Acute Kidney Injury (AKI) in Paediatrics

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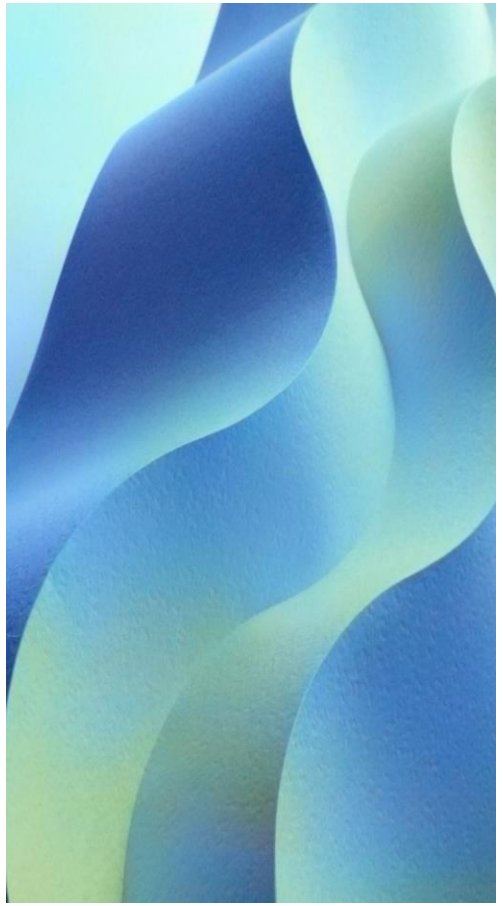
Key roles of the kidney

Filtration:	**Removal of Waste Products:** Filter out waste products and excess substances from the blood. **Excretion of Toxins:** Helps excrete toxins and drugs from the body.
Regulation of Blood Pressure:	**Kidneys release renin**: helps regulate blood pressure and fluid balance. **Fluid Balance:** By adjusting the volume of urine produced, kidneys help maintain blood pressure.
Electrolyte Balance:	**Sodium and Potassium:** Regulate levels of sodium, potassium, and other electrolytes. **Acid-Base Balance**: Helps maintain pH balance of blood by excreting hydrogen ions and reabsorbing bicarbonate.
Erythropoiesis:	**Production of Erythropoietin**: Produce erythropoietin, a hormone that stimulates the production of red blood cells in bone marrow.
Vitamin D Metabolism:	**Activation of Vitamin D:** Convert inactive vitamin D into its active form, calcitriol, which is essential for calcium absorption and bone health.
Regulation of Fluid Balance:	**Water Reabsorption:** Adjust the amount of water reabsorbed helping to maintain hydration and fluid balance



Acute kidney injury (AKI)

- Acute Kidney Injury (AKI) abrupt decrease in kidney function that encompasses both injury to the kidney (structural damage) and kidney impairment (loss of function)
- Diagnosis based on creatinine levels with or without urine (KDIGO)
- Incidence increasing - 26% of patients admitted to hospital (Meena 23)
- Nutritional management must be dynamic and individualized due to the fluctuating nature of the condition (Vega 23)

Causes of AKI in children

Pre Renal

Reduced blood flow to kidney

dehydration, low blood pressure, medications

Renal

Direct damage to kidney Haemolytic uraemic syndrome, nephritis, acute tubular necrosis (oxygen deprivation)

Post-renal

Urinary obstructions kidney stones, blood clots, bladder dysfunction

Dietary Aims

Provide sufficient energy to minimise/prevent catabolism

- Regulate protein intake to control urea but provide sufficient to prevent catabolism

- Control electrolytes

- Nutrition provision within fluid restriction!

PRNT 2023

Assessment and clinical discussions

- Nutritional assessment (weight, length/height, head circumference)
- Biochemistry levels & trends (K, urea, creat, phos, Na, Alb, Hb)
- Urine output
- GI function
- Diet history
- Clinical management plan (conservative treatment vs dialysis)
- Fluid allowance

Nutritional Intervention

Energy: Ensure adequate caloric intake to meet energy needs which may differ depending on stage of illness.

Energy

- SDI for age and euvolemic weight
- If critically unwell and ventilated –Schofield equation
- Maximise energy within fluid allowance and depending on degree of nausea, vomiting and diarrhoea
- Energy supplements up to 25% CHO
- Concentrated feeds up to 2 kcal/ml
- Increase concentrations gradually - tolerance
- Beware of re-feeding syndrome

Nutritional Intervention

Energy: Ensure adequate caloric intake to meet energy needs which may differ depending on stage of illness.

Protein - Balance protein intake to support growth and repair while avoiding excess that could worsen kidney function

Protein

Aim - SDI for age

Some centres withhold protein for first 24 hours if urea>40 mmol/L and then gradually increase

If **urea persistently high** and increasing, ensure adequate energy, then may need to temporarily reduce protein to lower end of SDI range

Additional allowed for KRT i.e. 0.1g/kg/d for HD, 0.15- 0.35g/kg/day for PD

If protein needs not met by feeds may need to introduce protein supplement

Critically unwell

- CKRT 10-100% increase in protein provision recommended or 1.5-2.5g/kg/day (ASPEN, 2019) to achieve +ve NB

Age (years)	Age 0-2	Age 2- 13	Age 13-18
Protein	2-3g/kg/day	1.5-2g/kg/day	1.5g/kg/day

- Taskforce – Increasing above the SDI to limit negative nitrogen balance

- Consensus Recommendations (2024)

Age (years)	Age 0-2	Age 2-13	Age 13-18
Protein	3-3.5g/kg	2-2.5g/kg	2g/kg

Nutritional Intervention

Energy Requirements: Ensure adequate caloric intake to meet energy needs which may differ depending on stage of illness.

Protein Needs: Balance protein intake to support growth and repair while avoiding excess that could worsen kidney function

Feeding modality – oral, enteral, parenteral

Electrolyte management – Aim to keep in normal range

Fluid Management: Carefully manage fluid intake and output to prevent overload or dehydration

Fluid and electrolytes

- Fluid allowance = UO + IL + UF
- if fluid volumes tight – Fluid advice e.g. Ice cubes, lollies

Electrolytes (K, Na, Phos)

- Anuria – levels rise rapidly
- Greater the UF more normal levels tend to be
- Restrict if ↑K or phos or if ↑ trend
- Aim normal ranges
- Advise about salty diet re: fluid restriction
- Parent education (suitable snacks)

Enteral feeding

- Slow, continuous feeds may be better tolerated.
- Regular anti- emetics
- Feed choice dependant on biochemistry

If gut not functioning

Commence PN – likely to need bespoke prescription in view of fluid and electrolytes.

Introduce enteral feeds as soon as possible.

Recovery Phase

- Increased u/o (sometimes polyuria)
- Reduced FR
- Relaxed biochemically based restrictions (diet and feed/ONS)
- Electrolytes might suddenly drop
- Remove NGT
- Discharge plan

References

Nutritional management of children with acute kidney injury – clinical practice recommendations from the paediatric renal nutrition taskforce. Vega et al (2023) Frequent

Nutrition in critically ill children with AKI on Continuous RRT: Consensus Recommendations. Raina R et al. (2024) kidney360.org Vol 5 February.