PRINCIPLES OF FLUID MANAGEMENT pdf

1: RRT Principles in Fluid Management

Fluid therapy is the most common intervention received by acutely ill hospitalized patients; however, important questions on its optimal use remain. Its prescription should be patient and context.

Intake Under normal circumstances most of our fluid intake is in the form of drinks but food also contains fluid and electrolytes, and water is also an end product of its oxidation which makes a further small but significant additional contribution to fluid intake. Drinking is governed by thirst, which is triggered when water balance is negative through insufficient intake or increased loss. It is also triggered by high sodium intake, since extra water is then needed to keep the ECF sodium concentration in the normal range. Sodium and water excess in particular can cause oedema, although this only becomes an issue when the ECF has been expanded by at least 2â€"3 litres. In the UK climate, the amount lost is 0. However, in the presence of disease this may be greatly increased see Section 5. These are the main organs for fluid and electrolyte regulation and excretion of waste products from metabolism, e. Their activity is controlled by pressure and osmotic sensors which result in changes in the secretion of hormones. The modest daily fluctuations in water and sodium intake cause small changes in plasma osmolality which trigger osmoreceptors. This in turn causes changes in thirst and the renal excretion of water and sodium. If blood or ECF volumes are subject to abnormal losses, volume receptors are triggered see below which override the osmoreceptors. In the presence of large volume changes, therefore, the kidney is less able to adjust osmolality. This can be important in some clinical situations. Water regulation Osmoreceptors which sense changes in plasma osmolality, are located in the hypothalamus and signal the pituitary to increase or decrease secretion of vasopressin or antidiuretic hormone ADH. Dilution of the ECF, including plasma, by intake of water or fluid of lower osmolality than plasma, causes ADH secretion to fall, so that the kidneys excrete more free water and produce a dilute urine. Conversely, dehydration causes the ECF to become more concentrated, ADH secretion rises and the renal tubules reabsorb more water, producing concentrated urine. In response to dehydration, the normal kidney can concentrate urea in the urine up to a hundred-fold, so that the normal daily production of urea related to protein metabolism in health can be excreted in as little as ml of urine. Age and disease can impair the renal concentrating capacity so that a larger volume of urine is required in order to excrete the same amount of waste products. Also if protein catabolism increases due to a high protein intake or increased catabolism, a larger volume of urine is needed to clear the resulting increase in urea production. To assess renal function, therefore, measurement of both urinary volume and concentration osmolality are important, and the underlying metabolic circumstances taken into account. If sodium depletion occurs, the ECF and plasma volumes fall. Pressure sensors in the circulation are then stimulated and these excite renin secretion by the kidney. This, in turn, stimulates aldosterone secretion by the adrenal gland, which acts on the renal tubules, causing them to reabsorb and conserve sodium. On the other hand, even in health, we are slow to excrete an excess sodium load, possibly because human physiology evolved in the context of the hot, low sodium environment of Africa and has not until modern times been exposed to excessive sodium intake. The response of atrial natriuretic peptide to fluid infusions seems to be related more to volume stretching of the right atrium than sodium load per se. Pathophysiological effects on fluid balance Illness and injury alter fluid and electrolyte balance and distribution needs in many ways including: Non-specific metabolic responses to stress especially in the seriously ill or injured ; Changes in fluid or electrolyte handling directly attributable to specific organ or system dysfunction or the effects of drugs or other IV therapies used to treat such problems; Changes in fluid or electrolyte handling due to very restricted recent food intake or malnutrition. These changes were later shown to be due to neuroendocrine and cytokine changes and to occur in three phases. The ebb or shock phase is brief and is modified by resuscitation. This gives way to the flow or catabolic phase, the length and intensity of which depends on the severity of injury and its complications. As inflammation subsides, the convalescent anabolic phase of rehabilitation begins. In parallel with these metabolic changes, there are changes in water and electrolyte physiology. During the flow phase, there is an increase in ADH, cortisol and aldosterone secretion, especially if there has been any reduction in blood or ECF volume. These lead to retention of sodium and water with loss of potassium. It also explains why sick patients can be so easily overloaded with excessive IV sodium and water administration during the flow phase. Since water as well as sodium is retained, it is also easy to cause hyponatraemia by giving excess water or hypotonic fluid. It is important, therefore, to administer crystalloids, not only in the correct volume but also in the appropriate concentration especially as, in the presence of these responses to illness or injury, the kidneys are unable to correct for errors in prescribing, even in the absence of significant acute kidney injury AKI or other renal pathology. The convalescent phase of serious illness or injury is not only characterised by the return of anabolism but also by a returning capacity to excrete any excess sodium and water load that has been accumulated. This phenomenon can last from several hours to days. Albumin and other plasma proteins leak out from the intravascular compartment into the interstitial space and water and sodium also move into that space. This results in a net contraction of the intravascular compartment and expansion of the interstitial space. As the return of albumin to the circulation via the lymphatics is unchanged, the net result is an intravascular hypovolaemia with oedema. Potassium Potassium losses during serious illness and injury are not only secondary to increased excretion from high cortisol and aldosterone levels, but also to protein and glycogen catabolism. Malnutrition is common in hospital patients since it is both a cause and a consequence of illness and injury. When present, it can have non-specific effects on fluid and electrolyte status and handling since starvation is accompanied by reductions in cell membrane pumping, with consequent movement of more sodium and water into cells than usual, while simultaneously potassium, magnesium, calcium and phosphate move out of cells and are excreted by the kidneys. A malnourished individual therefore tends to have a degree of total body sodium and water overload, coupled with depletion of total body potassium, phosphate, magnesium and calcium. These changes are often unrecognized as plasma levels may remain normal. The most important problems caused by these changes in relation to IV fluid and electrolyte prescribing, occur when a malnourished individual is fed, even if that feeding is only in the form of glucose from IV infusions. The arrival of the glucose, coupled with the release of insulin it triggers, can reverse the depression of the membrane pumps, leading to cellular uptake of potassium, phosphate, magnesium and calcium with potentially dangerous falls in plasma levels. These problems are known as the refeeding syndrome and specific advice on the prevention and management of these problems is provided in the NICE guideline on Nutrition Support in adults. Detailed discussions of such changes are clearly not possible within this guidance but examples of issues that might influence IV fluid prescriptions are shown in Table The organ or system dysfunction may be the either the primary problem that has brought the patient into hospital or a significant co-morbidity Issues influencing IV fluid prescriptions. Effects due to very restricted recent food intake or malnutrition Some degree of starvation is common in individuals who are ill or injured, especially those who might need IV fluid therapy. Reduced or absent food intake leads quite swiftly to alterations in cell function which include a reduction in membrane pumping so that potassium leaks out of the cells and is then lost in the urine, while sodium and water move into cells. Malnourished individuals, and even those who are overweight but have a history of recent starvation, may therefore have lower than expected total body potassium and higher total salt and water content. This makes them potentially vulnerable to fluid mismanagement, especially since malnutrition can also cause a decrease in cardiac reserve, a decrease in renal capacity to clear salt and water, and deficiencies of specific vitamins. This vulnerability is further enhanced if significant feeding is introduced at the same time as IV fluids withy the potential for inducing low phosphate, potassium or magnesium as part of the refeeding syndrome see Guidance of Refeeding syndrome in NICE CG32 â€” Nutrition Support in Adults. The clinical approach to assessing IV fluid needs The most appropriate method of fluid and electrolyte administration is the simplest, safest and effective. The oral route should be used whenever possible and IV fluids can usually be avoided in patients who are eating and drinking. The possibility of enteral tube administration should also be considered if safe oral intake is compromised but there is enteral tube-accessible GI function. Resuscitation, Routine maintenance, Replacement and Redistribution. A 5th R â€” Reassessment is also a critical element of care. However, the clinical principles underlying these decisions can be approached as a series of questions. Does my patient need IV fluid resuscitation? This is the first question, since urgent IV fluid therapy is a critical element in the management of most shocked patients.

