ADQI 25 Figures

Figure 1. Pathogenesis of COVID-19 AKI showing both the direct viral effects of COVID-19 on the kidney and the non-viral pathogenic mechanisms contributing to AKI, including those related to critical care. AKI: acute kidney injury

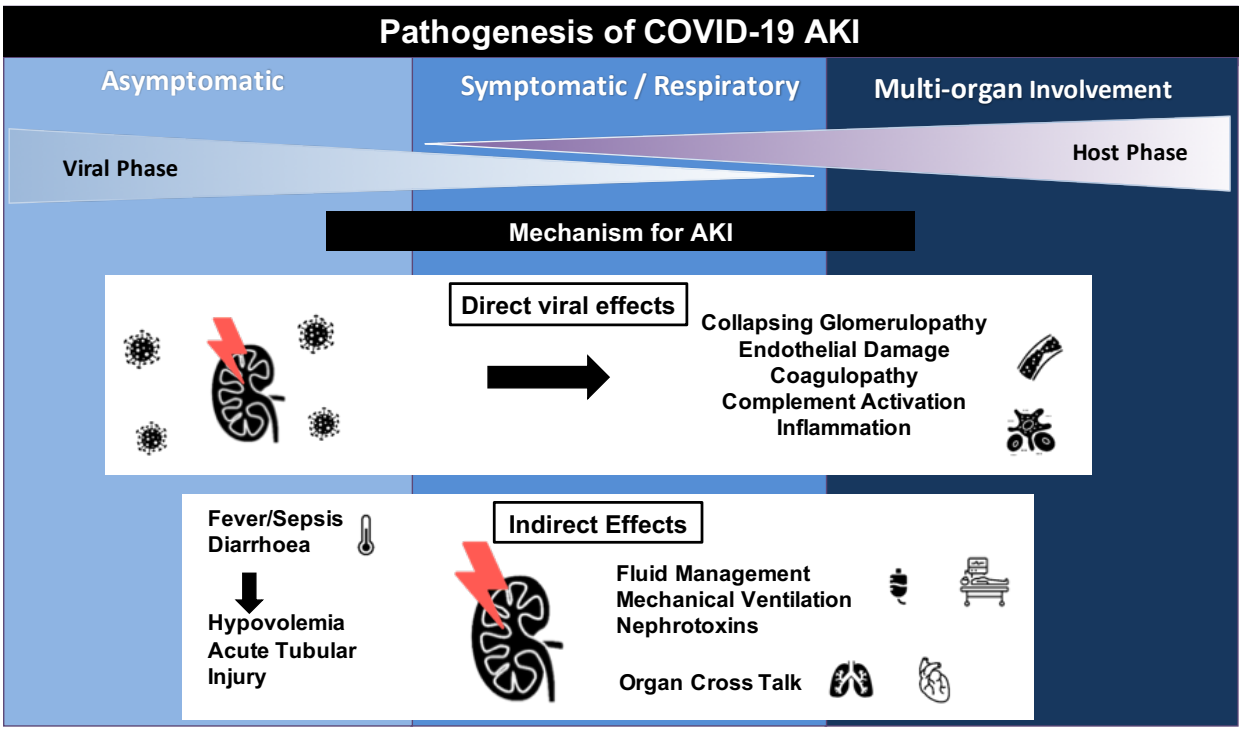


Figure 2. Stage-based Management of COVID-19 AKI. Colors refer to disease mechanisms shown at the top and discussed in section 1. Bars showing all three colors are relevant to all causes of AKI in CIOVID-19.

