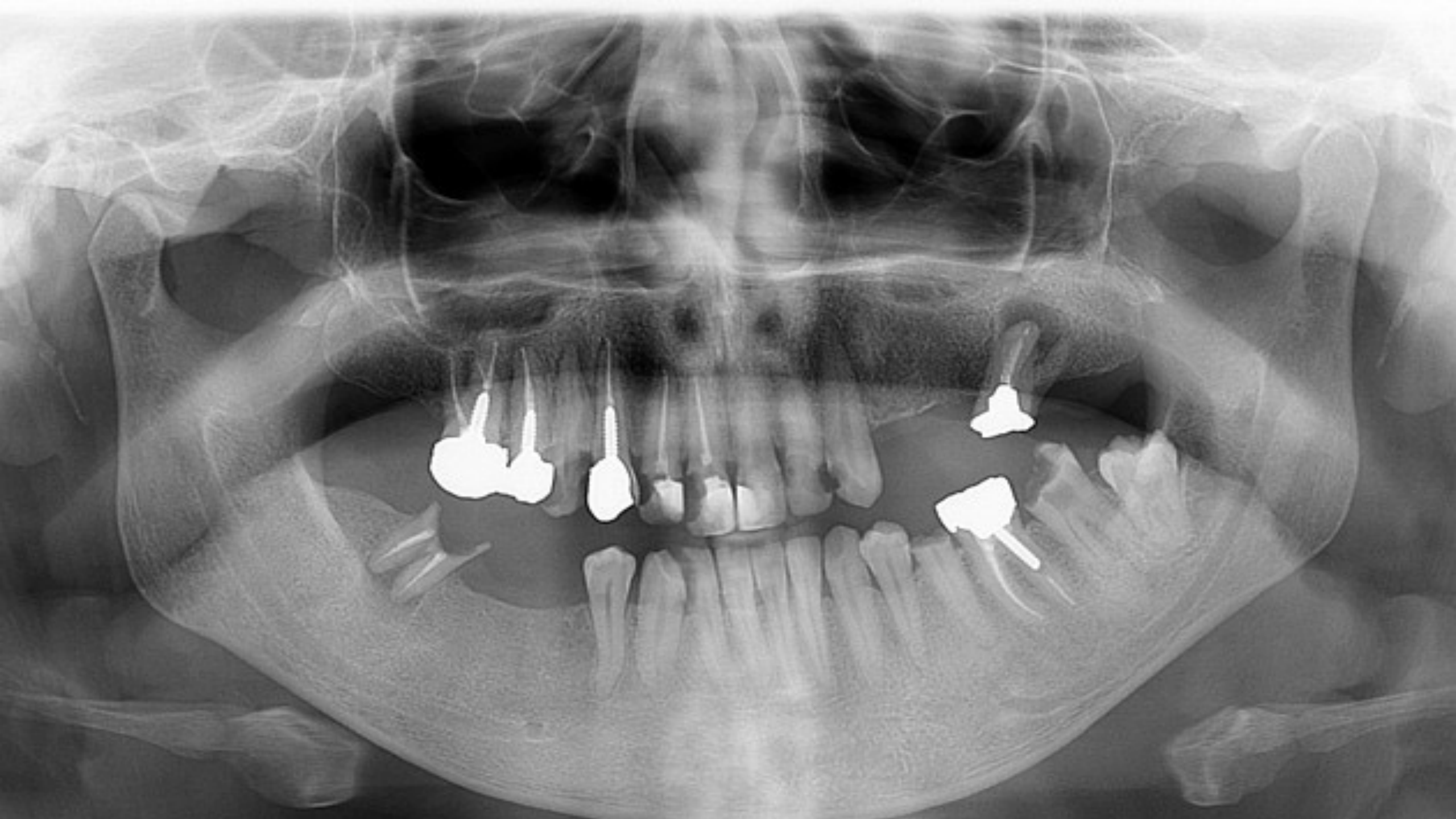


And now back to the patient...

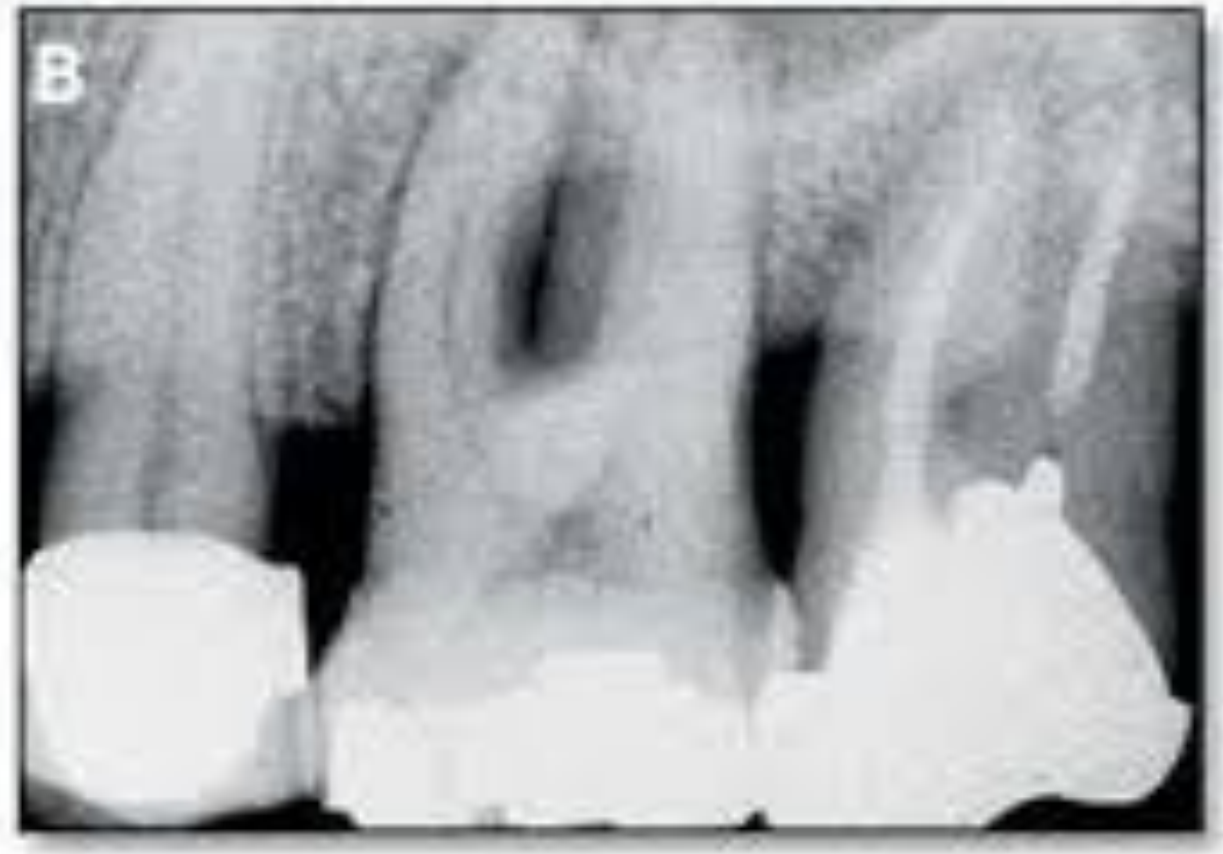


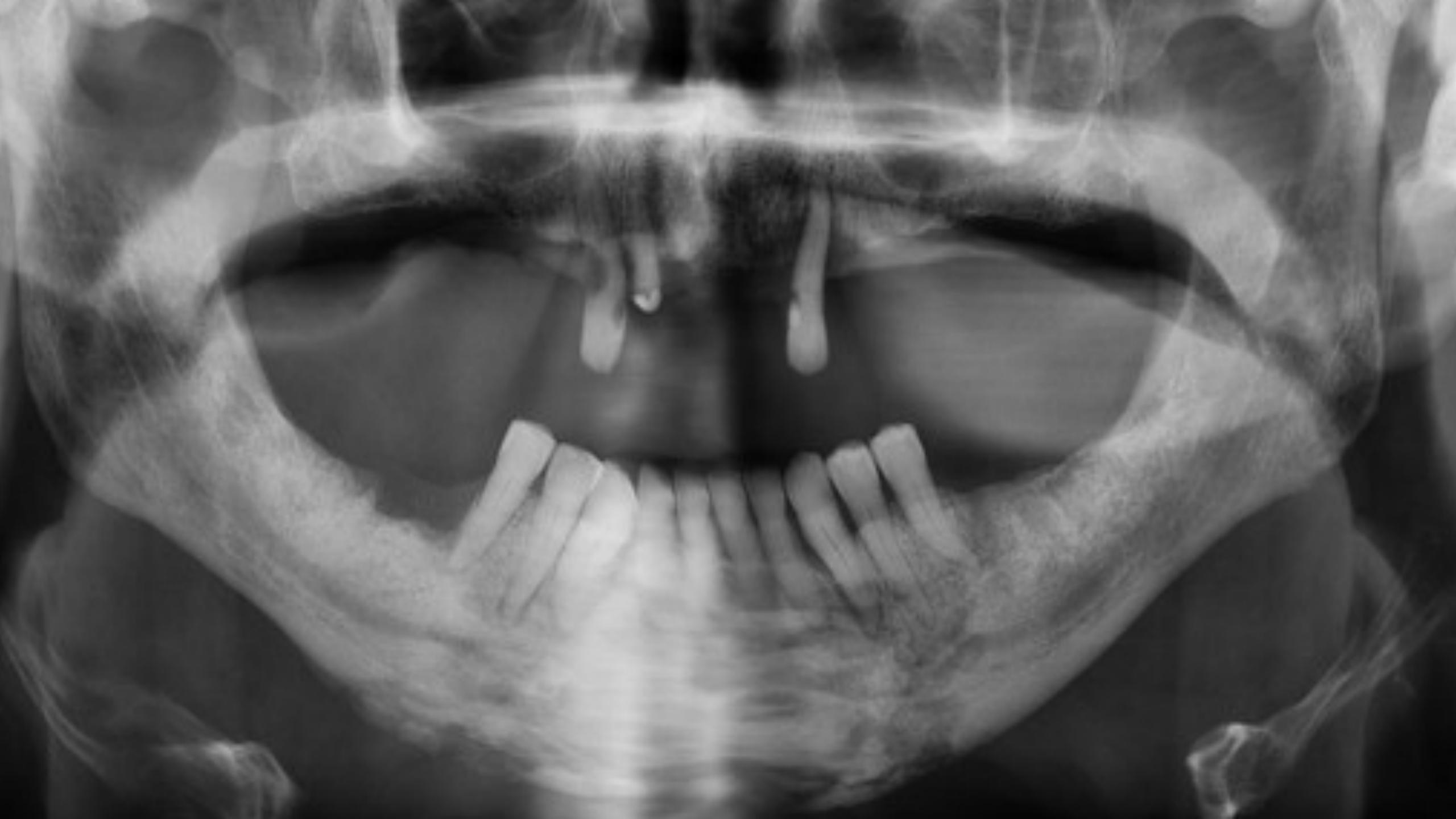
Into the mouth - What special tests might we move onto?

