ADQI 17 Figures

Workgroup 1

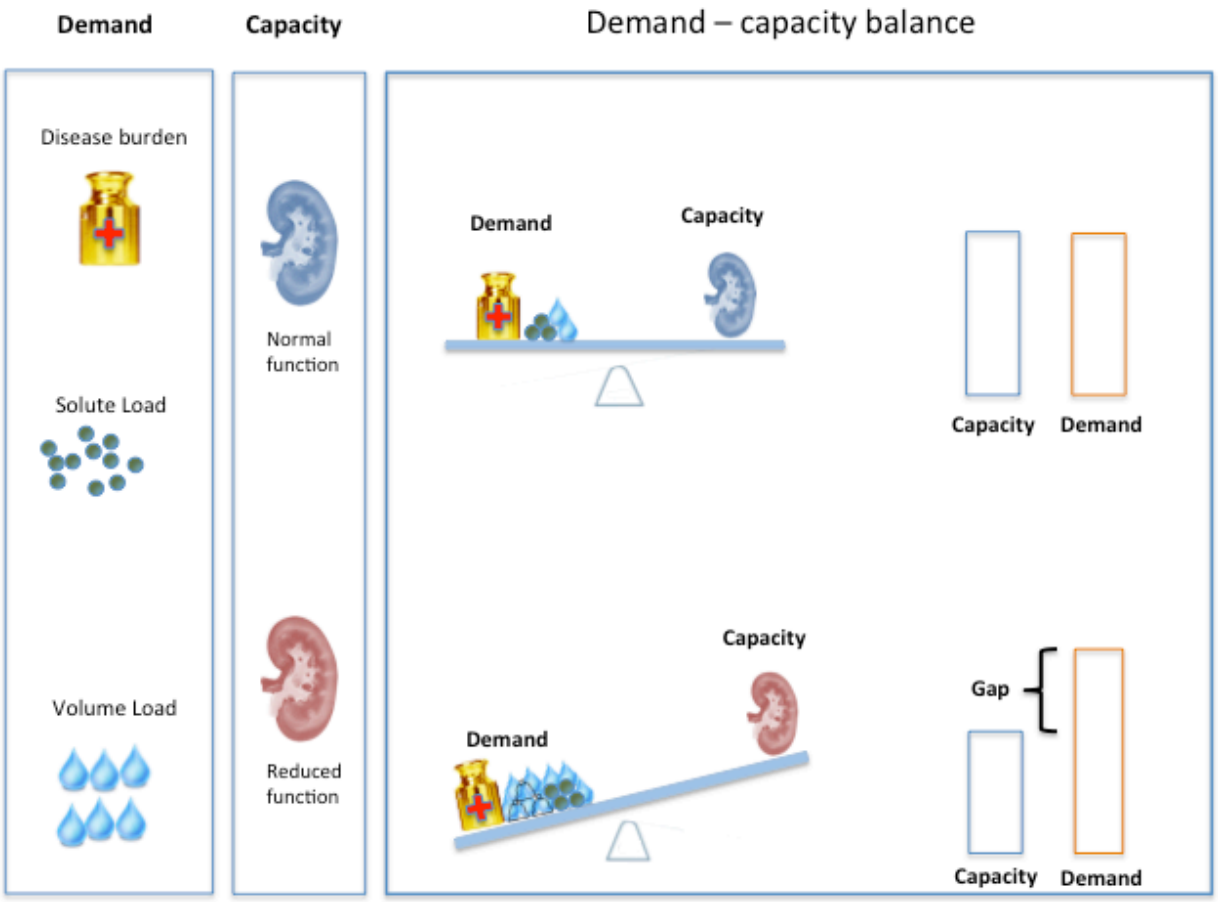


Figure 1.1: Demand and capacity - a conceptual model

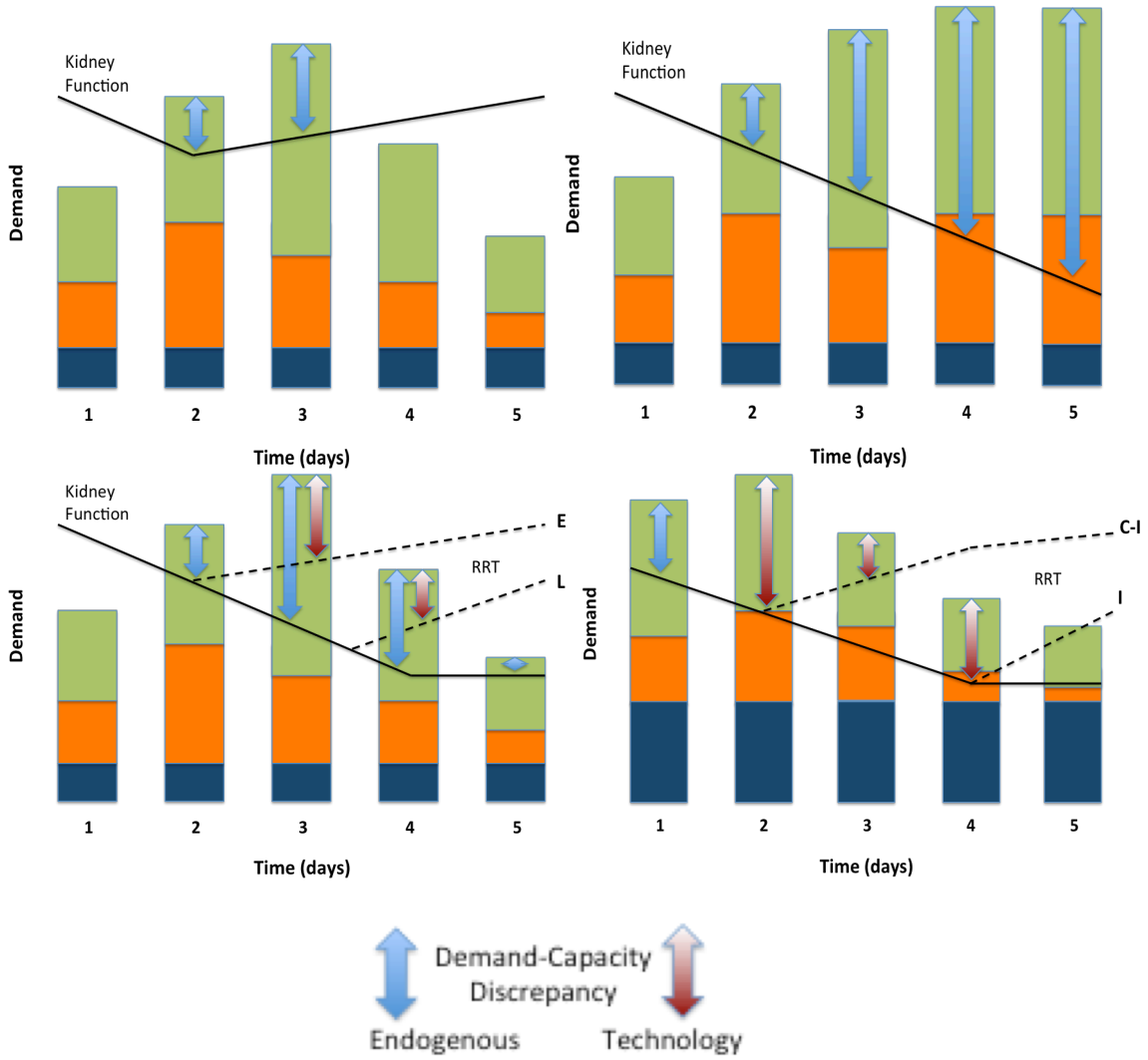


Figure 1.2: Shown are four patient scenarios. The bars represent total demand including chronic disease (blue), acute illness (orange) and solute/fluid excess (green).
The top two panels represent no RRT—the left illustrates early reversal of AKI and the right shows progressive renal failure and increasing discrepancy between renal function capacity and physiological demands.
The two bottom panels illustrate the effect of RRT (dashed lines) with (left) early (E) or later (L) initiation and two different demand-capacity discrepancy patterns. On the right the patient scenario illustrated is different with high underlying disease burden and either initiation of continuous RRT on day 2 transitioning to intermittent RRT on day 4 (dashed line marked as C-I) or initiation of intermittent therapy on day 4 (I).