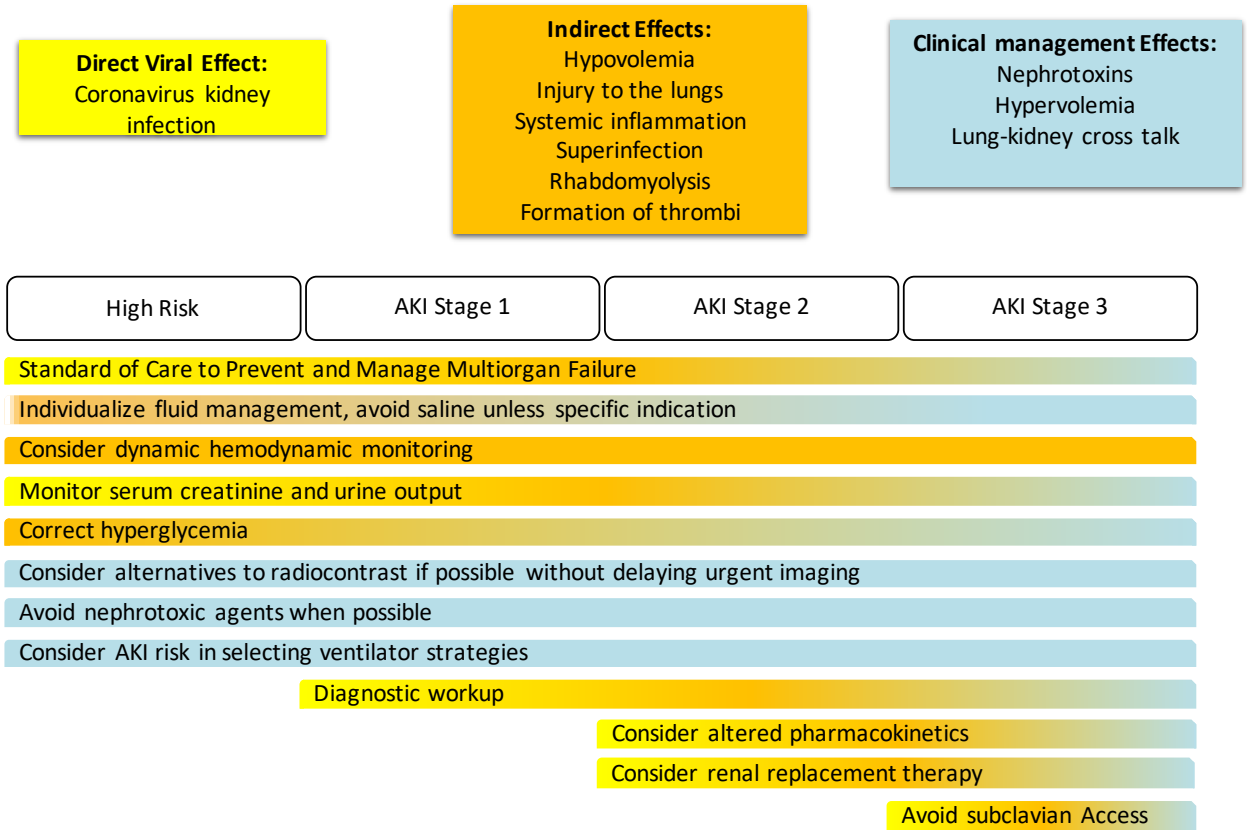


Figure 3. Step-wise plan for renal replacement surge during pandemic or disaster from preparatory to response to crisis stage.