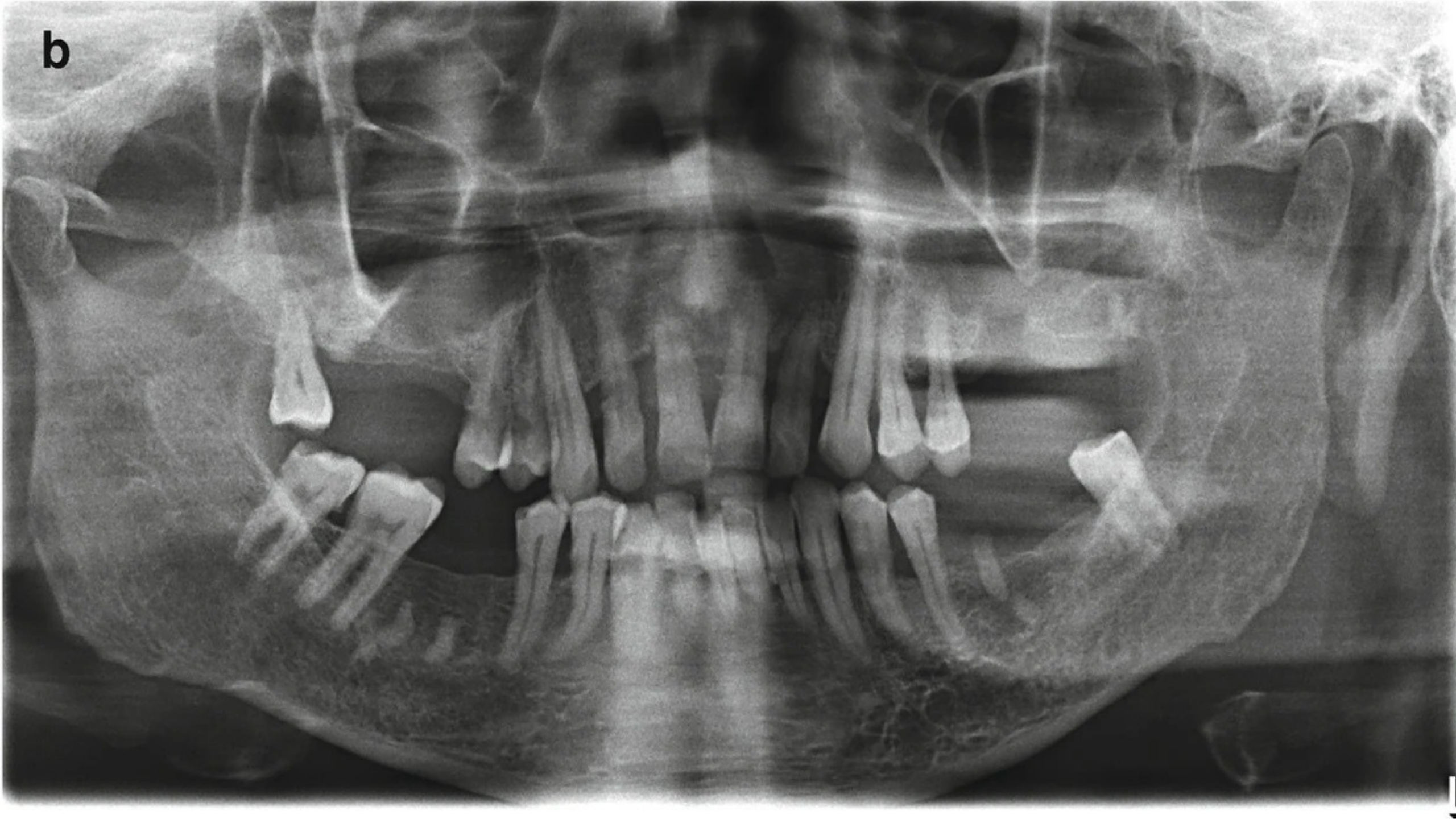
- Percussion testing
- Mobility
- Pocket depths
- Vitality testing
- Frac finder / transillumination
- Radiographs
- Anything else?




A


B




b

How should we manage?

Ubi pus, ibi evacua (latin aphorism)

“Where [there is] pus, there evacuate [it]”

“If there’s pus about, let it out”

What other options do we have?

- In the case of a periapical abscess, we assume bacteria invaded the pulpal tissues:
  - Extirpate
  - Extract

- In the case of a periodontal abcess, we assume bacteria invaded the periodontal tissues:
  - Local debridement

What other options do we have?

- But the pus...
  - If there's pus about let it out - **Incision and drainage**

Incision and Drainage Video:

https://www.youtube.com/watch?feature=oembed&v=Fwr0l3DV4uM

What other options do we have?

- But the pus...
  - If there's pus about let it out – **drainage**
    - **Either through the tooth via extirpation**
    - **Through an incision**

- What if it is severe? (think about affected spaces , risks of those spaces and whether treatment can be efficient enough e.g can you drain a submandibular space abscess?)
  - Refer to ED – consider urgency

- What if we can't get it anaesthetized enough for treatment today?
  - Analgesia
  - Antibiotics

Analgesia

What is pain?

“AN UNPLEASANT SENSORY AND EMOTIONAL EXPERIENCE ASSOCIATED WITH, OR RESEMBLING THAT ASSOCIATED WITH, ACTUAL OR POTENTIAL TISSUE DAMAGE.”

AS DEFINED BY THE INTERNATIONAL ASSOCIATION FOR THE STUDY OF PAIN

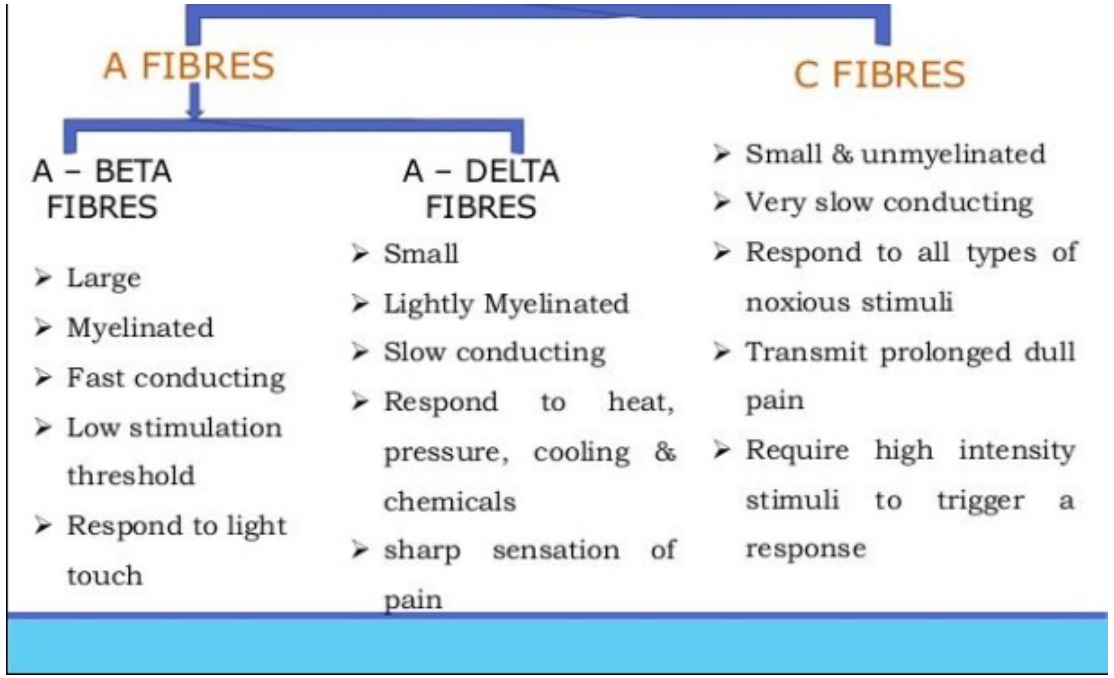
Pain is important

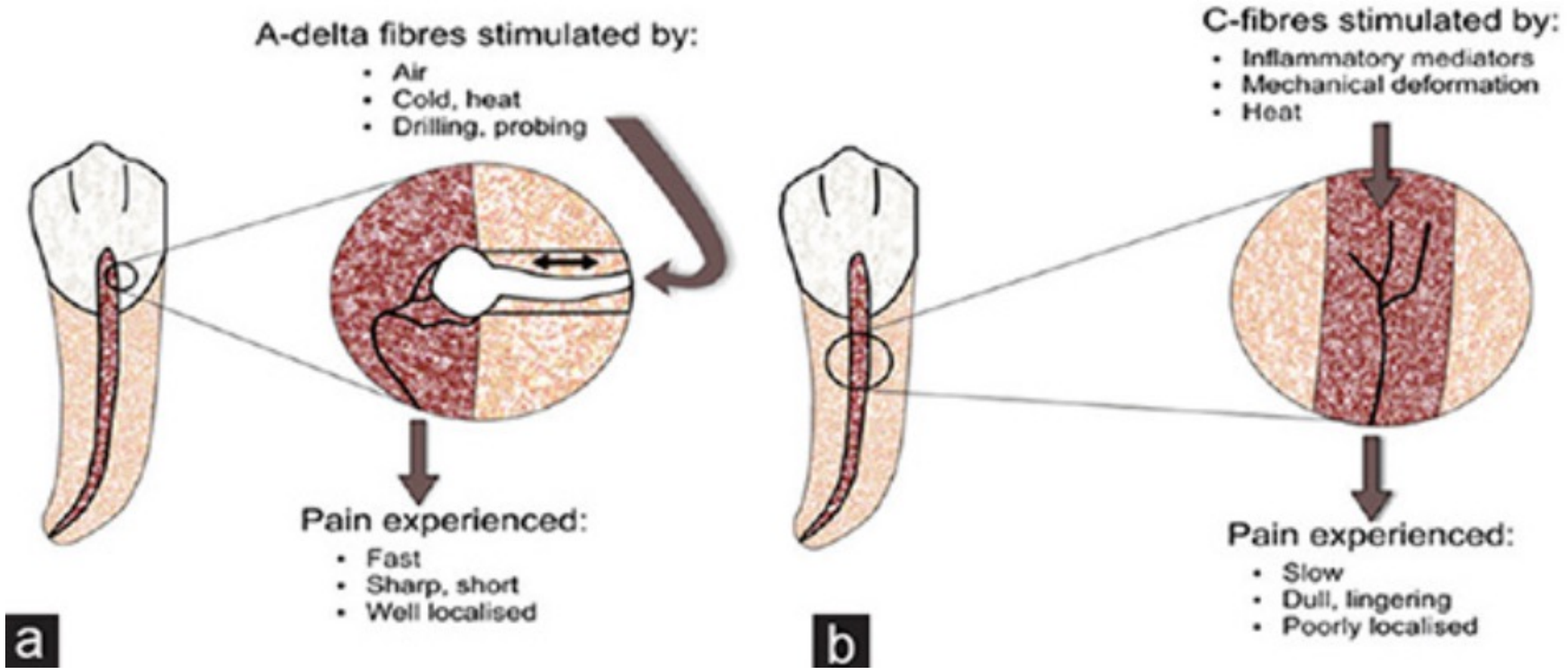
Nociception (the ability to detect pain) is an important mechanism that alerts the body to potential harm or injury.

Can you think of medical conditions/situations where a patient does not have nociception and the implications of this?