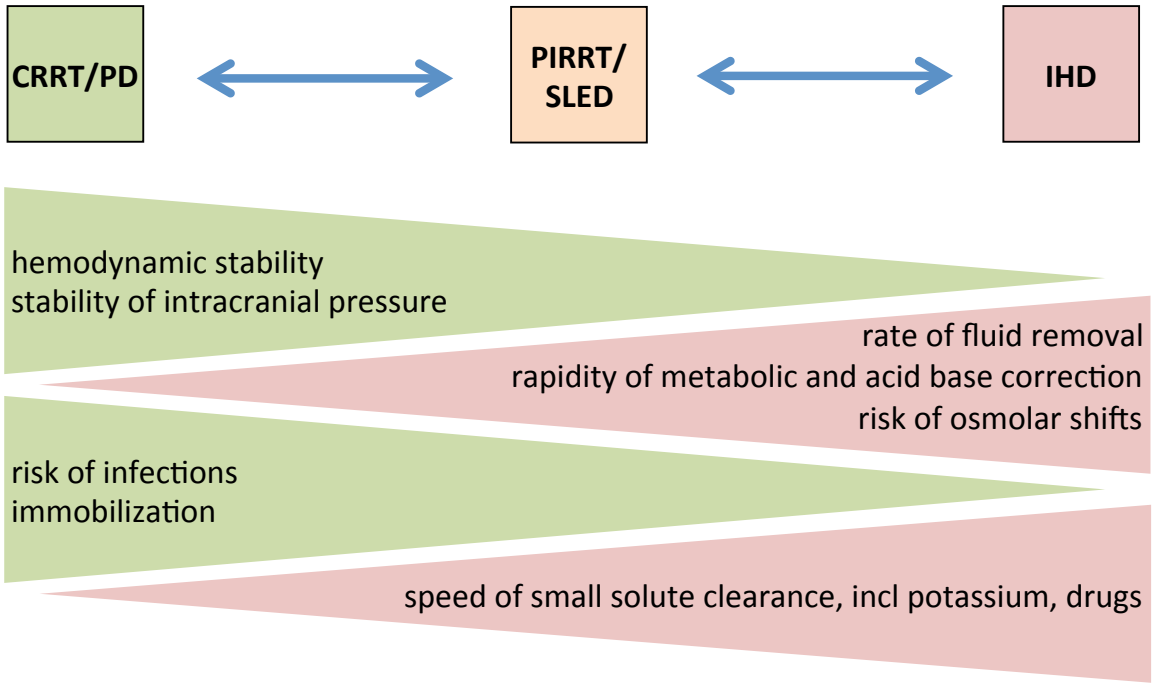


Figure 1.3: Characteristics and risks of different RRT modalities. Abbreviations: CRRT = continuous renal replacement therapy; IHD = intermittent haemodialysis; PIRRT = prolonged intermittent renal replacement therapy; SLED = slow efficiency dialysis; PD = peritoneal dialysis.

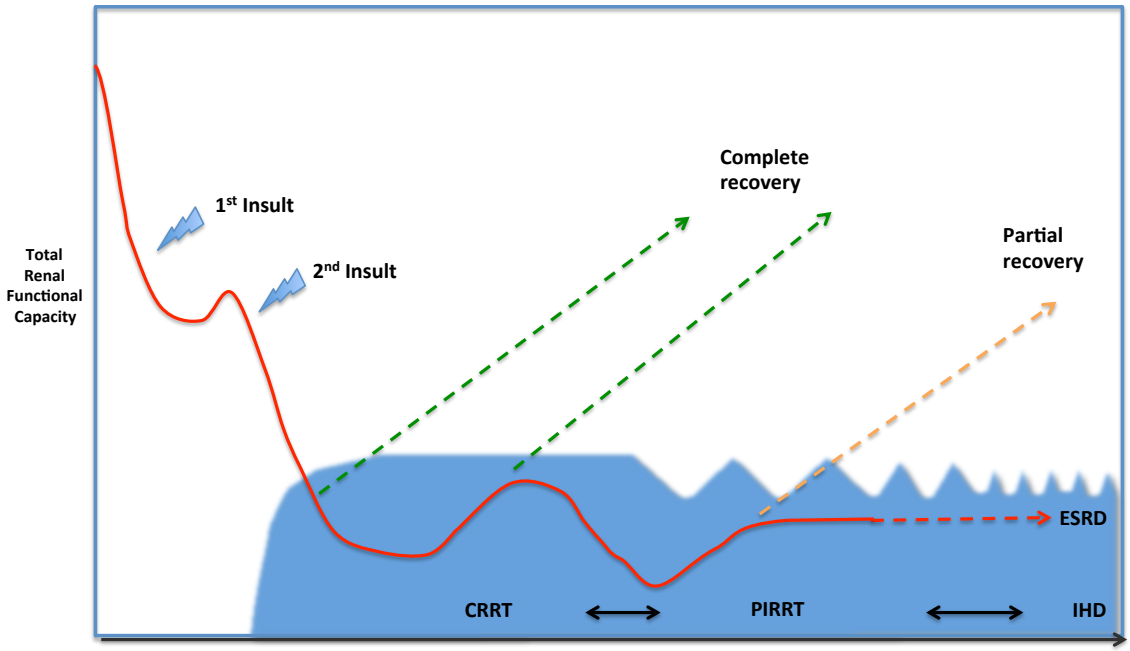


Figure 1.4: Potential pathways following an episode of AKI, including transition of RRT modalities. Abbreviations: ESRD = end stage renal disease; CRRT = continuous renal replacement therapy; PIRRT = prolonged intermittent renal replacement therapy IHD = intermittent hemodialysis.