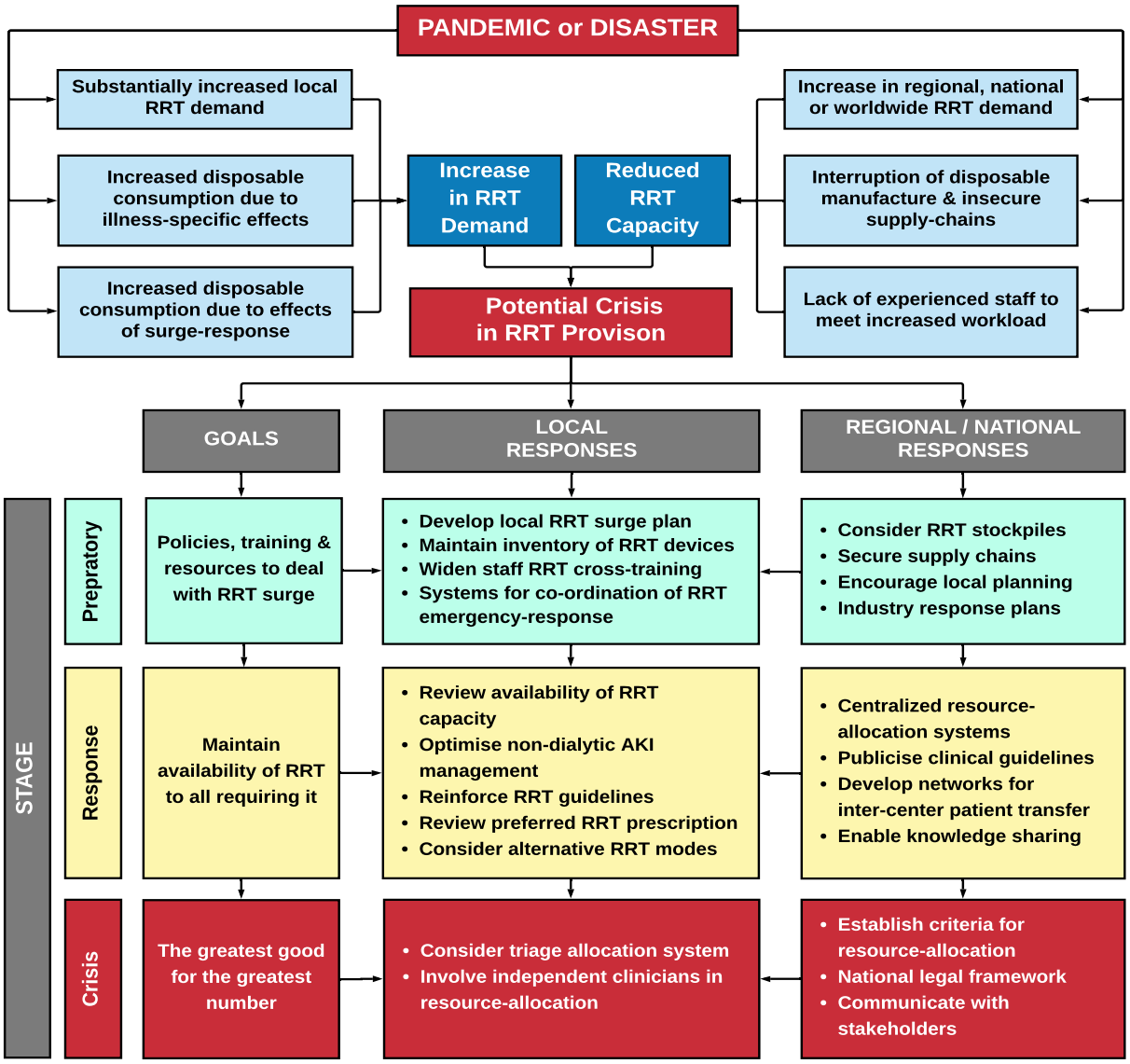


Figure 4. Potential EBP treatment options based on underlying COVID-19 pathophysiology. The figure illustrates potential indications for use of EBP in COVID-19 based on underlying pathophysiology. All therapeutic options need to be tested in clinical trials in the context of COVID-19. The EBP therapies for consideration can be complementary to pharmacological support. EBP therapies might be considered in sequence or as separate entities according to current evidence or pathophysiological rationale, as changes in pathophysiology over the disease course might indicate different treatment approaches. AKI, acute kidney injury; ARDS, acute respiratory distress syndrome; COVID-19, coronavirus disease 2019; DAMPs, damage-associated molecular patterns; EBP, extracorporeal blood purification; HCO, high cut-off; HP, hemoperfusion; IL, interleukin; MCO, medium cut-off; PAMPs, pathogen-associated molecular patterns; RRT, renal replacement therapy; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; TNF, tumor necrosis factor; TPE, therapeutic plasma exchange.