Pain pathways

1. Transduction: Nociceptors are stimulated and messages are transmitted via nerve fibres

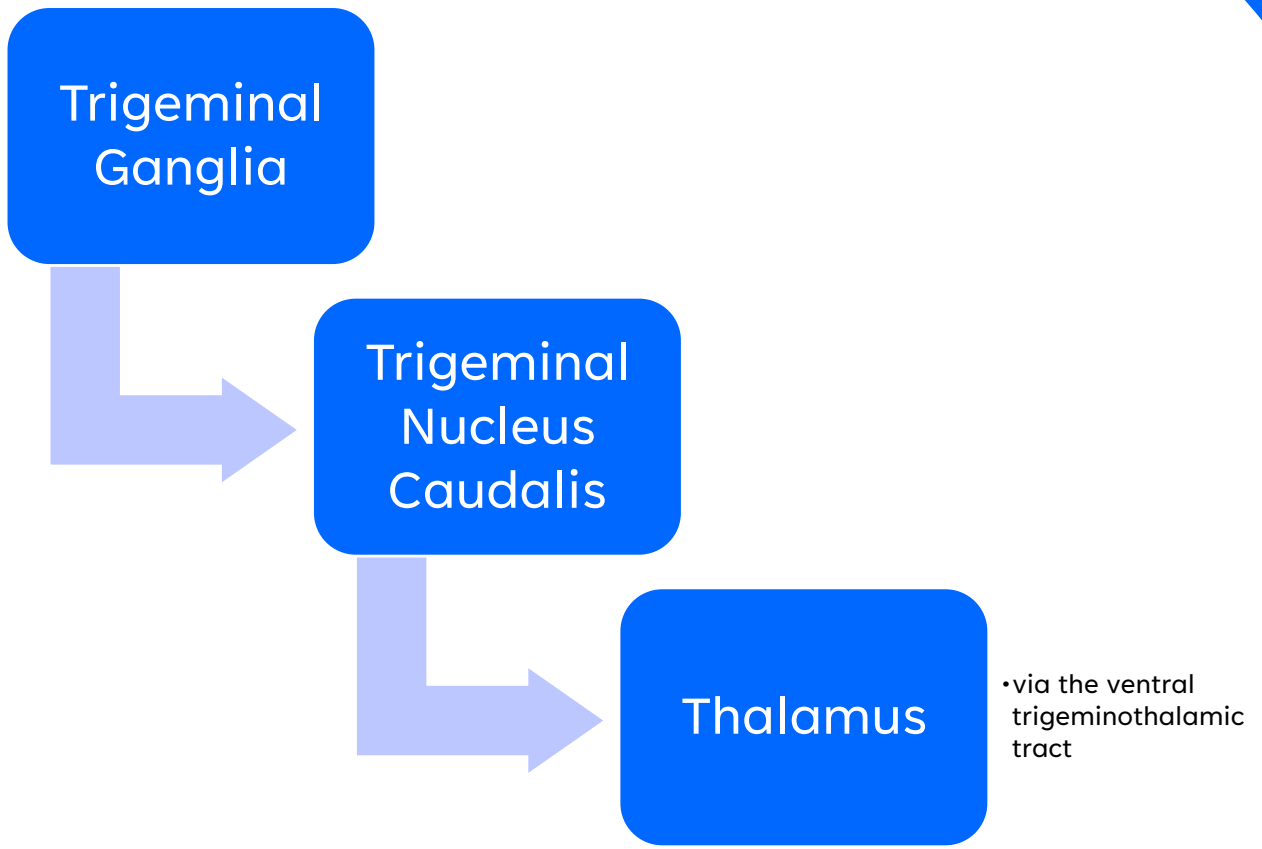




^The pulp, periodontal ligament and the temporomandibular joint (TMJ) have nociceptors. Additionally the periodontal ligament and the TMJ also have proprioceptors and mechanoreceptors

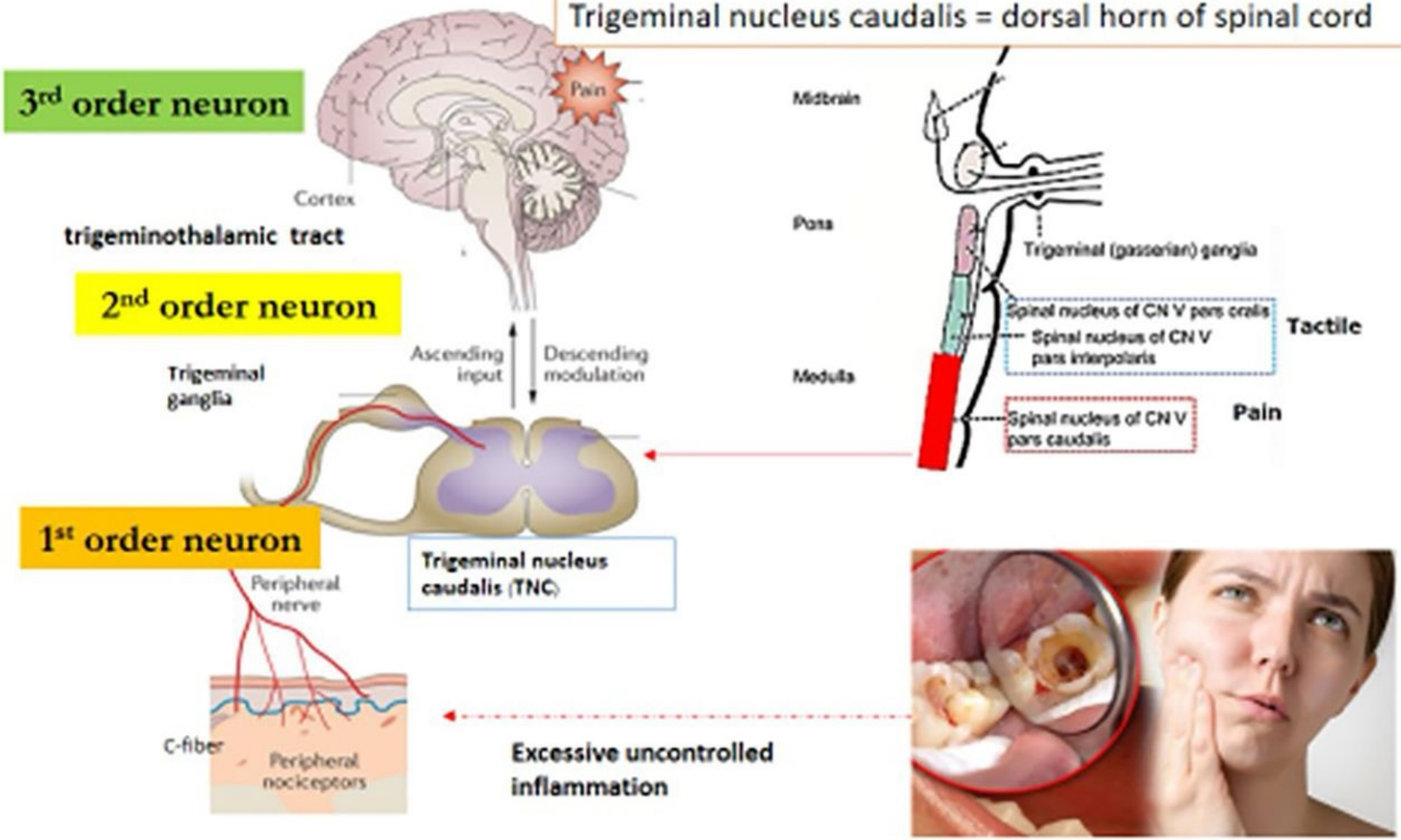
Pain pathways

2. Transmission (of odontogenic pain)



Overview Oro-facial pain physiology

Trigeminal ganglia = dorsal root ganglia
Trigeminal nucleus caudalis = dorsal horn of spinal cord



Rotpenpian N, Yakkaphan P. Review of literatures: physiology of orofacial pain in dentistry. eNeuro. 2021;8(2):ENEURO.0535-20.2021. doi:10.1523/ENEURO.0535-20.2021.

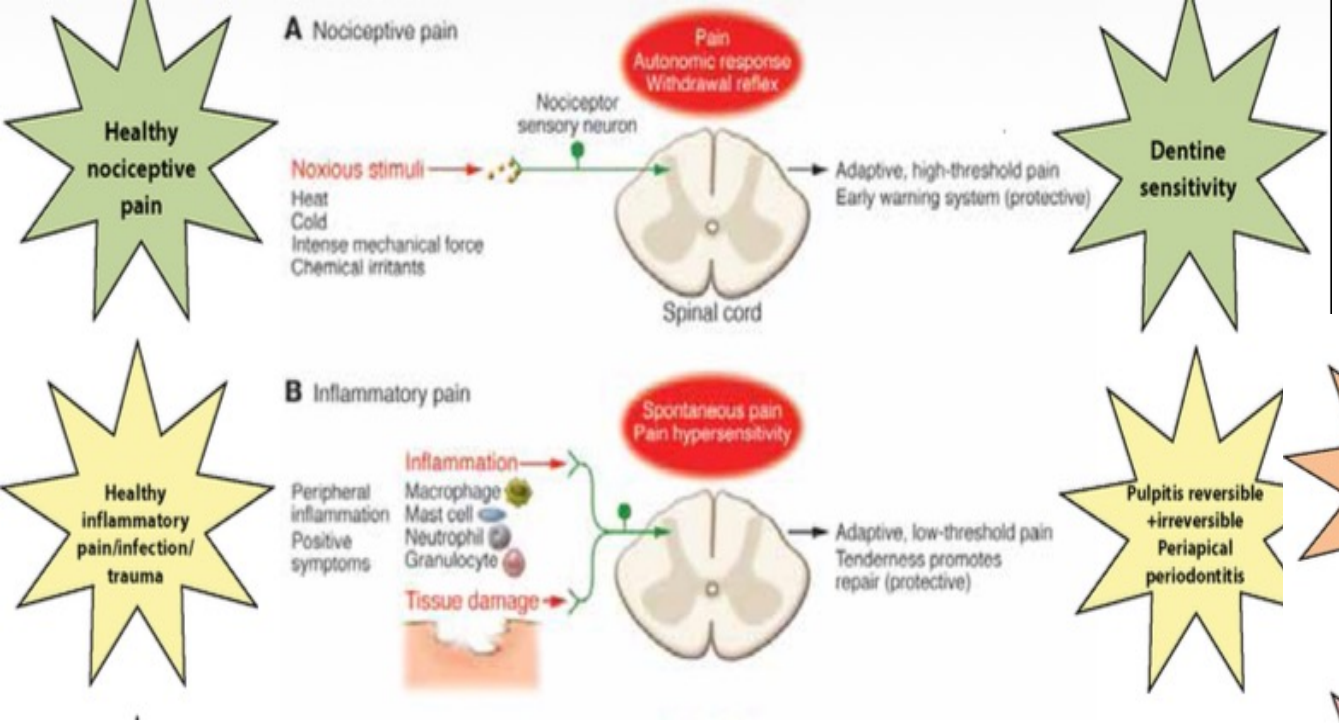
Pain pathways

3. Modulation

- Pain modulation or the descending pathway sends signals from the somatosensory cortex to the trigeminal nucleus caudalis.
- Either serotonin and norepinephrine, enkephalin or opioid peptides are produced: this process leads to a pain reduction

Pain pathways

4. Perception
    - The brain receives the signals, interprets them and does something with them.
        - E.g. stops masticating on a painful tooth



A Nociceptive pain
Pain caused by a non inflammatory response to a noxious stimulus = tissue damage

B Inflammatory pain

C Pathological pain
Neuropathic pain
Pain initiated or caused by a primary lesion or disease in the PNS or CNS = nerve damage

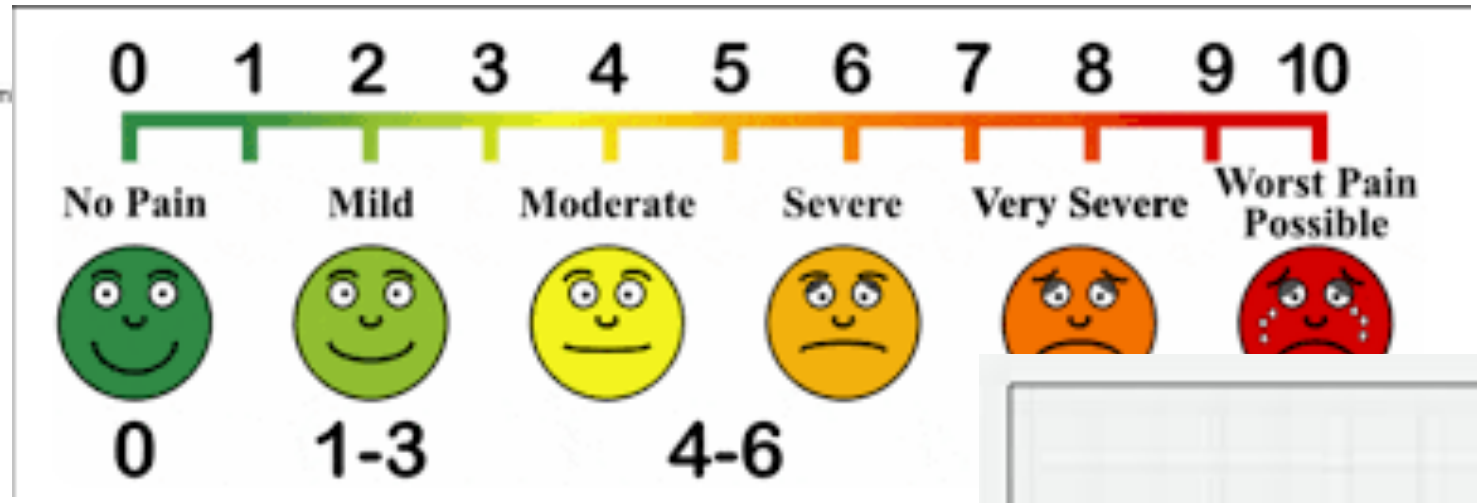
REMEMBER it may be possible to have coincident combinations

