RAISED ICP

Aims: To appraise junior nursing staff and nursing students of mechanism of physiology and therapy around intracranial pressure.
For senior nurses this session may supplement their knowledge on underlying physiology, physics and pharmacology as well as offer an opportunity to ask questions and share experience.

Structure:
Start with a definition of terms and some physiology. Then talk about strategies for manipulating ICP and how they work. Supplement this information with a general spiel on neuroprotective care.

Physiology:
- Normal ICP
- Monroe-Kellie doctrine (draw curve)
- How it is measured
    - Fibre-optic devices
    - EVD
    - EVD catheter in subdural space (common at RPAH with evacuation of SDH)
        - In this configuration they cannot drain CSF
- Concept of CPP
    - Autoregulation (draw curve), dys-autoregulation in traumatised brain
- Determinants of ICP
    - PCO2 (draw curve)
    - PO2 (draw curve)
    - Space occupiers (blood, tumours)
    - Brain volume
    - CSF volume
    - Venous drainage
- CMRO2
- Clinical signs of raised ICP
    - Mostly focus on ICU signs, but can mention fundoscopy

Therapy:
- Non-medical
    - No neck lines, no ties, sit up 45 degrees
    - Neutral head position
    - Remove collar
    - Hypothermia
        - Controversial, not to be used indiscriminately
- Medical
    - Sedation
        - Propofol (lowers ICP and CMRO2)
        - Opioid (lowers ICP, ablates cough/gag, lowers CMRO2)
        - Midazolam (lowers ICP, minimal effect on C MRO2)

        - Ketamine (lowers ICP … yes really, don't believe the myths… might still be difficult to institute as it has a very tenacious reputation for raising ICP)
        - Thiopentone coma (rescue therapy for refractory ICP)
    - Neuromuscular blockade
        - Bolus rocuronium / cisatracurium
        - Cisatracurium infusion
    - Ventilation
        - Short-term rescue for acutely raised ICP
        - Avoid high PEEP (venous drainage)
    - Osmotherapy
        - Avoiding hyponatremia
        - Mannitol – metabolically inert and may exacerbate medium-term ICP via "reverse osmosis" (which is a stupid term, I agree), more haemodynamic instability and water loss
        - Hypertonic saline – simpler, easier and causes less complication that mannitol
        - THAM – not used at RPAH
    - NSAID
        - Not used at RPAH, can lower ICP via vasoconstriction
    - Dihydroergotamine
        - Not used at RPAH
    - Steroids
        - No. Just no.

- Mechanical ("simple mechanical problems warrant simple mechanical solutions")
    - Surgical
        - Skull off
            - Talk about some trials, evolving evidence, heterogeneity of practice
        - Remove blood
        - EVD
    - Draining CSF
        - Can be done if EVD is in situ, usually only in consultation with NSx

General:
Talk about brain injury – in particular secondary injury. Discuss general NSICU measures employed to limit and reduce secondary injury (euglycaemia, normoxia, avoidance of fevers).

Clinical case:
Try to find a clinical case that is currently on the floor receiving management for raised ICP. Pull up their record on ICCA and run through the ICP flow sheet with the responses.