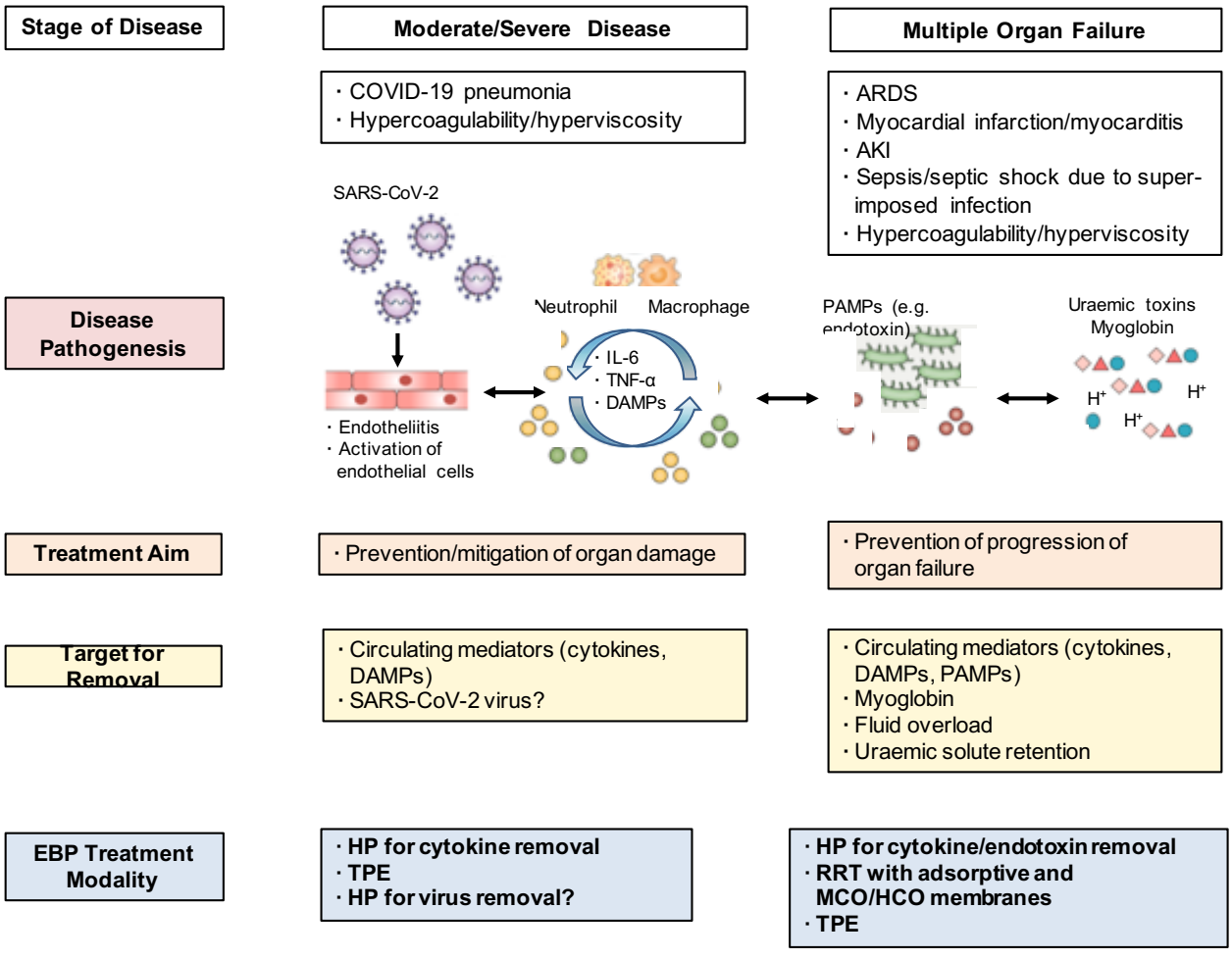
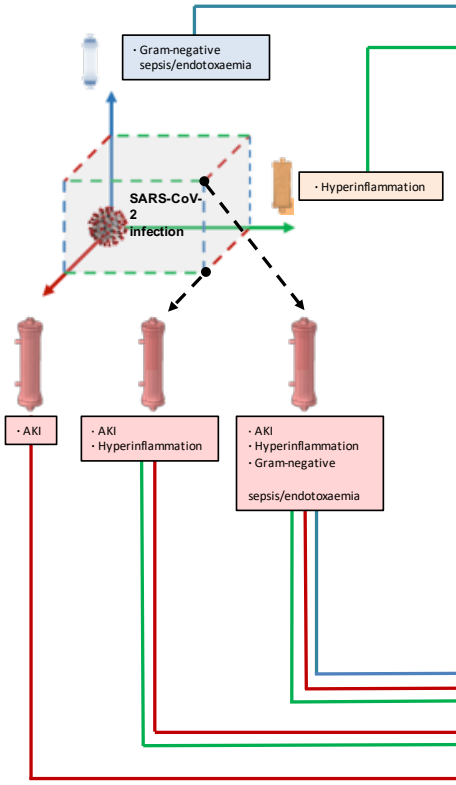