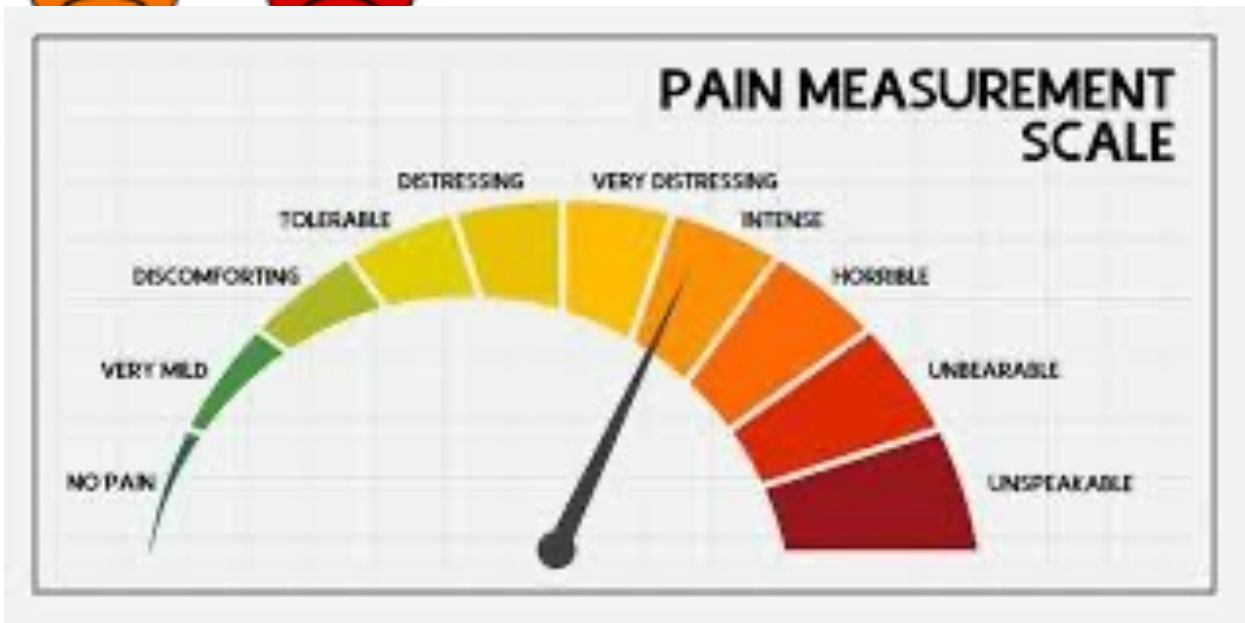
Validated pain assessment tools

Numerical rating scale	Visual Analogue Scale, VAS	Atiken (1969)	>6
Faces scales	Wong-Baker Faces Pain Scale	Wong (1998)	>3
	Faces Pain Scale-Revised, FPS-R	Hicks (2001)	
	Faces Pain Scale, FPS	Bieri (1990)	
	Oucher pain scale	Beyer (1992)	
Adjective scales	Verbal Rating Scale, VRS	Tesler (1991)	>9
Pieces of hurt	Pieces of hurt, Poker chip tools	Hester (1979)	>3
Colour scales	Coloured Analogue Scale	McGrath (1996)	>4
Universal pain scale	Universal pain assessment tool	Department of Anesthesiology and Reanimation, California University (2005)	All ages

Wong-Baker FACES® Pain Rating Scale

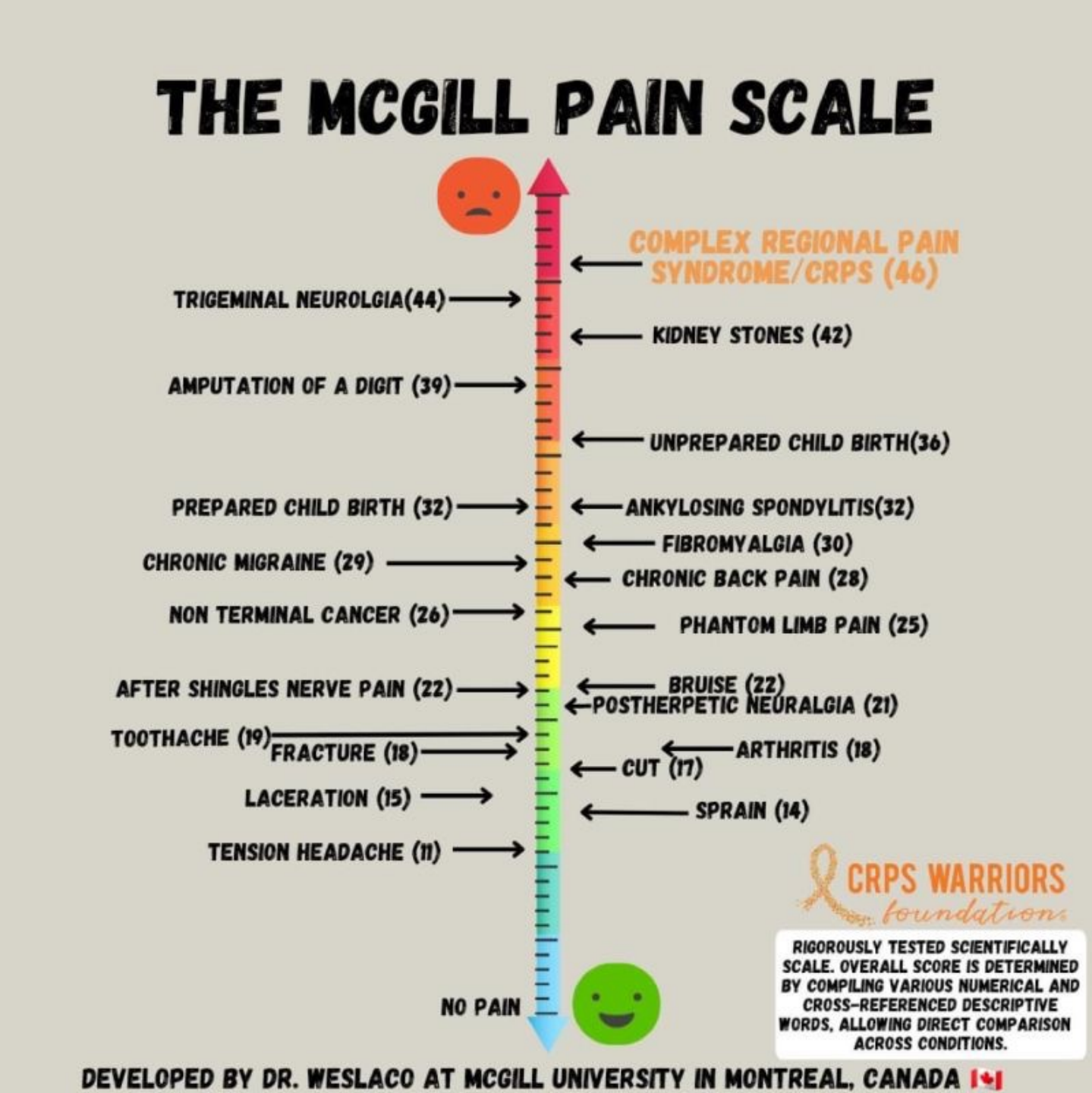
0	2	4	6	8	10
No Hurt	Hurts Little Bit	Hurts Little More	Hurts Even More	Hurts Whole Lot	Hurts Worst





How are we making an assessment of the degree of pain?

- History
- Examination
- Tests
- Expectations based on condition



Interpreting the McGill Pain Questionnaire

Management

Medications

Principles of pain management

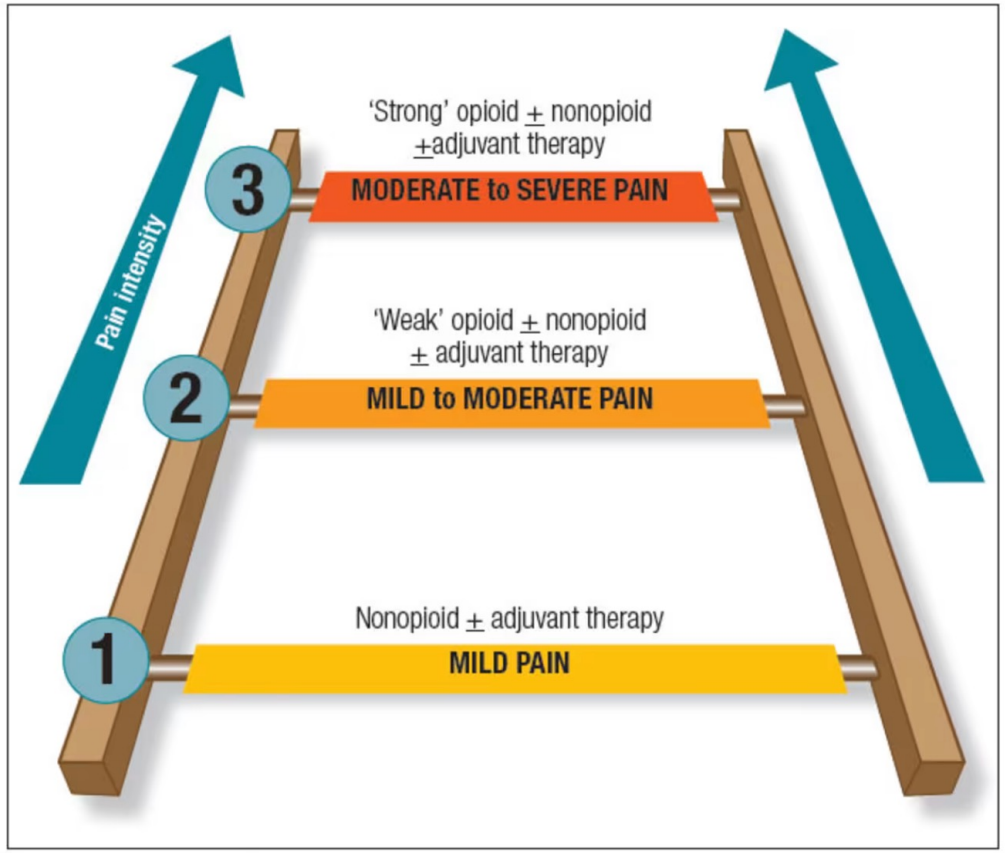


Figure 1. A modern rendition of the original 1986 WHO pain ladder with 3 steps. Patients begin at the first rung and then based on pain intensity progress, rung by rung, up the ladder as pain worsens.

Whilst there are issues with this ladder, it is a good tool for a prudent prescriber to think about.

You will see pain management across different specialties both in and out of Dentistry. Other strategies may be very different compared to what we need to think about.