Workgroup 2

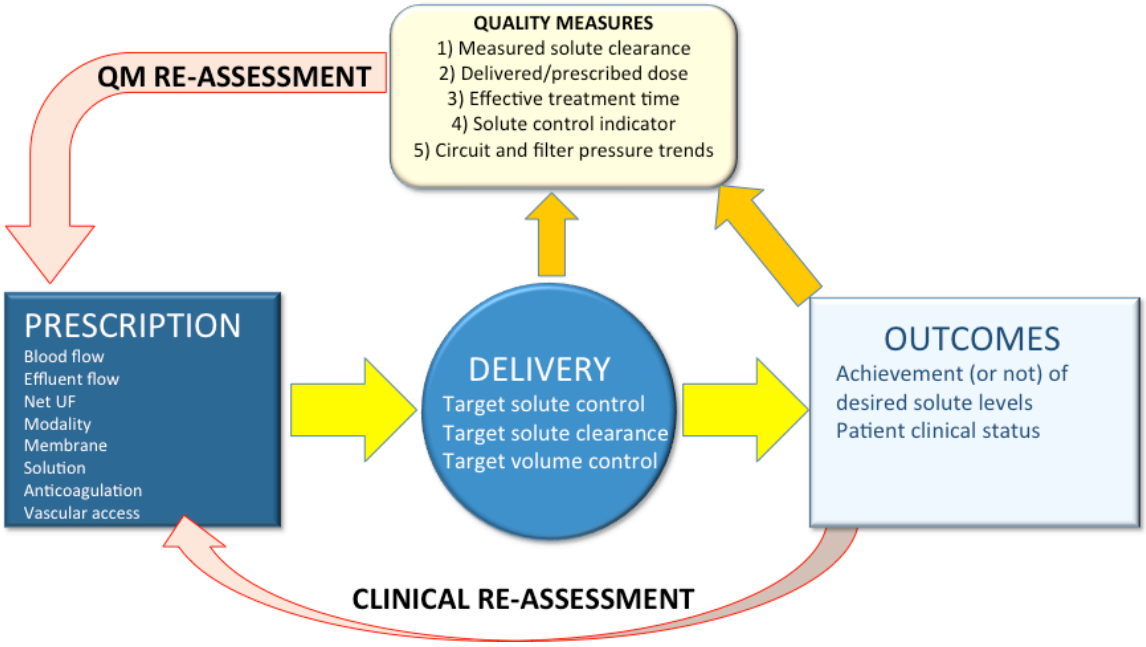


Figure 2.1: Concept of dynamic continuous renal replacement therapy (CRRT) dose. Following the initial prescription of CRRT, treatment begins which may modify patient course and outcome. At this point, providers should frequently reassess the response to prescribed CRRT dose. This can be achieved by following selected quality measures focused on CRRT dose. These quality measures could target delivered clearance; ratio of delivered to prescribed dose; effective treatment time; and other measures of solute control. Furthermore, the patient's clinical condition may change while receiving CRRT. In such circumstances, CRRT prescription may require additional modification (e.g., reduction or interruption of net ultrafiltration in response to hemodynamic deterioration and/or hypovolemia).

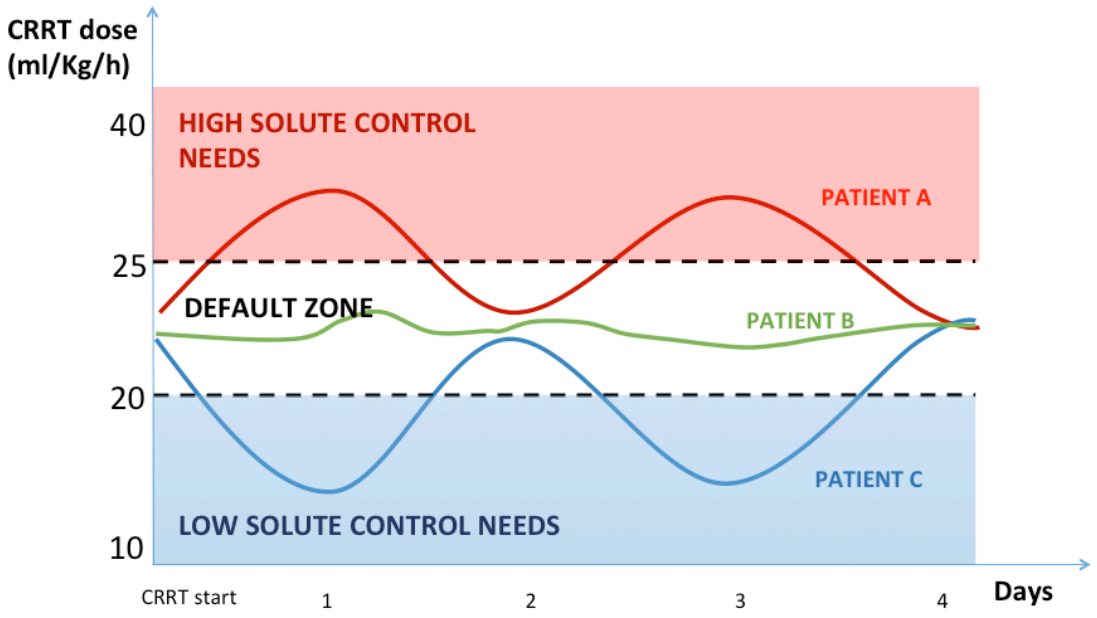


Figure 2.2: Precision CRRT delivery. CRRT dose should be dynamic and adapted to changes in acuity, physiology and metabolic profile of critically ill patients. For example, Patient A has pneumonia and oliguric AKI. The CRRT dose is increased from the default of 20 ml/kg/h to 35 ml/kg/h after 24 hours due to the development of a hypercatabolic state characterized by sepsis and increasing serum urea concentration. The next day, the patient's condition improves and urea control is achieved. The CRRT dose can now be reverted to 20 ml/kg/h. By day 3, the patient receives nutritional support which contributes to increasing serum urea concentrations at a CRRT dose of 20 ml/kg/hr. This would again require dose modification. Alternatively, Patient C has diuretic-resistant congestive heart failure and fluid overload. Following initial CRRT prescription primarily for fluid removal, solute clearance exceeds demand due to residual kidney function. Accordingly, the patient's CRRT dose is reduced to 15 ml/kg/h. By day 2, the patient's urine output decreases and serum urea concentration increases. In this circumstance, the prescribed CRRT dose can be increased to achieve the new solute control target. Finally, Patient B is critically ill and is admitted to ICU following surgery. This patient achieves steady state solute control without the need for modification with the default CRRT dose of 20-25 ml/kg/hr.