Figure 5. Composition, demonstrated use, and prescription of EBP using cartridges and RRT membranes. The three-dimensional plot represents the COVID-19 spectrum of potential clinical conditions evolving from infection. The y-axis, z-axis and x-axis indicate inflammation, gram-negative sepsis/endotoxemia, and AKI, respectively. Black dots within the plot represent combination of different clinical conditions. AKI, acute kidney injury; AN, acrylonitrile; COVID-19, coronavirus disease 2019; CRRT, continuous renal replacement therapy; CVVHD, continuous veno-venous hemodialysis; HCO, high cut-off; HP, hemoperfusion; MCO, medium cut-off; PEI, polyethyleneimine; PMMA, polymethylmethacrylate; PMX, polymyxin B; RRT, renal replacement therapy; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; ST, surface-treated.



Composition	Porous polymer beads - sorbents	PMX covalently bound to polypropylene-polystyrene fibre	AN69-PEI concentrated, PMMA	AN69-ST, MCO/HCO	AN69, PMMA, polysulfone
Indication	Hyperinflammation	Gram-negative sepsis/ endotoxaemia	AKI, hyperinflammation, gram-negative sepsis/ endotoxemia	AKI, increased myoglobin levels, hyperinflammation	AKI
Technique	Haemoperfusion	Haemoperfusion	Haemodialysis/ haemofiltration/ haemodiafiltration	Haemodialysis (CVVHD for MCO/HCO)/ haemofiltration/ haemodiafiltration	Haemodialysis/ haemofiltration/ haemodiafiltration
Target of Removal	Cytokines	Endotoxin	Uraemic toxins, excess fluid, electrolyte and acid-base disorders, cytokines, endotoxin	Uraemic toxins, excess fluid, electrolyte and acid-base disorders, myoglobin, cytokines	Uraemic toxins, excess fluid, electrolyte and acid-base disorders
Mechanism of Removal	Adsorption	Adsorption	Adsorption, (cytokines/endotoxin), filtration (convection and diffusion)	Adsorption (cytokines), filtration (convection and diffusion)	Filtration (convection and diffusion)
Duration	2–24 h	2 h	Up to 24 h (with the same disposable)	Up to 72 h (with the same disposable)	Up to 72 h (with the same disposable)
Frequency	1–3 days	2 days	1–3 days	Variable	Variable
Anticoagulation	Citrate or heparin	Citrate or heparin	Citrate or heparin	Citrate or heparin	Citrate or heparin
Blood flow	100–500 mL/min	80–120 mL/min	150–250 mL/min	150–250 mL/min, 80–200 mL/min for MCO/HCO	150–250 mL/min