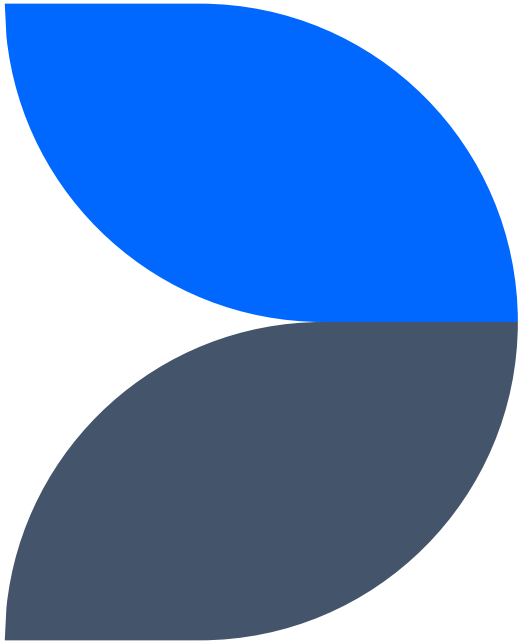
Pergolizzi J, Raffa R. The WHO Pain Ladder: Do We Need Another Step?. Pract Pain Manag. 2014;14(1).

Local Anaesthetic (a special mention)

- Binds to the sodium channels which blocks the influx of sodium ions during nerve transmission
- Will provide short term (or procedural) relief
- Think about injection site (infection) and pKa of the solution as to whether it will work

What comes next is an overview

THE MOST UP TO DATE THERAPEUTIC GUIDELINES SHOULD BE CONSULTED



Activity

Personal Formulary

Paracetamol/acetaminophen

Name of drug	Dose for adults	Max dose in 24hr
Paracetamol 500mg tablet	500mg orally. 1-2 tablets up to 4 times daily	4000mg

*acts within the CNS with no anti-inflammatory effect. It does have an anti-pyretic affect (inhibiting Prostagladin E2

NSAIDS

- Have an anti-inflammatory effect as well as good efficacy for bone pain.
- Caution must be used as can have adverse effects on renal, cardiovascular and gastrointestinal systems.
- Designed to be used short term and to be taken regularly.
- Ideally should not be taken for more than 5 days.
- No longer recommended to take with food.
- Can be non-selective or cox-2 selective (more targeted).

NSAIDS

Name of drug	Dose for adults	Max dose in 24hr
Ibuprofen 200mg tablet	400mg orally 6-8hrly	1200mg
Naproxen XXXXmg tablet	1000mg orally once daily 750mg orally once daily 500mg orally, 12hrly 250mg orally, 4 hourly	1100mg
Celcoxib 200mg tablet	200mg, orally up to once or twice per day	400mg

Opioids

- Act pre-synaptically:
  - Block the calcium channels to inhibit the release of neuro-transmitters such as substance P and glutamate
- Act post-synaptically:
  - Open potassium channels which hyperpolarize cell membranes increasing the required action potential to generate nocioceptive transmission

Opioids

Name of drug	Dose for adults	Max dose in 24hr
Oxycodone 5mg tablet	5mg orally, 6hrly	288mg? - disputed
Tramadol 50mg tablet	50mg orally, 1-2 tablets 6hrly	400mg, but 300mg if >75yrs
Paracetamol 500mg + Codeine 30mg tablet	I or II up to QDS PRN	4000mg paracetamol

- Tapentadol can be prescribed but is not on dental PBS.
- Hydromorphone is in dental PBS but extreme caution should be used.
- Remember-codeine does not have an analgesic effect on everybody (consider pharmacogenomics)

A note on little people

- Asprin should not be given to children under 16 years as this risks Reye's syndrome.

Medications are calculated on weight for children:

Ibuprofen = 5-10mg/kg up to 400mg, 6-8hr

Paracetamol = 15mg/kg up to 1000mg, 4-6hr

^Refer to Paediatric teaching for more information

Non Pharmacological Pain Management

A special mention

Alternate strategies

Breathing techniques

Distraction techniques

Hypnosis

Acupressure

Accupuncture

*these will be revisited in a future lecture

Antibiotics

Quiz Question 9

What was the most commonly prescribed antibiotic by dentists in Australia in 2024?

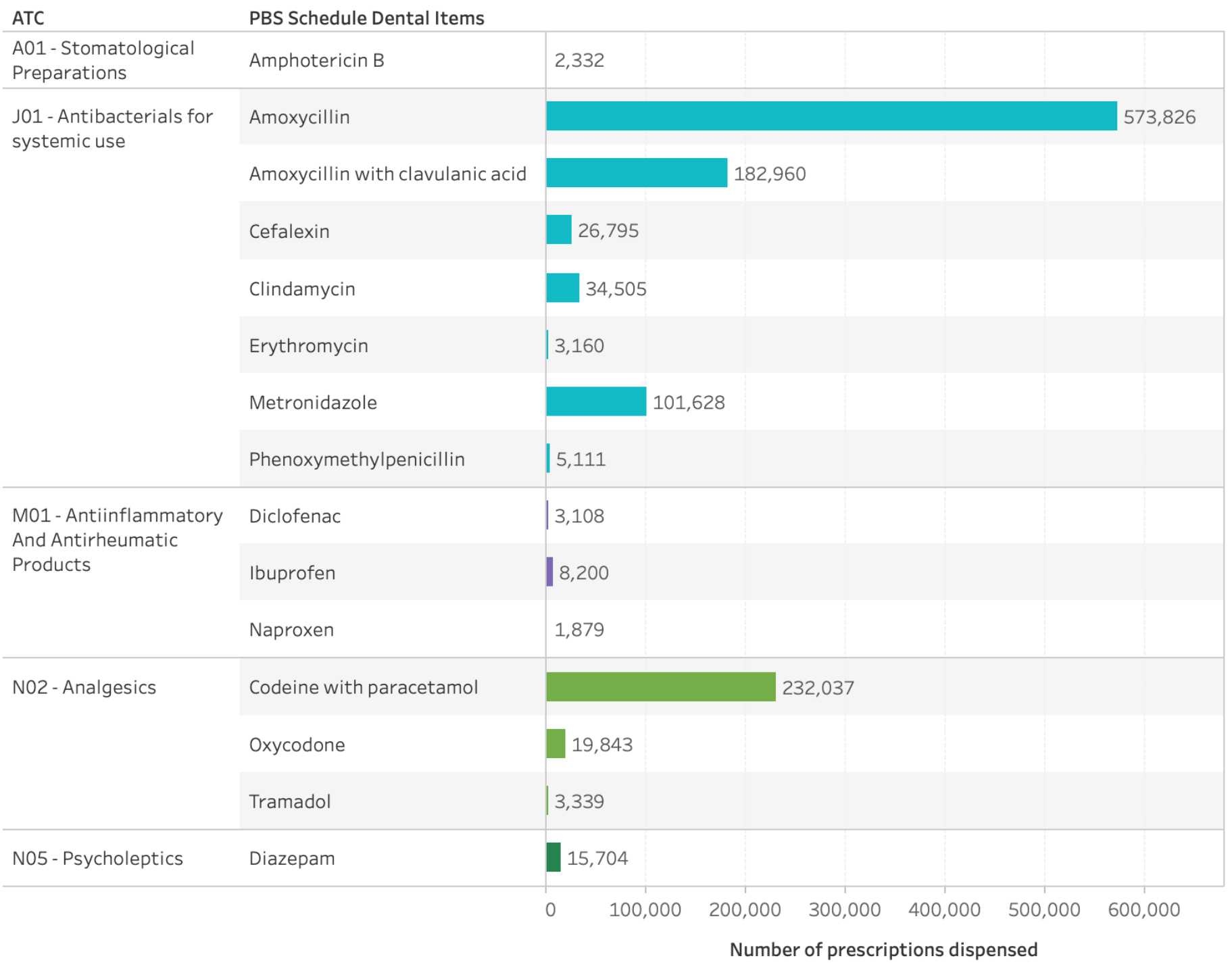
Amoxicillin

Quiz Question 10

What was the most commonly prescribed analgesic, by dentists in 2024

Codeine with paracetamol

2024



https://www.aihw.gov.au/reports/dental-oral-health/oral-health-and-dental-care-in-australia/contents/prescribing#Most-commonly-dispensed-dental-prescriptions

Surgical Antimicrobial Prophylaxis

- Surgical antibiotic prophylaxis is rarely indicated:
  - Prevention of infective endocarditis
  - Replanting an avulsed tooth
  - CERTAIN oral and maxillofacial procedures (such as bone grafting)
  - In certain patients with profound immunocompromise

- Joint prostheses:
  - Not indicated HOWEVER;
  - Position statement from the Arthroplasty Society of Australia
    - If infection and within 3m of replacement surgery – treat aggressively and quickly
    - If no infection, then defer treatment to >3m
    - If orthopaedic surgeon requests antibiotic prophylaxis, get them to prescribe.

Prevention of infective endocarditis

Prosthetic cardiac valve or prosthetic material used for cardiac valve repair
Previous infective endocarditis
Congenital heart disease *but only* if it involves:

- unrepaired cyanotic defects, including palliative shunts and conduits
- completely repaired defects with prosthetic material or devices, whether placed by surgery or catheter intervention, during the first six months after the procedure (after which the prosthetic material is likely to have been endothelialised)
- repaired defects with residual defects at or adjacent to the site of a prosthetic patch or device (which inhibits endothelialisation)

Rheumatic heart disease in patients at high risk of endocarditis (indigenous Australians and those at significant socioeconomic disadvantage)
Heart transplant patients (consult the patient's cardiologist for specific recommendations)

Source: Reference 38

https://australianprescriber.tg.org.au/articles/antibiotic-prophylaxis-for-dental-procedures.html

A note on sensitivty

- Antibiotic ‘Allergy’ is rare and mislabelling is causing overuse of 2nd and 3rd line antibiotics
- Therapeutic Guidelines would now consider whether there is a:
  - Non Severe Allergy
    - Immediate: Mild urticaria, mild rash, maculopapular rash or benign childhood rash
    - Delayed: maculopapular rash or benign childhood rash
  - Severe Allergy
    - Immediate: acute angioedema, anaphylaxis
    - Delayed: Eosinophilia, Stevens Johnson syndrome

Common* Scenario’s

Empirical Antibiotic Regimens for spreading odontogenic infections (if prompt dental treatment)

For spreading odontogenic infections (without severe local or systemic features listed in Table 13.19) in patients undergoing a dental procedure within 24 hours of presentation, use [3] [1] [4] :

1. phenoxymethylpenicillin 500 mg (child: 12.5 mg/kg up to 500 mg) orally, 6-hourly for 5 days

OR

2. amoxicillin 500 mg (child: 15 mg/kg up to 500 mg) orally, 8-hourly for 5 days. For dosage adjustment in adults with kidney impairment, see amoxicillin dosage adjustment.

For patients who have had a **nonsevere (immediate or delayed)** [Note 1] hypersensitivity reaction to a penicillin [Note 2], use:

1. cefalexin 500 mg (child: 12.5 mg/kg up to 500 mg) orally, 6-hourly for 5 days. For dosage adjustment in adults with kidney impairment, see cefalexin dosage adjustment

OR if adherence to a 6-hourly regimen is unlikely for a child

1. cefalexin 20 mg/kg up to 750 mg orally, 8-hourly [Note 3] for 5 days.

Empirical Antibiotic Regimens for spreading odontogenic infections (if prompt dental treatment)

For patients who have had a **severe (immediate or delayed)** [Note 4] hypersensitivity reaction to a penicillin, use:

clindamycin 300 mg (child 10 mg/kg up to 300 mg) orally, 8-hourly for 5 days [Note 5].

Clindamycin use, even if short-term, is associated with increased risk of *Clostridioides difficile* (formerly known as *Clostridium difficile*) infectious diarrhoea [2]. If diarrhoea occurs, advise patients to stop the clindamycin and alert their dentist and general medical practitioner for management advice.

