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QUESTION 13

Describe the relationship between creatinine clearance and serum creatinine concentrations. What are the potential pitfalls in using serum creatinine concentrations to assess renal function in a critically ill patient in ICU

Creatinine is a breakdown product of protien metabolism, mostly from muscle which is produced at a relatviely constant rate, is filtered at the glomerulus of the kidney and is minimally reabsorbed along the tubule.

Creatinine clearance and serum creatinine levels are used as surrogate markers of glomerular filtration rate.

Glomerular filtration rate is a measure of the amount of plasma filtered at the glomerulus per unit time
- is a product of the filtration co-efficient and the net starling forces.
- the filtration coefficient is a marker of permiability glomerular permiability
- net starling forces are a balance between
  - hydrostatic pressure which is elevated due to the cappillary beds in series
  - oncotic pressure which is almost zero in bowmans capsule due to the lack of filtered protiens.

Renal clearance is the volume of plasma completely cleared of a substance per unit time

clearance = (urine concentration)volume/plasma concentration $C = UV/P$

GFR = clearance if the substance is not reabsorbed along the tubule
- inulin is a plant polysaccaride and is most accurate but problematic due to steady state requirements
- serum creatinine may be used as an alternative
  - most accurate to collect urine and use the above formula to assess creatinine clearance
  - because serum creatinine it is at steady state, eGFR can be calculated by Cockroff-Gault

Limitations of creatinine clearance as an estimate of GFR

General limitations
- assumptions required to correct for age, weight and sex
- the relationship between creatinine clearance and serum creatinine is non linear
- filtration is only one component of a complex kidney, although GFR is used as a surrogate of fn

Critically ill patients
- the amount of creatinine produced varies with muscle mass, nutrition, steroid use, muscle injury
- there can be a decline of almost 50% of function before serum creatinine levels rise
- they do not indicate dynamic changes in renal function
- are modified by aggressive fluid resuscitation

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