Workgroup 3

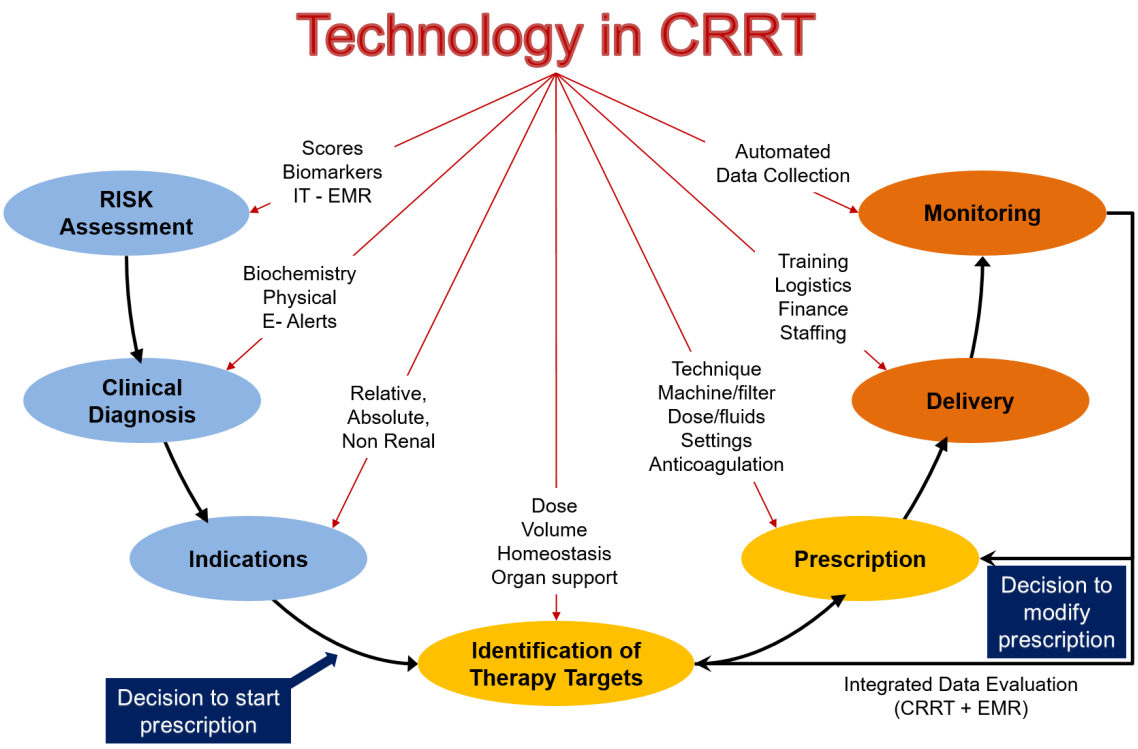


Figure 3.1: The role of technology at different levels in the continuum of AKI management

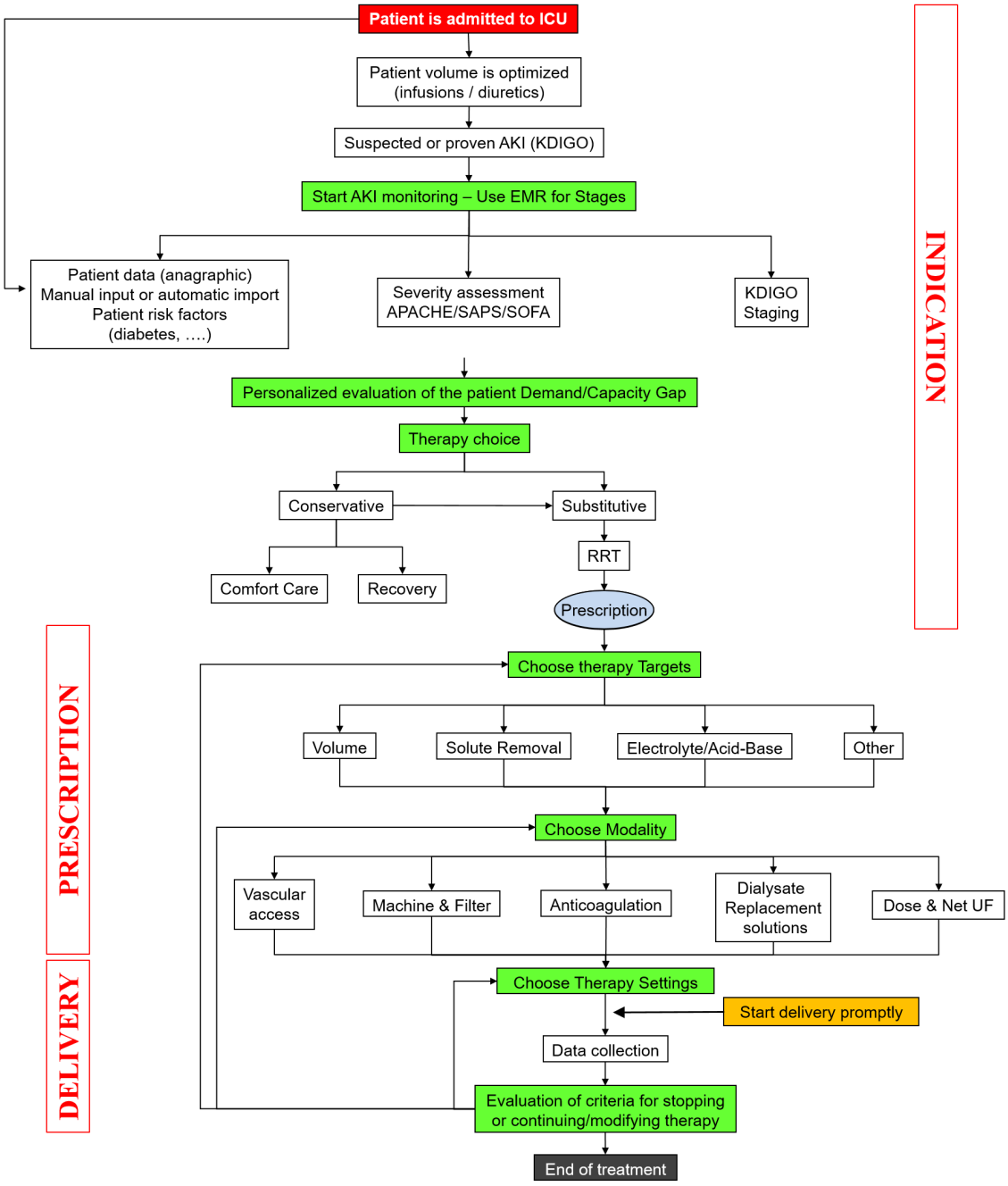


Figure 3.2: Proposed algorithm to manage critically ill patients from AKI diagnosis to CRRT prescription, delivery and weaning.