Empirical Antibiotic Regimens for spreading odontogenic infections (if prompt dental treatment)

Name of drug	Dose for adults	Max dose in 24hr
Phenoxymethylpenicillin 500mg tablet	500mg orally, QDS 5/7	-
Amoxicillin 500mg capsule	500mg orally, TDS 5/7	-
Cefalexin 500mg tablet	500mg orally, QDS 5/7	-
Clindamycin 150mg tablet	300mg orally, TDS 5/7	-

Empirical Antibiotic Regimens for spreading odontogenic infections (if unable to provide prompt dental treatment)

1. metronidazole 400 mg (child: 10 mg/kg up to 400 mg) orally, 12-hourly for 5 days

PLUS EITHER

1. phenoxymethylpenicillin 500 mg (child: 12.5 mg/kg up to 500 mg) orally, 6-hourly for 5 days

OR

2. amoxicillin 500 mg (child: 15 mg/kg up to 500 mg) orally, 8-hourly for 5 days. For dosage adjustment in adults with kidney impairment, see amoxicillin dosage adjustment

OR as a single drug

2. amoxicillin+clavulanate 875+125 mg (child 2 months or older: 22.5+3.2 mg/kg up to 875+125 mg) orally, 8-hourly for 5 days. For dosage adjustment in adults with kidney impairment, see amoxicillin+clavulanate oral dosage adjustment.

For patients who have had a **nonsevere (immediate or delayed)** [Note 6] hypersensitivity reaction to a penicillin [Note 7]; use:

metronidazole 400 mg (child: 10 mg/kg up to 400 mg) orally, 12-hourly for 5 days

PLUS EITHER

1. cefalexin 500 mg (child: 12.5 mg/kg up to 500 mg) orally, 6-hourly for 5 days. For dosage adjustment in adults with kidney impairment, see cefalexin dosage adjustment

OR if adherence to a 6-hourly regimen is unlikely for a child

1. cefalexin 20 mg/kg up to 750 mg orally, 8-hourly [Note 8] for 5 days.

Empirical Antibiotic Regimens for spreading odontogenic infections (if unable to provide prompt dental treatment)

For patients who have had a **severe (immediate or delayed)** [Note 9] hypersensitivity reaction to a penicillin, use:

clindamycin 300 mg (child: 10 mg/kg up to 300 mg) orally, 8-hourly for 5 days [Note 10].

Empirical Antibiotic Regimens for spreading odontogenic infections (if unable to provide prompt dental treatment)

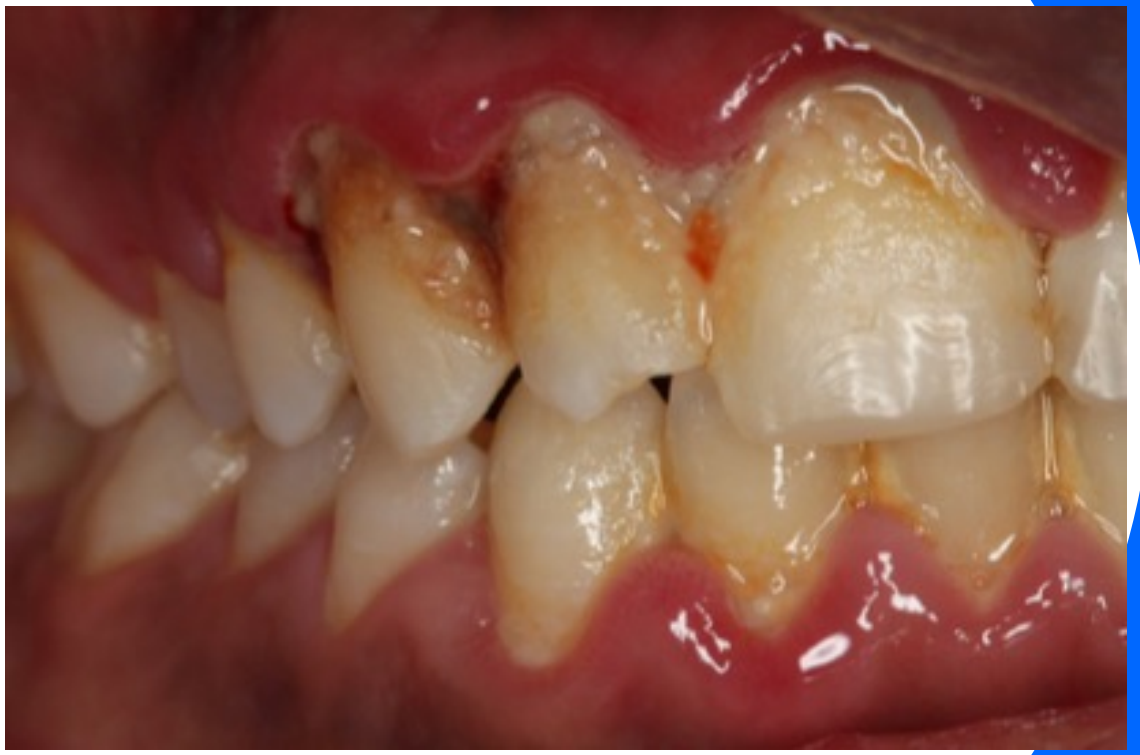
Name of drug	Dose for adults	Max dose in 24hr
Metronidazole 200mg tablets	400mg orally, BD 5/7	-
Phenoxymethylpenicillin 500mg tablets	500mg orally, QDS 5/7	-
Amoxicillin 500mg capsule	500mg orally, TDS 5/7	-
Amoxicillin 875mg Clavulanic Acid 125mg tablets	1000mg orally, TDS 5/7	-
Cefalexin 500mg tablets	500mg orally, QDS 5/7	-
Clindamycin 150mg tablet	300mg orally, TDS 5/7	-

Acute Necrotising Ulcerative Gingivitis

Debride

Smoking cessation

Hydrogen Peroxide 3% m/wash – mixed 50:50 with warm water



For antibiotic therapy of necrotising gingivitis, use [2] [6] :

metronidazole 400 mg orally, 12-hourly for 3 to 5 days.

PBS

If metronidazole is not suitable for treatment of necrotising gingivitis, use [7] :

amoxicillin 500 mg orally, 8-hourly for 3 to 5 days.

PBS

Acute Necrotising Ulcerative Gingivitis

Name of drug	Dose for adults	Max dose in 24hr
Metronidazole 200mg tablets	400mg orally, BD 5/7	-
Amoxicillin 500mg capsule	500mg orally, TDS 5/7	-

Replanting an avulsed tooth

First line:

amoxicillin 500 mg (child: 15 mg/kg up to 500 mg) orally, 8-hourly for 7 days.

In Penicillin Sensitivity:

doxycycline orally, once daily for 7 days [Note 3] [Note 4]

child less than 21 kg: 2.2 mg/kg

child 21 kg to less than 26 kg: 50 mg

child 26 to 35 kg: 75 mg

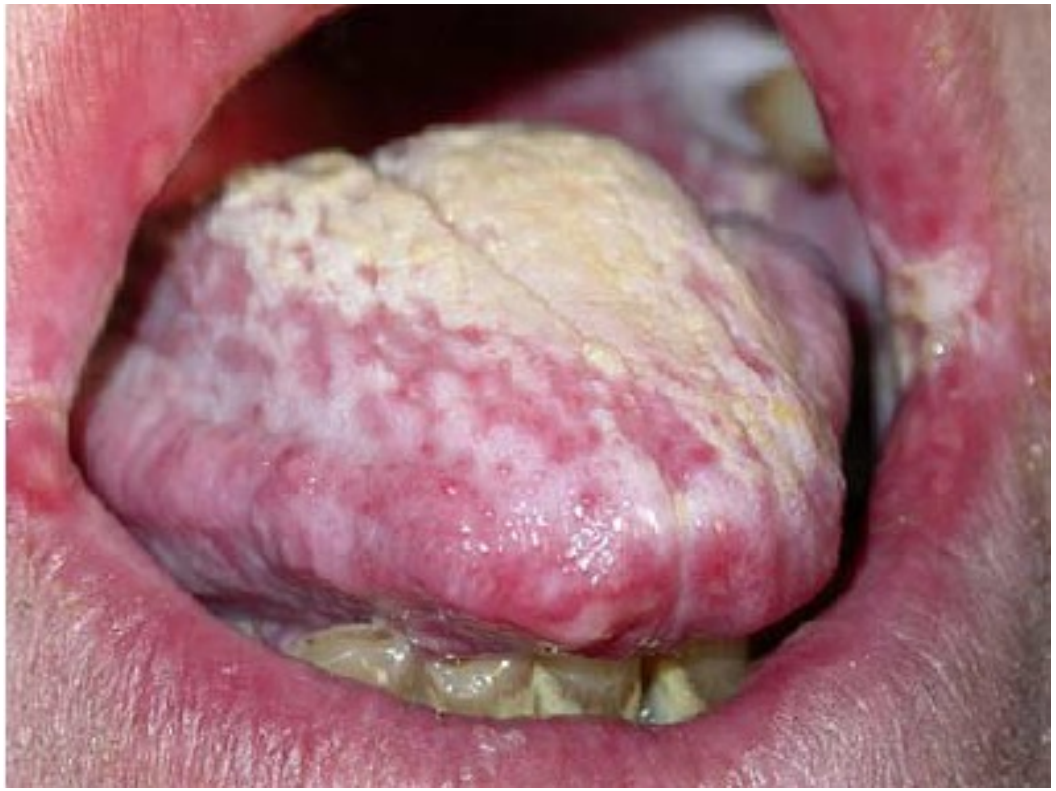
child more than 35 kg or adult: 100 mg.

*check tetanus status, if greater than 5yrs refer to GP for assessment

Replanting an avulsed tooth

Name of drug	Dose for adults	Max dose in 24hr
Amoxicillin 500mg capsule	500mg orally, TDS 7/7	-
Doxycyline 100mg tablet	100mg orally, OD 7/7	-

Oral Candidiasis



For adults with oral or oropharyngeal candidiasis, use [11] [11] [14] :

1. miconazole 2% gel 2.5 mL topically (then swallowed), 4 times daily after food and drink, for 7 to 14 days as guided by symptom resolution. Place directly in the mouth and on the tongue

OR

1. nystatin 100 000 units/mL liquid 1 mL topically (then swallowed), 4 times daily after food and drink, for 7 to 14 days as guided by symptom resolution [Note 8]. Place under tongue or in buccal cavity

OR

2. amphotericin B 10 mg lozenge sucked (then swallowed), 4 times daily after food and drink, for 7 to 14 days as guided by symptom resolution.

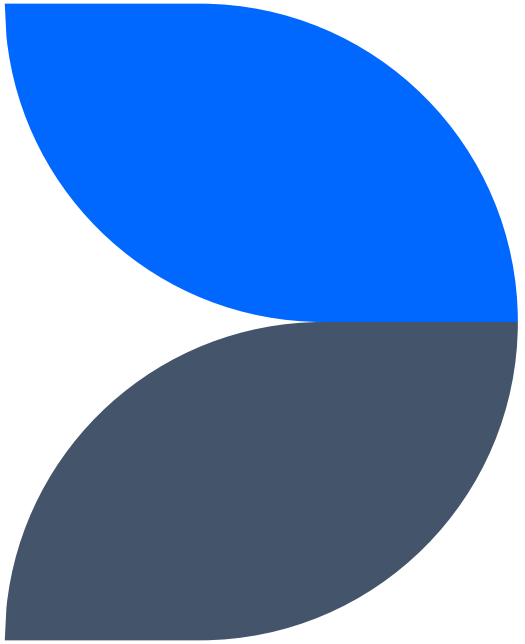
The diagnosis and management of this will be covered by Oral Medicine.

Oral Candidiasis

Name of drug	Dose for adults	Notes
Miconazole 2% oral gel	2.5mL topically and then swallowed, QDS after food and drink for 14/7. Continue to use for several days after symptoms disappear	Comes in a 40g tube
Nystatin 100 000 units/mL oral liquid	1mL swished in mouth and then swallowed, QDS after food and drink for 14/7. Continue to use for several days after symptoms disappear.	Comes in a 24mL bottle. Will need to send enough. One bottle is 24 doses – 6 day supply
Amphotericin B 10mg lozenge	10mg lozenge sucked and then swallowed, QDS 14/7. Continue to use for several days after symptoms disappear.	Comes as a packet of 20. Will need to send enough. One packet is 20 doses – 5 day supply.

