



PERI OPERATIVE FLUID MANAGEMENT

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ABSTRACT

Perioperative fluid management plays a crucial role in Enhanced recovery pathways. Improving perioperative fluid management decreases complications, reduces length of stay and potentiates recovery. Preoperative and Post-operative fluid management is as important as intra-operative fluid management. Preoperative hydration with carbohydrate containing drinks upto until 2 hours before surgery should be encouraged , as this helps to improve metabolism, reduces insulin resistance, anxiety, nausea and vomiting. Intraoperative fluid should be given to maintain euvolemia. The administration of intravenous fluid in preoperative, intraoperative and post-operative period at right amount plays a great role.

INTRODUCTION

Hypovolemia leads to circulatory insufficiency with decreased oxygen delivery to organs and peripheral tissues causing organ dysfunction and shock. Fluid overload leads to interstitial edema, local inflammation and impairs collagen regeneration leading to weakening of tissue healing with increased risk of post-operative wound infection, wound rupture and anastomosis leakage. It also impairs cardio-pulmonary function [1-4]. The primary goal of perioperative fluid management is to optimize patients health, avoid fluid overload, reduce complications and length of stay [5-8]. In past, the fluid therapy was focused just on intraoperative fluid management but recently the concept has been shifted to perioperative fluid management and it is categorized into 3 components: a) Preoperative b) Intraoperative c) Post-operative.

Goal Directed Therapy:

Early on, it was recommended to give very little fluid intraoperatively, as fluids were thought to increase post-operative complications[9, 10]. Later on, it became clear that not providing optimal amount of fluid in intraoperative period lead to major adverse effect on post-operative period, including complications such as Acute tubular necrosis[11]. Considering this knowledge, fluid administration became standard of care during surgery which required anesthesia[12]. Restricting intraoperative fluid causes post-operative complications, however fluid overload also leads to severe post-operative complications such as pulmonary congestion[13] decreased tissue oxygenation, decreased wound healing[14, 15], increased edema [16] and delayed recovery[8]. Intraoperative fluid management during surgery should be guided by goal directed therapy (GDT) and should be titrated to the desired effect.

Route Of Fluid Administration:

Fluid is administered via intravenous route. Intravenous fluid administration does not necessarily increases intravascular volume[17]. Due to tissue injury, much of the administered fluid gets accumulated in the interstitial space causing an unwanted edema. The best way to improve hydration is to increase per oral fluid intake which is beneficial for perioperative patient care.