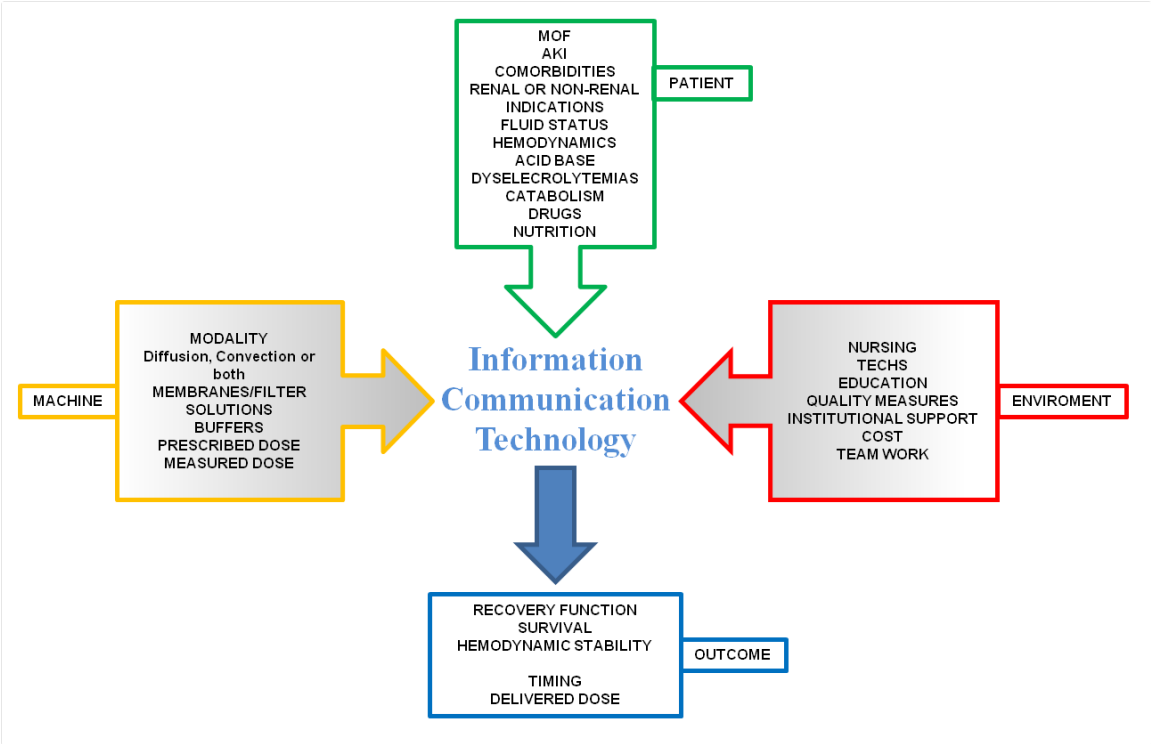


Figure 3.3: Determinants allowing adequate RRT prescription and delivery

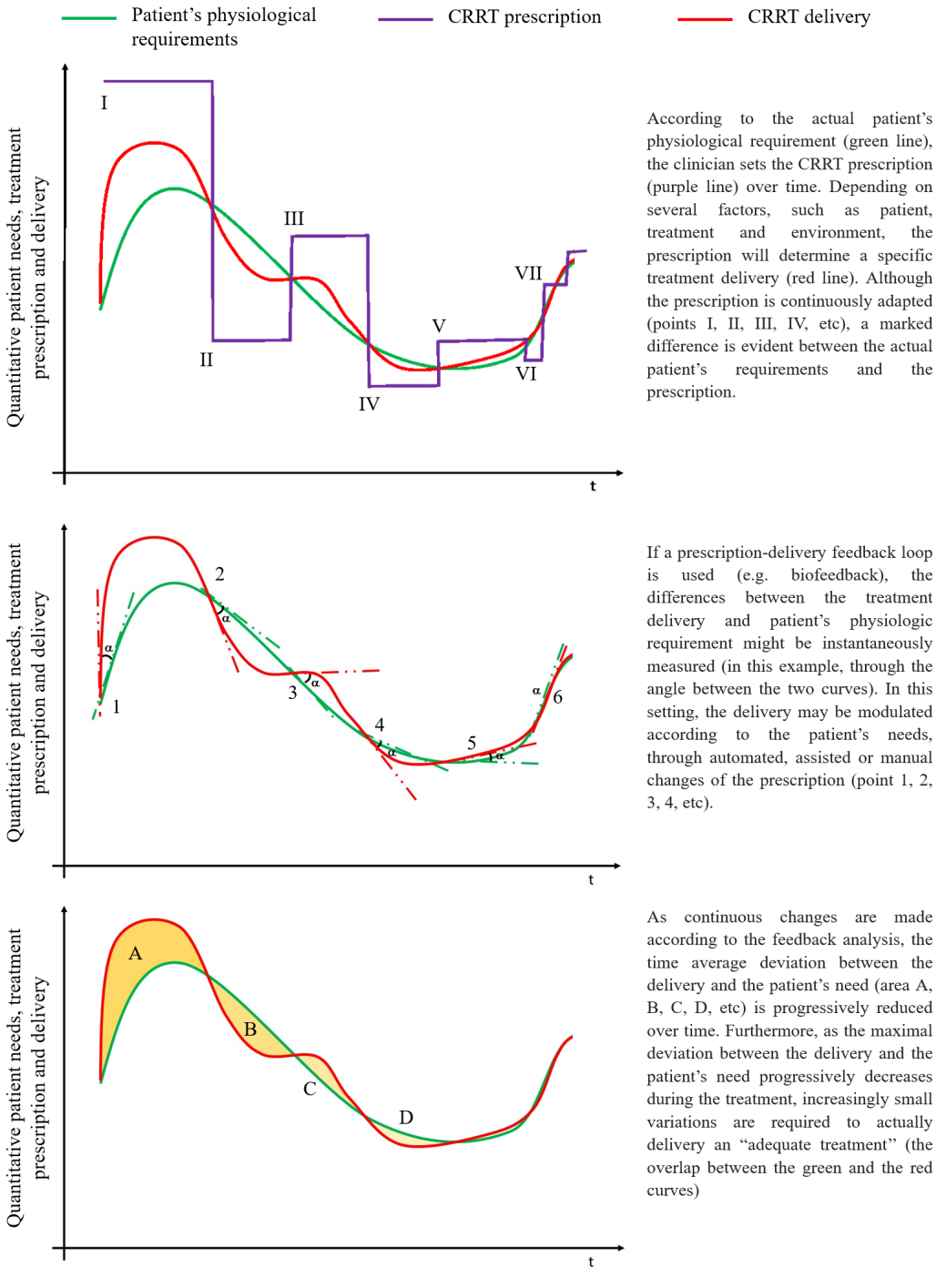
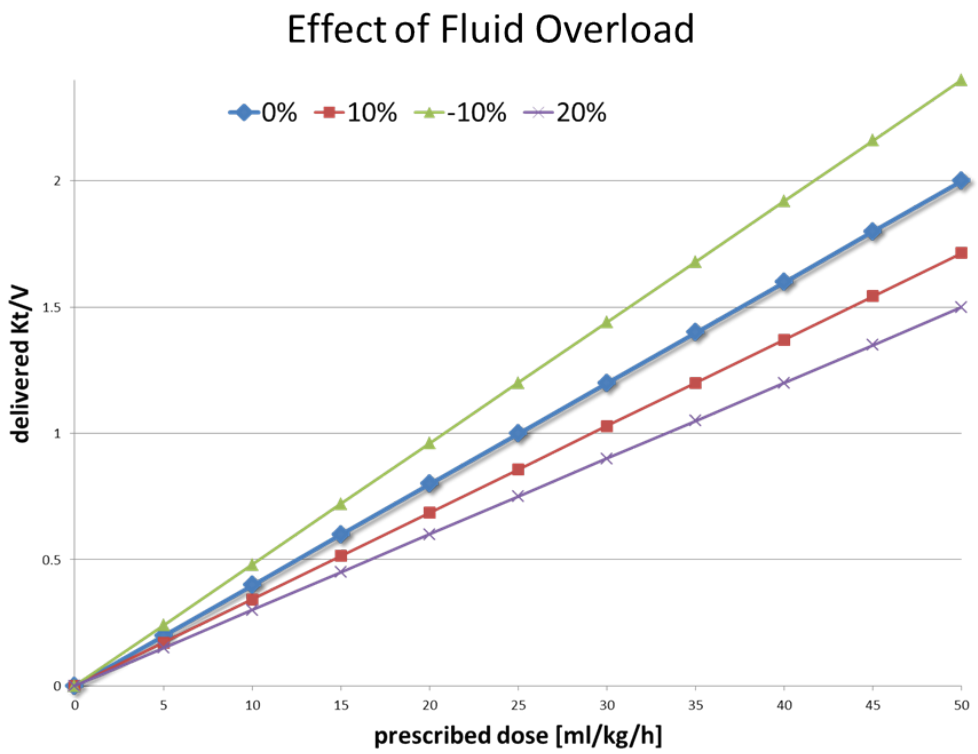


Figure 3.4: The role of prescription-delivery feedback loop during CRRT. (*) Includes solutes, acid-base, fluids and other patient and treatment variables.