Prescribing

The practical side



Prescription?

“A prescription is a legal document that health practitioners write for a pharmacist to dispense a specific medication.” (health.gov.au)

Prescribing

“Through the Pharmaceutcical benefits Scheme (PBS), anyone with a Medicare card can access more than 5,000 subsidized medicines.”

“Dentists may personally prescribe or supply a Schedule 4 (S4) or Schedule 8 (S8) medicine in accordance with their authority. Any medicine supplied must be appropriately packaged and fully labelled according to regulations”

Principles of safe prescribing

- Legislation applicable in WA includes:
  - *Medicines and Poisons Act 2014*
  - *Medicines and Poisons Regulation 2016*
- If going on to practice in other states or territories it is important to be aware of variations in legislations.

Principles of safe prescribing

- Prescribing rights are specific to an individual practitioner and cannot be delegated or shared.

- Drugs can be prescribed only for dental treatment for patients under their care.
  - Legislation varies regarding prescribing for staff, family or friends but it is generally not recommended.

TGA recommends to follow the British Pharmacological Society (BPS) practices

All prescribers should:

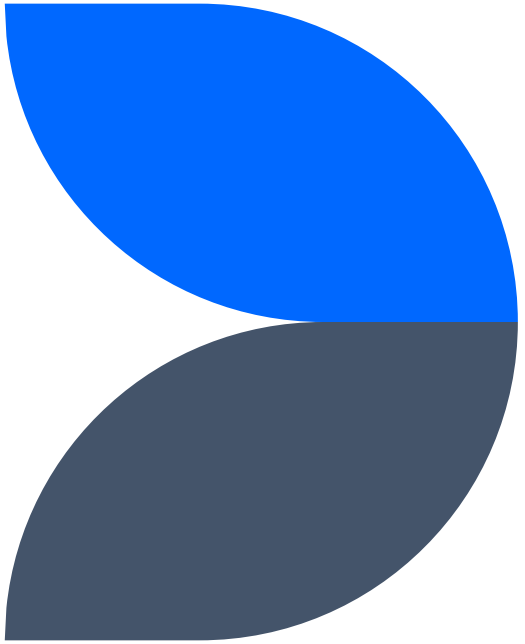
1. Be clear about the reasons for prescribing
2. Take into account the patient's medication history before prescribing
3. Take into account other factors that might alter the benefits and risks of treatment
4. Take into account the patient's ideas, concerns and expecatations
5. Select effective, safe, and cost effective medicines individualized for the patient.

TGA recommends to follow the British Pharmacological Society (BPS) practices

6. Adhere to guidelines and local formularies where appropriate.
7. Write unambiguous legal prescritptions using the correct documentation.
8. Monitor the beneficial and adverse effects of medicines.
9. Communicate and document prescribing decisions and the reasons for them.
10. Prescribe within the limitations of your knowledge, skills and experience.

Digital Tools

Dental Prescriber



Dental Prescriber App Links
CAUTION – AS OF 27/1/26 NOT USING TGA GUIDELINES v4

Apple Store Link

https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://apps.apple.com/au/app/dental-prescriber/id438184927&ved=2ahUKEwi6jfT2tquSAxVXRmwGHQCcErAQFnoECB4QAQ&usg=AOvVaw3VbLNrokQXVFSw11WyKvrw

Google Play Store link

https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://play.google.com/store/apps/details%3Fid%3Dcom.williamha.dentalprescriber%26hl%3Den_AU&ved=2ahUKEwi6jfT2tquSAxVXRmwGHQCcErAQFnoECB0QAQ&usg=AOvVaw00d6_qA2cPqCN_-TSScUNi

Digital Tools

drugs4dent

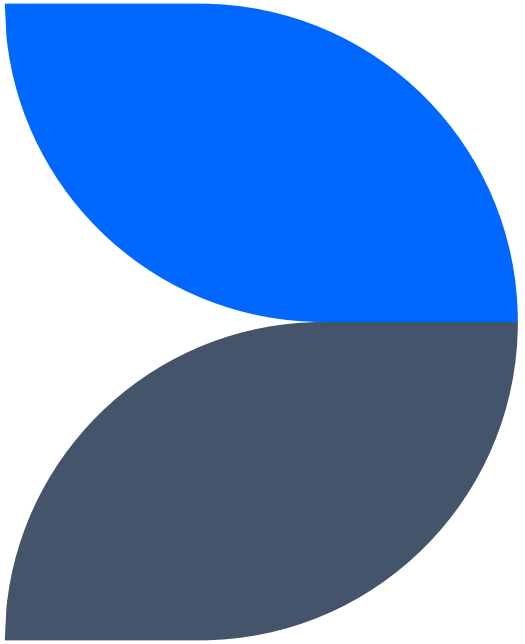
Drugs4Dent

https://www.mimsdrugs4dent.com

This is accessible on University networks
ADA access *should* be coming soon

Digital Tools

Therapeutic Guidelines



Therapeutic Guidelines v4

https://app-tg-org-au.eu1.proxy.openathens.net/guidelines

This is accessible on University networks

Drugs of dependance

- Additional considerations should apply when prescribing drugs of dependance (some S4 and all S8).
- If a patient requests drugs of dependance, particularly if they exhibit a good levels of knowledge or preference for a specific drug, CONSIDER that they may have a disorder or substance abuse.
- ScriptCheckWA can give you information about a patients recent history with dispensed medications.
  - This might be particularly useful if a new patient attends the practice and is demanding medications.

Script Check WA

Search | Authorisations | Correspondence

Welcome Richard Hague

Dashboard / Patient Search

Patient Search

Name

Enter first name *

Enter surname *

Enter date of birth

IHI

Search

Patient Search Results

Clear Filter

Clear Search

Name	Date of Birth	Gender	Address	Postcode
Enter details to search for a patient. Your search results will appear here - including patients associated with your query.				

*This is meant to be information in real time.

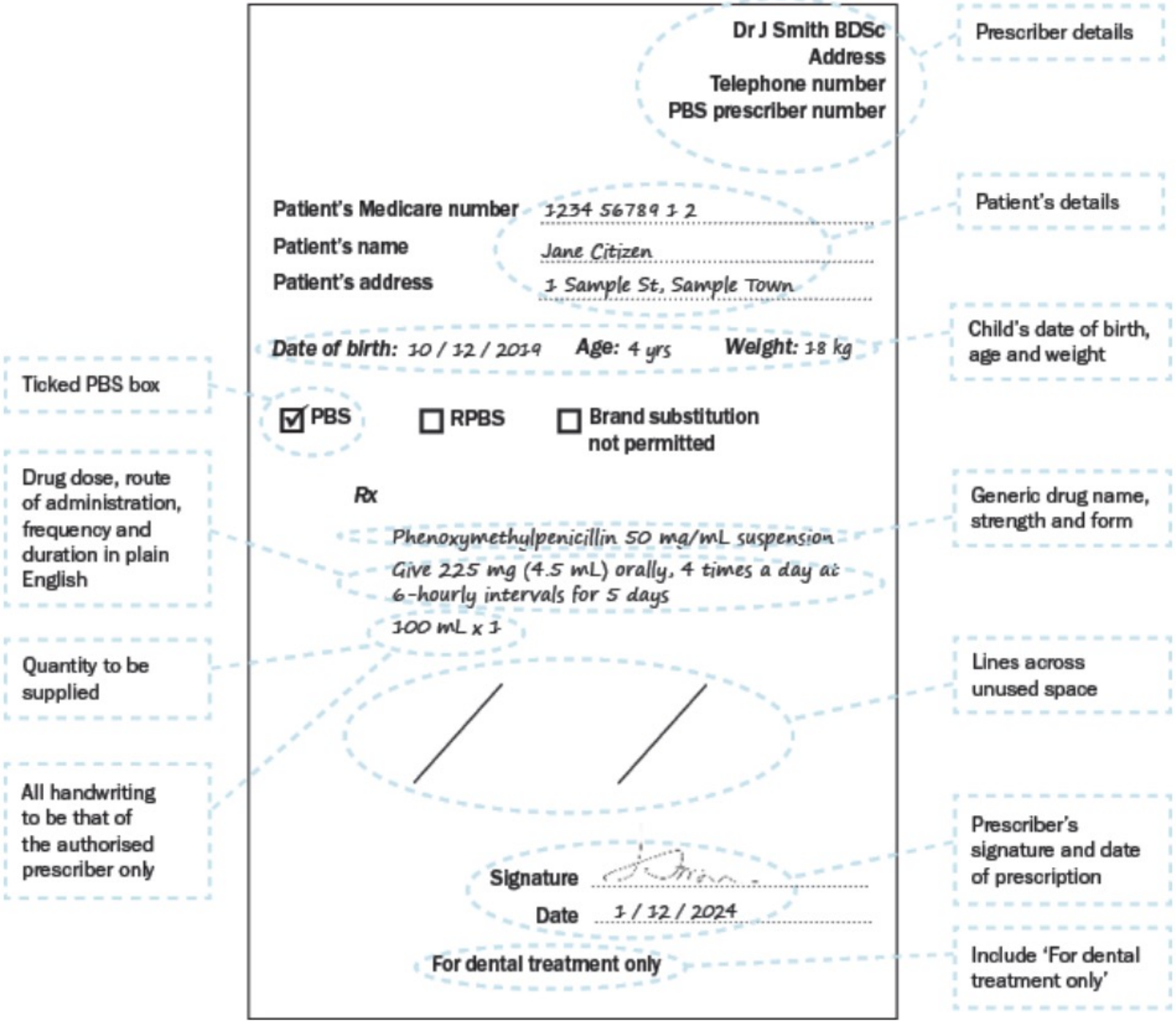
Cost to patients

- PBS will subsidise items prescribed by a dentist, as long as they are marked “Dental Items”
- Medicines not listed as “Dental Items” may still be prescribed but the patient will have to pay the full cost.
- Prescription only, non-subsidized items can be prescribed “private” or “non-PBS”.