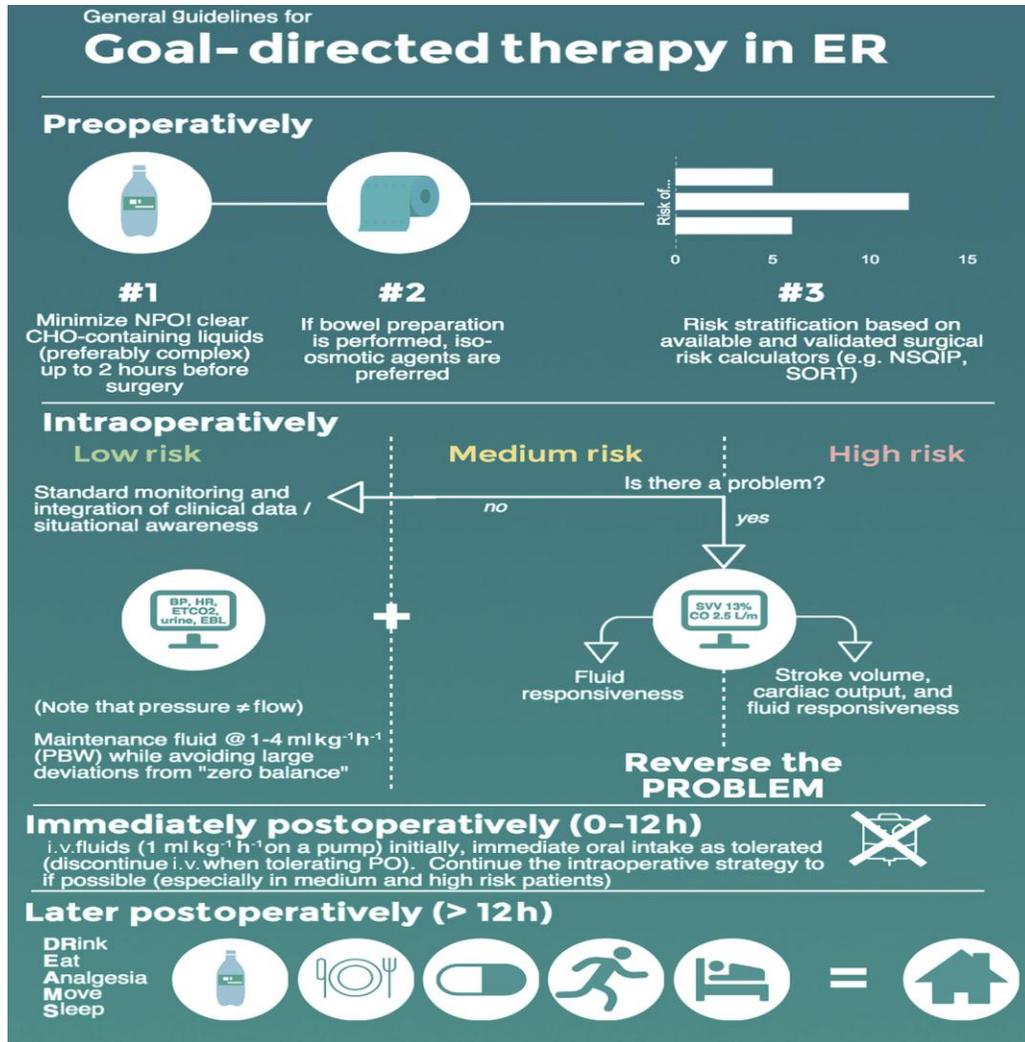


Figure 1: Guidelines from the American Society for Enhanced Recovery (ASER) and Perioperative Quality Initiative (POQI) for the perioperative management of fluids using goal-directed therapy (GDT) in enhanced recovery pathways (ERPs). BP, blood pressure; CHO, carbohydrate; CO, cardiac output; EBL, estimated blood loss; ETCO₂, end tidal carbon dioxide; HR, heart rate; IV, intravenous; NPO, nil per os; NSQIP, National Surgery Quality Improvement Program; PBW, predicted body weight; PO, per os; SORT, Surgical Outcome Risk Tool; SVV, stroke volume variation.

Preoperative Fluid Management:

According to ASA guideline, NPO duration prior to surgery is - 8 hours for solid food, especially fatty meal[18] - 2 hours for clear liquid. The goal of this guideline is to avoid the risk of pulmonary aspiration, reduce the acidity of gastric fluid[18]. 8 hours of fasting prior to surgery leads to catabolic state. Thus ingestion of complex carbohydrate containing fluids prior to surgery helps to balance it and keep the body in desired anabolic state, reduces PONV, reduces insulin resistance[19], minimizes the length of hospital stay in

patients undergoing major abdominal surgeries[20]. Mechanical bowel preparation prior to surgery showed functional hypovolemia affecting cardiovascular capacity and cause preoperative dehydration[21]. Therefore, bowel preparation is no longer recommended. In several studies, the allowance of perioperative diuresis of 0.5 ml/kg/hour in combination with judicious fluid therapy has been shown to reduce post-operative morbidity [1, 22, 23].

Intraoperative Fluid Management:

The goal of intraoperative fluid management is to maintain central euvolemia avoiding salt and water excess. Fluid therapy is guided by knowledge of physiological needs, cardiovascular measurements as well as monitoring renal function by urine output. Parameters such as mean arterial pressure, heart rate and diuresis may be affected by factors other than circulatory status such as pain, body temperature, physiological and psychological stress, anesthetic and analgesic drugs etc. Therefore, these parameters are imprecise for the measurement of intravascular status. Hypovolemia is detected if blood volume decreases by 20% and fluid overload does not change BP or HR at all in patients without heart failure. The use of central cardiovascular measurements such as stroke volume or functional parameters (arterial waveforms analysis, SVV etc) is recommended for monitoring circulatory status (GDT) to secure sufficient circulation and avoid fluid overload with or without simultaneous use of 'zero-balance' or restricted fluid therapy. During surgery, there is 'third space fluid' loss. Thus, leads to recommendation of 15ml/kg/hour fluid in first hour of surgery and thereafter reduction in accordance with algorithm. However, more recent studies cannot demonstrate any such fluid loss. Therefore, the concept of 'Third space fluid' loss should be abandoned[24, 25]. Nisan evich et.al randomized 152 patients undergoing elective intra-abdominal surgery to a restrictive versus a standard(liberal) fluid regimen(1230 ml versus 3670 ml) showing reduced complications , length of stay and faster bowel movement in restrictive group[26]. Several subsequent trials confirmed these results, showing benefits from zero-balance peri-operative fluid approach[2-5, 22, 27]. Since there is no established definition of normovolemia, fluid requirements vary significantly according to patient and surgical needs. There is evidence aimed at individualizing fluid management with GDT[28]. Excessive fluid restriction during high risk surgery also causes harm with increase in risk of AKI[29]. Hypotension with MAP <65 mm Hg even for short duration leads to myocardial and kidney injury [30, 31]. GDT improves intra-operative hemodynamic stability, thus benefits by avoidance of episodes of hypotension [32].