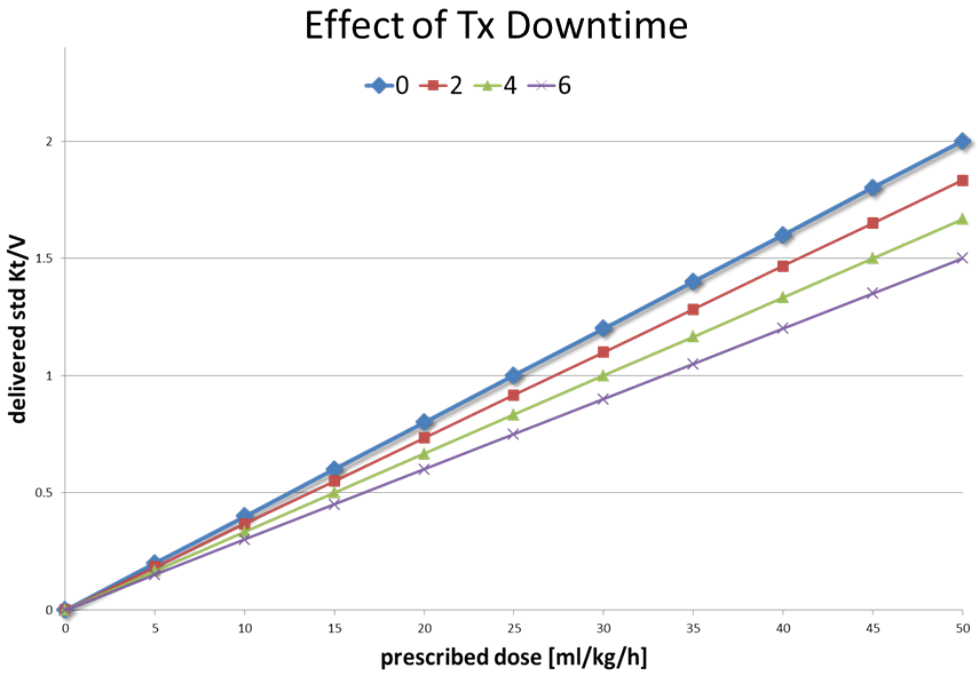


Figure 3.5: Nomogram to achieve precision delivery of CRRT when dose is prescribed according to ideal weight and fluid overload or downtime may induce variations in effective delivery.

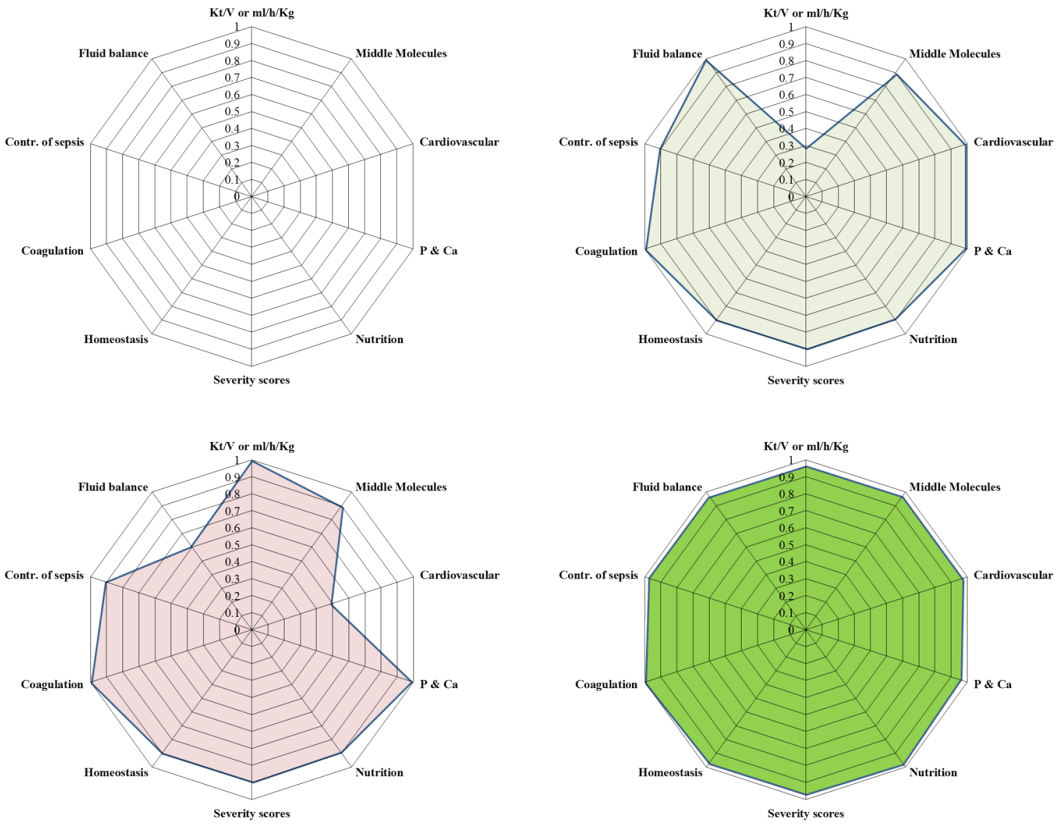


Figure 3.6: Radar plot describing the broader spectrum of adequacy. Every single aspect can be measured in arbitrary or objective units, but the final result of the polygon in the radar plot will describe a comprehensive evaluation of treatment adequacy. Some examples in plots (top right and bottom left) describe incomplete adequacy while in the bottom right panel a fully adequate treatment is described.

