Fluid Therapy Management in Hospitalized Patients: Results From a Cross-sectional Study

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ABSTRACT

Purpose: Intravenous (IV) fluid therapy is widely used in hospitalized patients. It has been internationally studied in surgical patients, but little attention to date has been dedicated to medical patients within the Italian context. The aims of the present study were to describe the prevalence of fluid therapy and associated factors among Italian patients admitted to medical and surgical units, describe the methods used to manage fluid therapy, and analyze the monitoring of patients by clinical staff.

Methods: In this cross-sectional study of 7 hospitals in northern Italy, data on individual and monitoring variables were collected, and their associations with in-hospital fluid therapy were analyzed by using logistic regression analysis. Patients aged ≥18 years who were admitted to medical and surgical units were included. Patients who received at least 500 mL of continuous fluids were included in the fluid therapy group.

Findings: In total, 785 (median age, 72 years; women, 52%) patients were included in the study, and 293 (37.3%) received fluid therapy. Maintenance was the most frequent reason for prescribing IV fluid therapy (59%). The mean (SD) volume delivered was 1177 (624) mL/d, and the highest volume was infused for replacement therapy (1660 [931] mL/d). The mean volume infused was 19.55 (13) mL/kg/d. The most commonly used fluid solutions were 0.9% sodium chloride (65.7%) and balanced crystalloid without glucose (32.9%). The proportion of patients assessed for urine output (52.6% vs 36.8%; $P < 0.001$), serum electrolyte concentrations (74.4% vs 65.0%; $P = 0.005$), and renal function (70.0% vs 58.7%; $P = 0.002$) was significantly higher in patients who did receive fluid therapy versus those who did not. In contrast, the use of weight and fluid assessments was not significantly different between the 2 groups ($P = 0.216$ and 0.256, respectively). Patients admitted for gastrointestinal disorders (odds ratio [OR], 3.5 [95% CI, 1.8–7.05) and for fluid/electrolyte imbalances (OR, 3.35 [95% CI, 1.06–10.52) were more likely to receive fluids. However, the likelihood of receiving fluids was lower for patients admitted to a surgical unit (OR, 0.36 [95% CI, 0.22–0.59]) and with cardiovascular diseases (OR, 0.37 [95% CI, 0.17–0.79).

Implications: Only one third of the study patients received fluid therapy. Crystalloid fluids, are the fluids of choice for maintaining plasma volume. During fluid therapy, measurement of the serum electrolyte concentrations, renal function, and urine output was largely used while weight and fluid balance were rarely assessed. (*Clin Ther.* 2017;39:311–321)
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Key words: cross-sectional studies, fluid therapy, in-hospital patients, management, monitoring, safety patient.

INTRODUCTION

Intravenous (IV) fluid therapy is widely used in hospitalized patients to manage altered fluid intake, increased fluid losses, or acid–base and electrolyte

Accepted for publication December 21, 2016.
http://dx.doi.org/10.1016/j.clinthera.2016.12.013
0149-2918/$ - see front matter
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imbalances.[1–3] Many patients receive IV fluids during hospitalization to treat or prevent dehydration and/or hypovolemia or to deliver nutritional elements or drugs.[2]

Although the correct use of IV fluids can be lifesaving, recent studies have shown that fluid therapy is not without risks.[1] The effects of the types and volumes of fluid delivered and the criteria for safe IV fluid administration to hospitalized patients have been studied mainly in the surgical context in the perioperative period.[4–6] Walsh et al[4] found that 54% of patients in the postoperative period developed at least 1 fluid-related complication, such as hypernatremia, dysrhythmia, or fluid overload. The cohort study conducted by Pipanmekaporn et al,[5] involving a sample of 720 patients who had undergone thoracotomy for noncancerous lesions, reported that a positive fluid balance of >2000 mL was a significant risk factor for cardiovascular complications such as cardiac arrhythmia (risk ratio, 3.15 [95% CI, 1.44–6.90]; $P = 0.004$).

The National Confidential Enquiry into Patient Outcome and Death[7] stated that hypovolemic patients who have received an inappropriate volume of IV fluids in the preoperative period have a 30-day mortality rate of ~20.5% compared with 4.7% for patients who have instead received an adequate volume of fluid therapy. In contrast, Benes et al[6] found that goal-directed fluid therapy based on dynamic parameters, such as the cardiac index and central venous saturation, decreased the postsurgical morbidity rate, complication rate, and length of stay in the intensive care unit.

Few studies to date[2–4,8] have analyzed the methods used to manage IV fluid therapy, monitoring/assessment of IV fluid therapy, and incidence/prevalence of fluid-related complications in patients admitted to medical and surgical units. A retrospective study conducted in the infectious diseases wards of an Iranian hospital[3] found that the overall rate of errors in fluid therapy was 1.3 per patient during hospitalization. These errors may be related to inadequate training or knowledge of health care personnel; safe fluid administration should consider the dose–effect relationship and possible adverse events. These elements require clinical skill, an understanding of pathophysiologic mechanisms, and knowledge of the properties of the IV fluids.[1,9,10] Therefore, patient assessment during IV fluid administration is very important to reduce both morbidity and mortality and to achieve better patient outcomes. Ferenczi et al[8] reported that in 65.1% of patients undergoing fluid therapy, the serum urea, creatinine, and sodium concentrations were assessed daily and that 85.0% of physicians wanted to evaluate these parameters before prescribing IV fluids. Weight was measured on admission in 25.0% of patients and assessed daily in only 9.4% of patients receiving IV fluids, and 25.0% of physicians checked the patients' weight daily before prescribing IV fluids.

Consistent results were obtained by Eastwood et al.[2] Assessment of serum electrolyte concentrations, renal function, and fluid balance was widely performed (94%), but weight was scarcely measured (19%).

Aiming to decrease the high variability in IV fluid management, the British Consensus Guidelines on Intravenous Fluid Therapy for Adult Surgical Patients[11] were developed in 2008 specifically for surgical patients. More recently, in 2013, the National Clinical Guideline Centre developed guidelines entitled Intravenous Fluid Therapy in Adults in Hospital,[12] which included recommendations for most adult patients requiring IV fluid therapy. These National Institute for Health and Care Excellence (NICE) guidelines proposed an IV fluid prescription approach based on algorithms to evaluate the patient's needs and assess the clinical situation to avoid fluid-related adverse events.

Because fluid therapy is widely used in hospitalized patients with the potential for adverse events,[1–3] and given that the available international literature has mainly focused on surgical patients,[4–7] there is a need to fill the knowledge gap regarding IV fluid therapy in the Italian context. Therefore, the aims of the present study were to describe the prevalence of fluid therapy and associated factors among patients admitted to medical and surgical units, analyze the assessment/monitoring of patients receiving IV fluid therapy compared with patients not receiving fluids, and describe the methods used to manage fluid therapy by clinical staff and the characteristics of fluid therapy.

PATIENTS AND METHODS

This cross-sectional study was conducted in 7 hospitals in northern Italy; 2 were teaching hospitals

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