For details on prescribing for routine maintenance see section Intravenous fluid therapy for fluid resuscitation. Can my patient meet fluid and electrolyte needs by the oral or enteral route? The unnecessary use of IV fluids should be avoided. When they are needed, they should be stopped as soon as possible. Assessment must be informed by all information available including a focussed history and examination along with results of clinical monitoring e. NEWS, fluid balance and body weight and laboratory results. For details on assessment and monitoring, see section Assessment and monitoring of patients receiving intravenous fluid therapy. For details on prescribing for routine maintenance see section Intravenous fluid therapy for routine maintenance. Does my patient have existing fluid or electrolyte deficits or abnormal ongoing losses? Recommendations and more details on fluid prescription for replacement are covered in the section Intravenous fluid therapy for replacement and redistribution. Does my patient have problems with internal redistribution of fluid or other fluid handling issues from either their primary problem or significant co-morbidities? IV fluid prescriptions must aim to account for both non-specific responses to illness or injury described in Section 5. Recommendations and more details on these issues are also covered in the section Intravenous fluid therapy for replacement and redistribution. Consideration of all questions above allows estimates of the total volume of IV fluid and amounts of electrolytes that should be given, before deciding on the best rate at which to administer the fluids. Often, that rate needs to be slow in order not to overload the circulation or to cause acute electrolyte problems, since time is needed for transmembrane i. The best IV fluid or mix of fluids to use can then be chosen although, before completing the prescription, allowance must be made for any fluid and electrolytes intake from other sources. These include any food and drinks, enteral tube provision and other IV therapies. Blood or blood products, in particular, contain large amounts of electrolytes as do some IV drugs, especially those given in larger volume diluents, several times a day. Patients on artificial parenteral or enteral nutrition usually receive adequate fluid and electrolytes from their feed to meet at least routine maintenance needs and prescription of unnecessary additional IV fluids in such patients is a common mistake. The properties of available IV fluids Many different crystalloids, artificial colloids and albumin solutions are available for IV fluid therapy. The aim is to meet estimates of total fluid and electrolyte requirements. There are theoretical advantages to giving a colloid instead of a crystalloid when resuscitating the hypovolaemic patient because colloid-based fluids generally remain for longer in the circulation. Crystalloids are distributed throughout the ECF and traditional teaching is that their infusion has relatively limited and transient effects on plasma volume. However, such considerations are based on data derived from studies undertaken in euvolaemic human volunteers who have no illness-induced abnormalities in fluid distribution and capillary permeability, and in hypovolaemic patients, crystalloids have much better intravascular retention than these studies have suggested. The actual benefits, if any, of colloids over crystalloids when intravascular volume expansion is required are therefore unclear. A review of all the available IV fluids in the UK is beyond the remit of this guidance but understanding the composition and properties of some of those more commonly used provides much of the understanding needed to prescribe any fluid appropriately. Furthermore, it helps understanding of the issues in fluid prescribing which are of debate in current practice. A brief description of some of the available fluids highlighting their properties and potential pros and cons of their usage is detailed below. Isotonic saline Sodium chloride 0. However, questions have been raised in relation to its appropriate use. As with all crystalloids, sodium chloride 0. Traditionally sodium chloride 0. Theoretically, use of sodium chloride 0. In addition, it is also possible that a significant albeit lesser degree of unnecessary sodium and water retention, is a problem when sodium chloride 0.