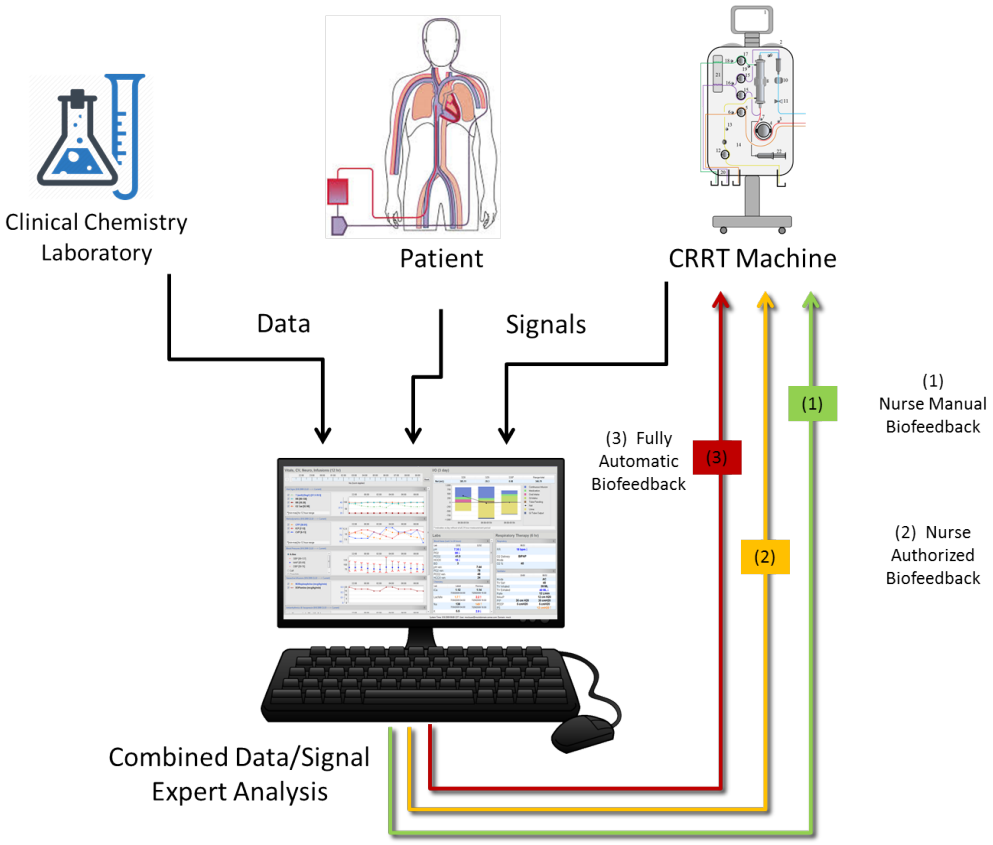


Figure 3.7: Different options for a CRRT feedback. Manual, Authorized, Automatic

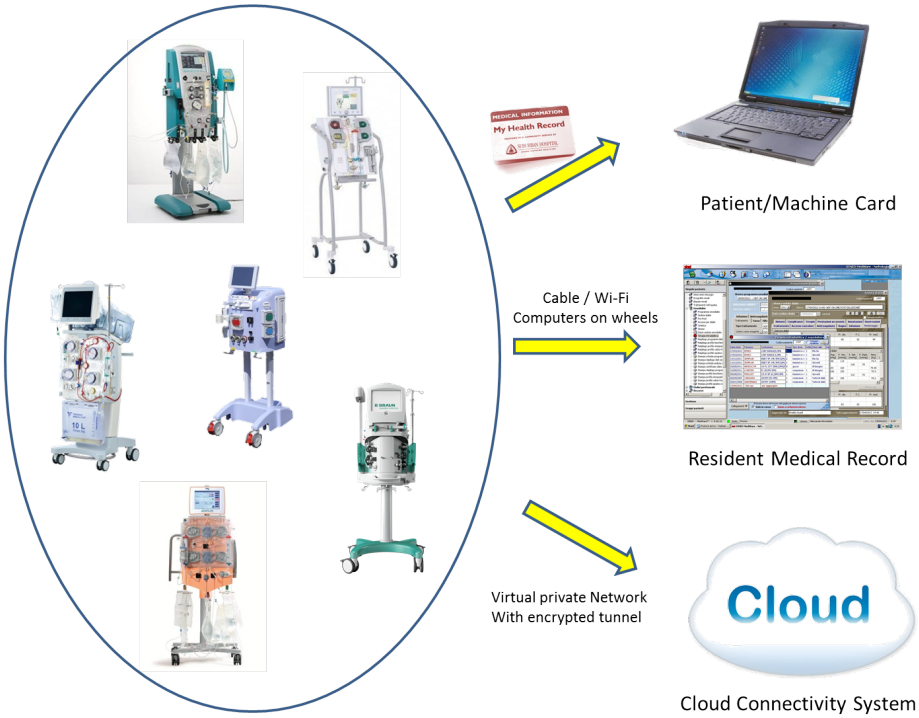


Figure 3.8: Different options for data collection in CRRT

Workgroup 4

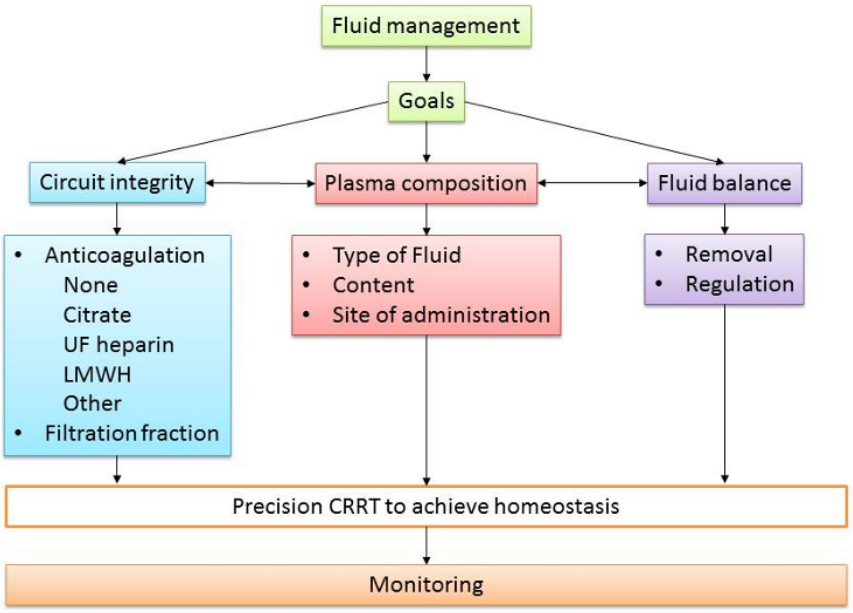


Figure 4.1: Conceptual Framework Of Fluid Management During CRRT. UF heparin: unfractionated heparin; LMWH: low molecular weight heparin

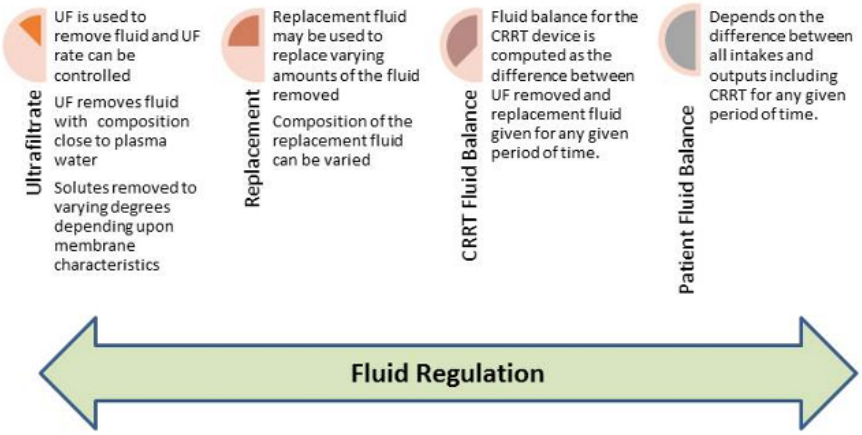


Figure 4.2: Principles of Fluid Management in CRRT. Fluid regulation encompasses all components of fluid management in the patient undergoing CRRT and includes: CRRT machine balance (ultrafiltration and replacement fluid use) and patient fluid balance.