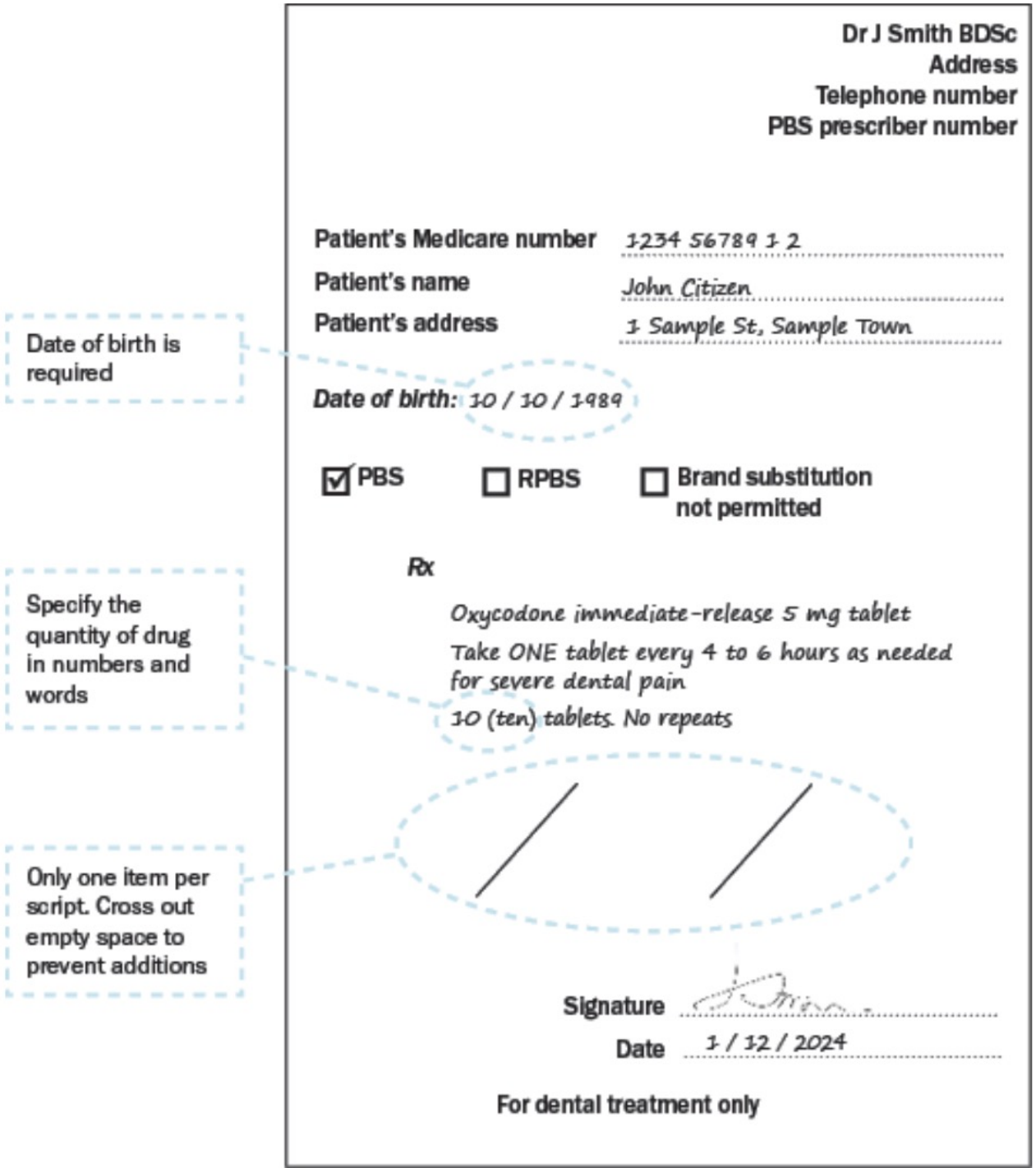
A quick note on dispensing

- The prescriber and the supplier (dispenser) will often be separate clinicians.
- Some practices may choose to keep a stock of medications (such as analgesia or antibiotics).
- If you work in a practice who dispenses medications:
  - These are not subsidized by the PBS
  - Must adhere to the same dispensing standards and legal requirements expected of a pharmacist.

General Prescription



Drug of addiction prescription

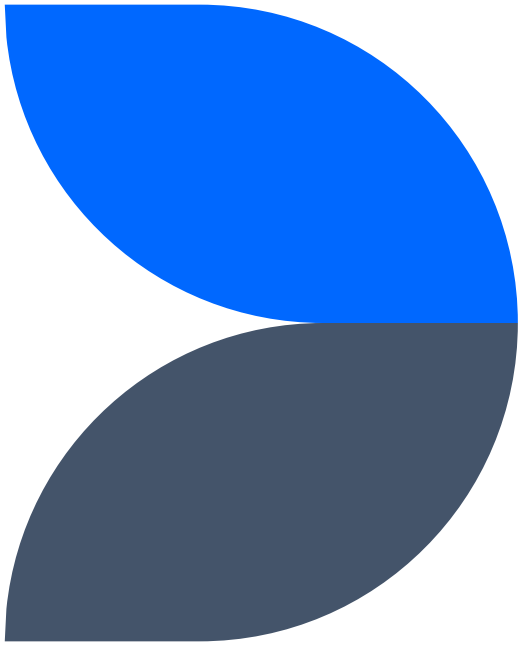


Discussing the prescription with the patient

- Talk to the patient about the drug (generic name)
- The expected therapeutic effects
- Instructions on how to take
- Potential side effects
- Other precautions
- Review?

Activity

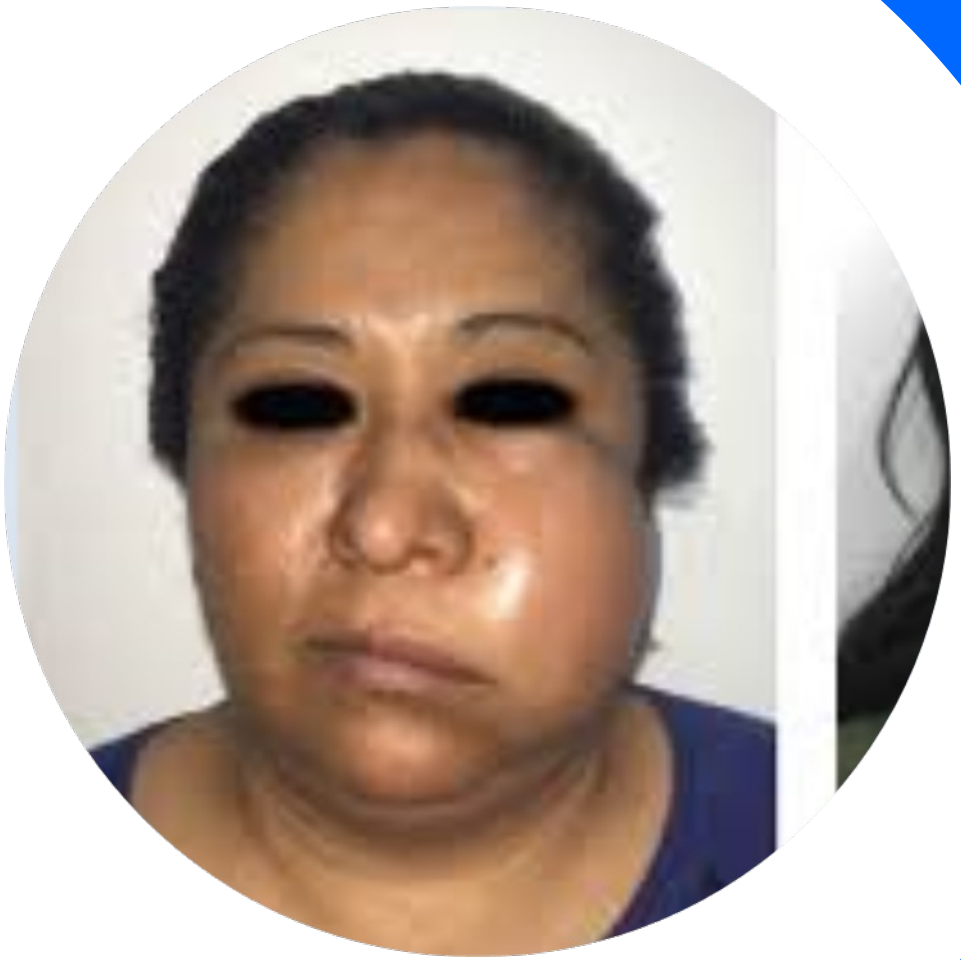
Writing Prescriptions



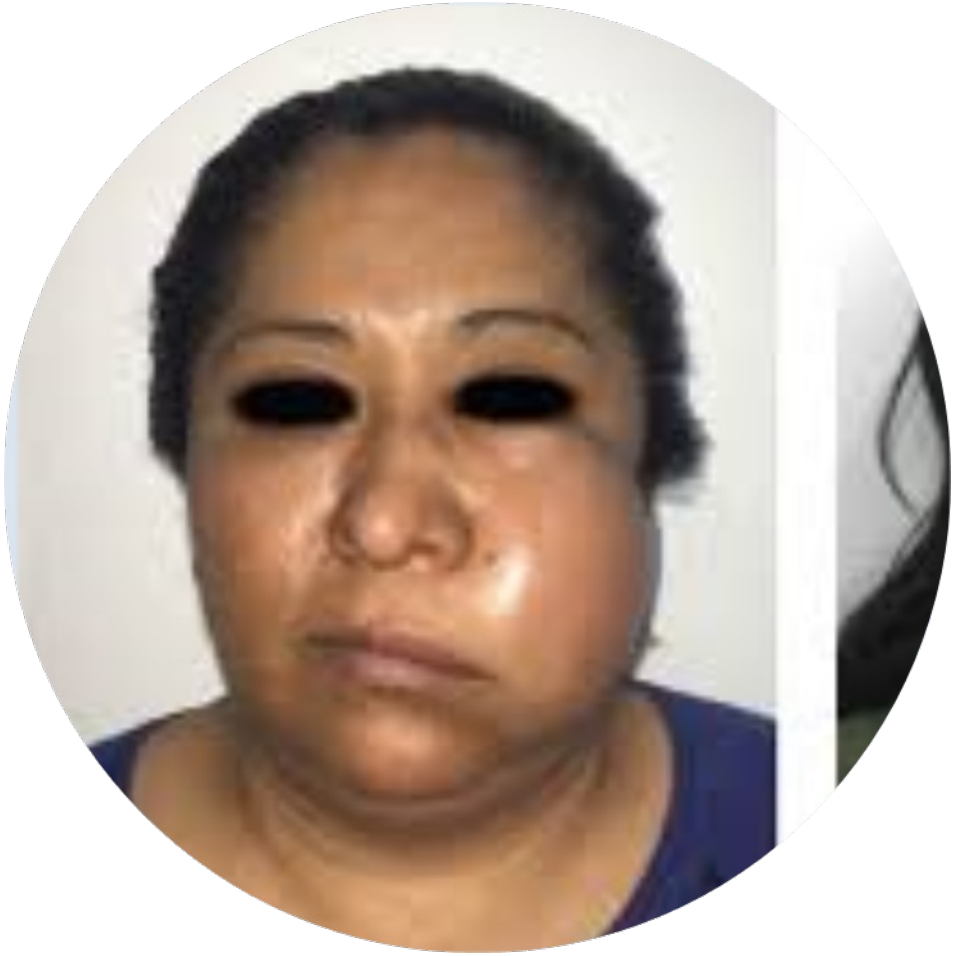
Our patient

What have we done so far?

- Incised and drained
- Accepted we wouldn’t get numb for dental treatment today
- Now we want to prescribe..
  - Antibiotics
  - Analgesia



Jane Smith
100 Any Street,
Perth WA 6000
1/1/1986



For emergency (non-personalised) stationery this section is left blank.

It is the responsibility of the prescriber to complete this section at the time of prescribing.

Richard Hague
OHCWA
Prescriber Number : XXXXX

Patient's Medicare no. | Patient's Ref no.

Patient's full name: JANE SMITH

Patient's address: 100 ANY STREET, PERTH

Postcode 6000

Entitlement no.

PBS Safety Net entitlement cardholder ☐ Concessional or dependant, RPBS beneficiary or PBS Safety Net concession cardholder ☐

(Tick appropriate boxes)

PBS ☑ RPBS ☐ Brand substitution not permitted ☐

① Amoxicillin + clavulanate 875+125mg tabs
Send: (15)
Label: Take one tablet orally every 8hrs for 5 days

Pharmacist/patient copy

Privacy notice on reverse

Doctor's signature ✍ Date 27/1/26

I declare that I have received this/these medicine(s) and the information relating to any entitlement to a pharmaceutical benefit is correct.

Patient's or agent's signature ✍ Date of supply / /

Agent's address

PB021.2008

SAMPLE

For emergency (non-personalised) stationery this section is left blank.

It is the responsibility of the prescriber to complete this section at the time of prescribing.

Richard Hague
OHCWA
Prescriber Number XXXX

Patient's Medicare no. | Patient's Ref no.

Patient's full name: JANE SMITH

Patient's address: 100 ANY STREET, PERTH

Postcode 6000

Entitlement no.

PBS Safety Net entitlement cardholder ☐ Concessional or dependant, RPBS beneficiary or PBS Safety Net concession cardholder ☐

(Tick appropriate boxes) DATE OF BIRTH - 1/1/1986

PBS ☑ RPBS ☐ Brand substitution not permitted ☐

① Oxycodone 5mg tablet
Send (20) (TWENTY)
Label: Take 5mg up to four times daily. No repeats

Pharmacist/patient copy

Privacy notice on reverse

Doctor's signature ✍ Date 27/1/26

I declare that I have received this/these medicine(s) and the information relating to any entitlement to a pharmaceutical benefit is correct.

Patient's or agent's signature ✍ Date of supply / /

Agent's address

PB021.2008

SAMPLE

Questions?