2: Principles of fluid management - Oxford Medicine

Late conservative fluid management describes a moderate fluid management strategy following the initial treatment in order to avoid (or reverse) fluid overload. Recent studies showed that two consecutive days of negative fluid balance within the first week of the intensive care unit stay is a strong and independent predictor of survival [1].

3: Principles and protocols for intravenous fluid therapy - Intravenous Fluid Therapy - NCBI Bookshelf

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Fluid therapy is the most common intervention received by acutely ill hospitalized patients; however, important questions on its optimal use remain. Its prescription should be patient and context specific, with clear indications and contradictions, and have the type, dose, and rate specified.

4: Principles of Fluid Management - Oxford Medicine

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5: Principles of fluid management and stewardship in sepsis

There are only four major indications for intravenous fluid administration: aside from resuscitation, intravenous fluids have many other uses including maintenance and replacement of total body water and electrolytes, as carriers for medications and for parenteral nutrition" Malbrain et al ().

6: Principles of Fluid Management. - Abstract - Europe PMC

The control and optimization of fluid balance is a clinically important component of continuous renal replacement therapy (CRRT). Inadequate fluid removal is associated with peripheral edema and vital organ edema (i.e. pulmonary edema).

7: Principles of fluid management for paediatric patients | Learning article | Pharmaceutical Journal

PHASES OF FLUID THERAPY Despite the wide variety of IV fluid types available for use in clinical www.enganchecubano.comples of Fluid Management The first clinical use of IV fluids for resuscitation followed shortly thereafter. the general principles behind IV fluid therapy remain similar today as they did in the nineteenth century." and that.

8: Intravenous fluid therapy in adults in hospital | Guidance and guidelines | NICE

Principles of fluid management and stewardship in septic shock: it is time to consider the four D's and the four phases of fluid therapy Manu L N G Malbrain, Niels Van Regenmortel, Bernd Saugel, Brecht De Tavernier, Pieter-Jan Van Gaal, Olivier Joannes-Boyau, Jean-Louis Teboul, Todd W Rice, Monty Mythen, Xavier Monnet.

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