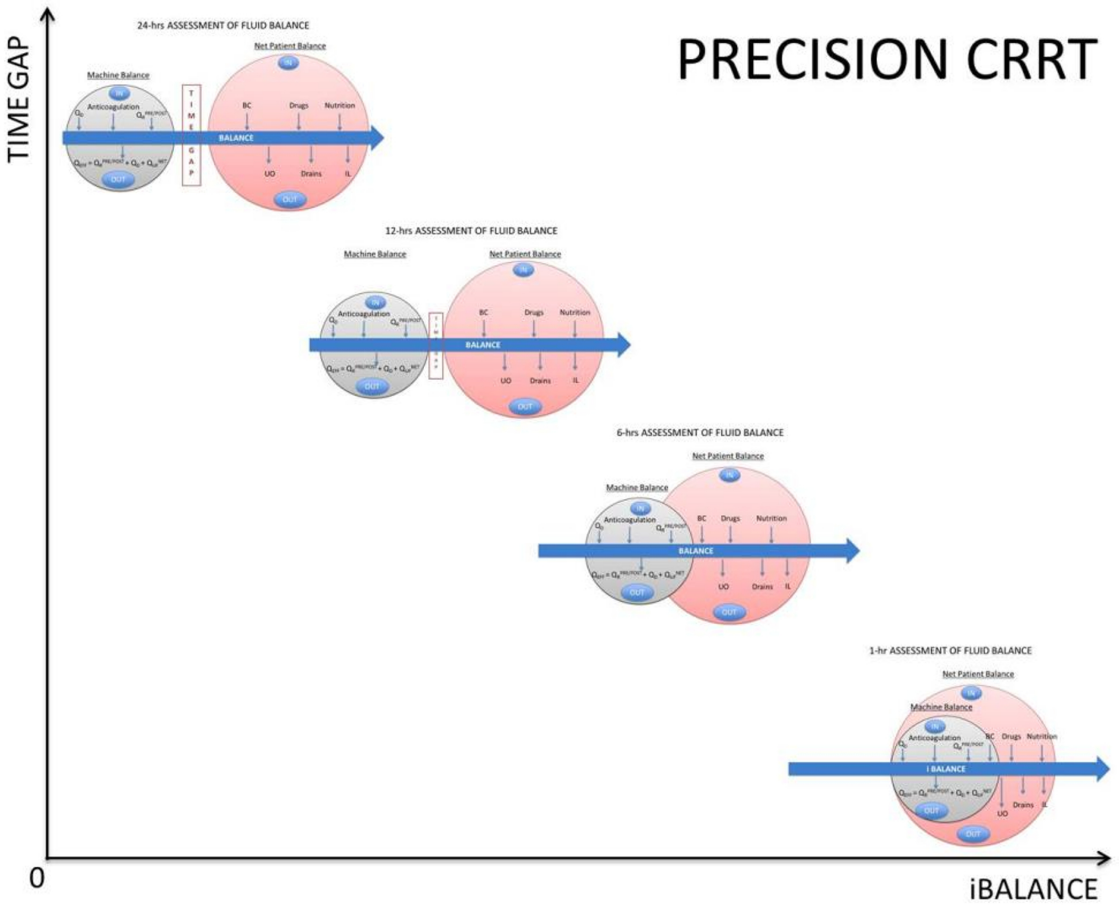


Figure 4.3: Integrated Balance (ibalance). The machine fluid balance (grey circle) depends on ultrafiltration, replacement fluid rates and anticoagulation. The net patient fluid balance (red circle) is calculated as the algebraic sum of patient inputs (e.g., blood compounds, drugs, nutrition) and outputs (e.g., urine output, drains, insensible losses). The machine-patient integrated fluid balance (ibalance) (blue arrow), which derives from the combination of the machine and the net patient fluid balance, is achievable only when frequent assessment of fluid inputs and outputs and CRRT fluid balance machine parameters are performed (e.g., every 1-2 hours). The more frequent the assessment, the shorter is the time gap (vertical axis) and more precise the ibalance (horizontal axis).

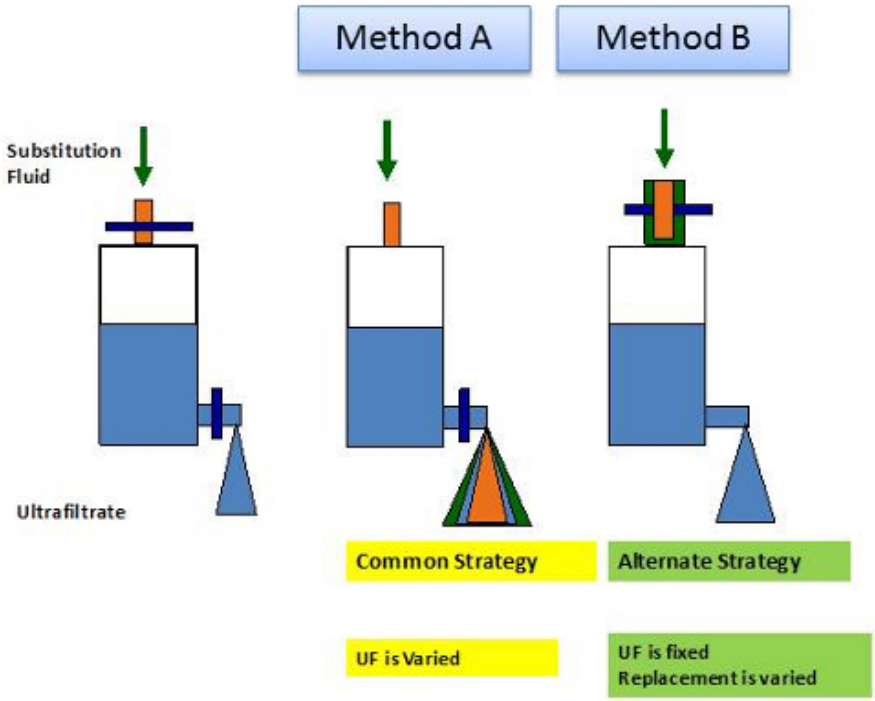


Figure 4.4: Approaches to Fluid Regulation with CRRT Fluid Balance. Two different methods can be used to achieve the target fluid balance with CRRT. In method A, the net ultrafiltration rate is varied on an hourly basis. In method B, the net ultrafiltration rate is fixed and the replacement fluid is varied. Hybrid strategies of variable ultrafiltration and replacement fluid rates can also be utilized.

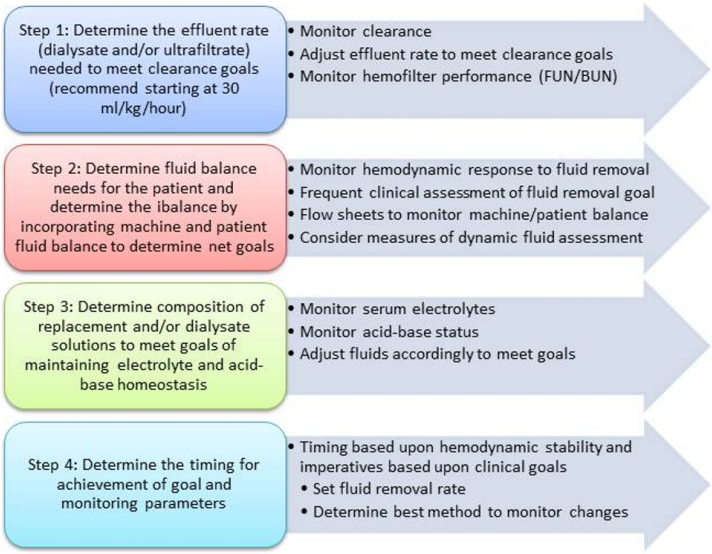


Figure 4.5: Step-Wise Fluid Management Prescription in CRRT