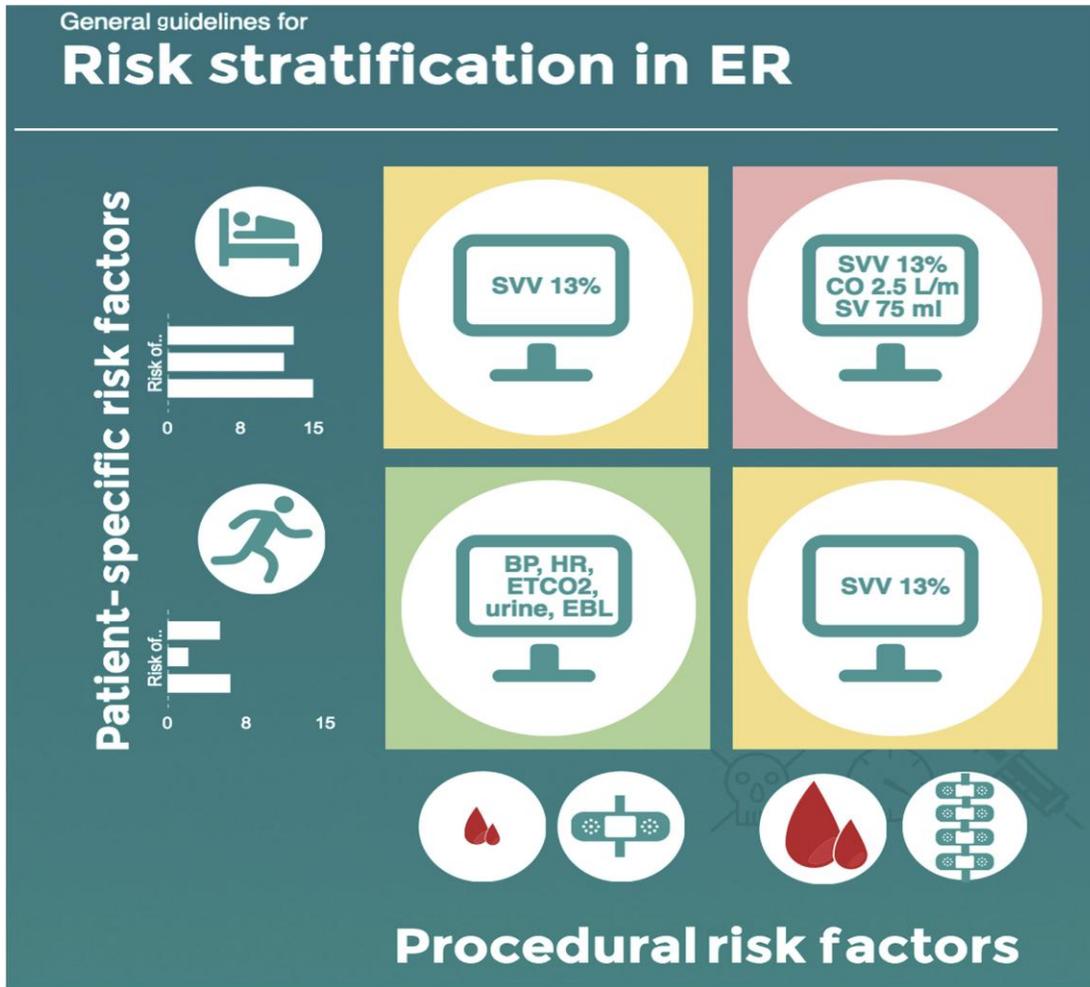


Figure 2: Guidelines for risk stratification of patients by cross matching procedural risks and patient-specific risk factors, as presented by the American Society for Enhanced Recovery (ASER) and Perioperative Quality Initiative (POQI). As patient risk factors increase, procedural risk factors increase, or both, more advanced monitoring should be used to help guide fluid management using goal-directed therapy (GDT). BP, blood pressure; CO, cardiac output; EBL, estimated blood loss; ETCO₂, end tidal carbon dioxide; HR, heart rate; PBW,; SV, stroke volume; SVV, stroke volume variation.

Postoperative Fluid Management:

Maintenance of proper fluid therapy during intraoperative period is necessary to avoid postoperative complications related to fluid overload and excessive iv hydration. Post-operative benefits of improved pulmonary function[13], tissue oxygenation, GI motility[6, 33] and improved wound healing[14, 15] are due to proper preoperative and intraoperative fluid management. Early shift to per oral hydration is preferred.

CONCLUSION

Peri-operative fluid management is crucial to avoid post-operative complications, reduce length of stay in hospital. Preoperative complex carbonated drinks help to reduce post-operative insulin resistance, PONV and improves metabolic state of health. With the goal of maintaining a state of euvoemia, intra-operative GDT utilizes a combination of fluids and ionotropes for optimal tissue perfusion during surgery. Oliguria during surgery should not be considered as a marker of hypovolemia as it may result from surgical stress unless other signs and symptoms of hypovolemia exists. Although oliguria should be treated appropriately. Post-operative oral hydration should be encouraged and excessive intravenous fluid administration should be avoided.

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