Fluid and electrolyte balance: how do junior doctors measure up?

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Fluid and electrolyte disorders are common in hospital patients and can cause serious complications, especially in the elderly. The task of fluid management is often left to the most junior members of the team, the senior house officer and the preregistration house officer. However, the level of teaching and support available to them in this regard appears to be unsatisfactory.

Fluid and electrolyte disorders along with acid–base imbalance are very common in hospital inpatients. Hypovolaemic shock is another condition that is commonly seen in hospital practice. Early recognition of these conditions and appropriate treatment are needed to prevent the serious complications that may arise. A report by the National Confidential Enquiry into Perioperative Deaths (1999) has criticized the fluid management of elderly hospital patients. The report also emphasizes that fluid prescription must be given the same status as the prescription of drugs. Although the importance of fluid and electrolyte balance is stressed in medical schools, continued education in clinical practice appears to be lacking.

AIMS

A study was undertaken to identify the level of awareness about fluid and electrolyte balance among junior doctors and to assess the clinical practice among doctors with regard to monitoring blood results and prescribing intravenous fluids. The authors also wanted to assess the level of support available to junior doctors from their seniors with regard to fluid management.

METHODS

A multiple choice questionnaire was designed which included questions under three sections. Section 1 consisted of basic questions about the physiology of fluid and electrolyte balance. Section 2 consisted of questions about simple aspects of management of fluid and electrolyte disorders and hypovolaemia. Section 3 consisted of questions about the level of support and advice available to junior doctors from their seniors and the day-to-day clinical practice with regard to fluid prescription and monitoring of blood results. Copies of this questionnaire were circulated to all senior house officers (SHO) and preregistration house officers (PRHO) who were nearing the completion of their preregistration year in five district general hospitals. The responses were then analysed.

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RESULTS

A total of 80 questionnaires were sent out. Seventy two doctors responded (90%), of which 37 were PRHOs and 35 were SHOs. There were no incomplete responses. The results are summarized in *Tables 1* and *2*.

Other results: Twenty six PRHOs and 16 SHOs replied that they need help most of the time in fluid and electrolyte

TABLE 1.
Questionnaire section 1 responses

Question	Acceptable choices	Unacceptable choices	Number of incorrect responses	
			SHO (n = 35)	PRHO (n = 37)
Normal urine output in a healthy adult (ml/kg/hour)	0.5–2	2–3 3–4 4–5	15	23
Normal sodium and potassium requirements in a healthy adult (mmol/kg/day)	1–2	2–3 3–4 4–5	13	21
Normal daily fluid requirements in a healthy adult (ml/kg/day)	30–50	10–30 50–70 > 70	14	16
Normal blood volume in a healthy adult (litres)*	5	4, 6, 7, 8	12	17
Normal blood pH	7.35–7.45	7.15–7.25 7.25–7.35 7.45–7.55	8	10
Normal serum osmolality (mosm/kg)	280–300	200–220 220–240 240–260 260–280	10	29
What does base excess in arterial blood gases indicate?	Metabolic acidosis or alkalosis	Respiratory acidosis or alkalosis, hypoxia, CO_2 retention	15	27

CO_2 = carbon dioxide; PRHO = preregistration house officer; SHO = senior house officer. *Although electrolyte measurements are often listed in relation to body weight, the authors chose to express blood volume in litres as blood volume is most often expressed in this manner and so this was felt to be less confusing for junior doctors

management. Forty two of the 72 junior doctors never had any formal teaching on this subject, and 26 did not check either clinical details or blood results before prescribing intravenous fluids.

DISCUSSION

Disorders of fluid, electrolyte and acid–base balance are frequently encountered in hospital patients as a result of a combination of factors. The primary pathological process for which the patient is admitted, e.g. renal failure, intestinal obstruction, peritonitis or gastroenteritis, can be the initiating factor. The problem can be aggravated by medication (Mendyka, 1992) and by reduced or absent enteral intake as a result of nausea, vomiting, postoperative state or pathology that precludes oral intake.

Monitoring and maintenance of fluid and electrolyte balance is vital in these circumstances, especially in the elderly and in postoperative patients. Renal function declines with age. Water and potassium metabolism is particularly vulnerable in older patients (Beck, 2000). Surgical patients are often maintained solely on intravenous fluids during the early postoperative period. Fluid management in such cases should be reviewed daily as standard regimens may be unsuitable.

Complications of fluid and electrolyte imbalance can be varied and include cardiac arrhythmias, metabolic encephalopathy and pulmonary oedema, even leading to acute respiratory distress syndrome in susceptible patients (Commerford and Lloyd, 1984; Bishop et al, 1991; Ellis, 1995).

Junior doctors play a major role in the care of hospital inpatients. Prescribing intravenous fluids and monitoring blood results are often left to the most junior member of the team. Hypovolaemic shock is an acute condition that needs immediate intervention. Here again, the junior doctor is often the first person to see the patient and is responsible for initiating the management. To carry this out efficiently, a sound knowledge of the basic physiology of fluid and electrolyte homeostasis is needed. Adequate advice and support from senior staff is also required.

This study, although small, shows deficiencies among junior doctors with respect to their knowledge of fluid, electrolyte and acid–base balance. It should be stressed that this questionnaire concentrated mainly on the physiological aspects of this subject, and only simple clinical problems were put forward for respondents to solve.

The importance of fluid management is often stressed to medical students, in the critical care courses conducted by the Royal College of Surgeons and in the Fellowship and Intercollegiate exams for surgical trainees. However, there appears to be a hiatus in teaching junior doctors about the importance of this during the crucial phase of their clinical training. They are often left to read about fluid and electrolyte balance from the texts, when it is far more practical to teach this subject at the bedside.

The study has also revealed that over a third of the junior doctors neither check clinical details nor blood results before prescribing intravenous fluids. In this era of litigation and the need for clinical governance, the authors feel that this practice is dangerous and can potentially lead to complications.

TABLE 2.
Questionnaire section 2 responses

Question	Acceptable choices	Unacceptable choices	Number of incorrect responses: SHO (*n* = 35)	Number of incorrect responses: PRHO (*n* = 37)
What fluid would you use to resuscitate a patient in shock (not as a result of blood loss)	Normal saline Hartmann's Haemaccel	Dextrose-saline 5% dextrose	3	5
What is the commonest cause of reduced urine output after major surgery	Hypovolaemia	Cardiac failure Renal failure Blocked catheter	8	14
What is the first thing you would do if a patient develops reduced urine output postoperatively?	Check input output chart Check pulse rate and blood pressure Give fluid challenge	Give diuretic	8	12
What fluid would you use to replace gastric/intestinal fluid loss?	Normal saline*	Hartmann's Dextrose-saline 5% dextrose	20	28

PRHO = preregistration house officer; SHO = senior house officer. *While normal saline may not be suitable for fluid resuscitation in all patients, the purpose of this question was to analyse the general awareness of fluids which are acceptable for resuscitation.

KEY POINTS

- The level of knowledge on the subject of fluid and electrolyte balance among junior doctors appears to be unsatisfactory.
- There appears to be a tendency among many junior doctors to prescribe intravenous fluids without checking clinical details and blood results. This practice is dangerous and can lead to serious complications.
- Regular teaching for junior doctors is needed in the clinical setting to maintain the level of knowledge on this important subject.

CONCLUSIONS

This study reveals that junior doctors' overall knowledge of fluid and electrolyte balance appears to be unsatisfactory. This study has also highlighted the need for better practical training on the wards and more support from senior staff to enhance awareness about this subject among junior doctors. HM

Conflict of interest: none.

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