

EDITORIAL COMMENT

Simultaneous Use of Intravenous Fluids and Diuretics in Patients Hospitalized With Heart Failure



When the Left Hand Does Not Know What the Right Hand Is Doing*

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Confusion of goals and perfection of means seems, in my opinion, to characterize our age.

—Albert Einstein (1)

These days, hospitalization for heart failure is on the minds of most U.S. clinicians and hospital administrators. Payment reforms designed to highlight quality of care and health outcomes have focused heavily on inpatients with a primary diagnosis of heart failure. The biggest ‘stick’ in the Centers for Medicare and Medicaid Services value-based purchasing initiatives is the Hospital Readmission Reduction Program, and heart failure drives the largest portion of these penalties (2). With heart failure 30-day mortality rates exceeding 10% and hospital readmission rates exceeding 20%, significant effort has gone into reducing these events. Unfortunately, the process of improving these outcomes has been less clear. Numerous randomized trials of various inpatient and transitional care measures have largely been negative (3).

Because decongestion is the cornerstone of treatment for acute heart failure (4), attempts to improve quality of care for such patients should pay

particularly close attention to therapies that affect volume control. Sutton’s law applies: “Why do you rob banks? Because that’s where the money is.” In hospitalized heart failure, the primary currency for volume control is diuretics. However, intravenous (IV) fluids are equally important. Although clinicians follow both daily weights and intake/output, with an occasional discussion of concentrating IV medication carriers, the habitual bag of saline hanging from the IV pole at the corner of the bed has largely been overlooked ... until now.

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In this issue of *JACC: Heart Failure*, Bickdeli et al. (5) leverage the billing database created by Premier, Inc. (Charlotte, North Carolina) to describe the use of IV fluids in patients also treated with loop diuretics for heart failure hospitalization. Among 131,430 qualifying hospitalizations from 346 hospitals in 2009 to 2010, 11% of patients received at least 500 ml IV fluids in the first 2 days of hospitalization. Rates of use varied significantly by hospital, with approximately one-fourth of hospitals giving IV fluids in <10% of cases and another one-fourth of hospitals giving IV fluids in >20% of cases. After adjustment for available patient characteristics (which were relatively similar between patients who did and did not receive IV fluid), administration of IV fluid was associated with a 50% to 100% higher absolute rate of in-hospital adverse outcomes.

Premier, Inc. captures approximately 20% of acute care hospitalizations in the United States, including a date-stamped log of all billed items at the patient level. In modern clinical care, this includes electronic capture of medication and IV fluid administration (6).

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The result is to give a raw look at a broad swath of on-the-ground inpatient care for heart failure in the United States. When the right question is asked of the data, it can highlight certain patterns that may go relatively unnoticed within the complex care of hospitalized patients. Here it shines a light on IV fluid use among patients for whom such therapy would seem unwarranted. What is shown is not some avant-garde movement toward the use of hypertonic saline or a hangover of albumin infusion as part of a “Lasix sandwich”; it is the opposing push-pull of saline and furosemide running through an IV catheter.

At first blush, it may come as a surprise that 1 in 9 patients admitted for diuresis are given at least 0.5 liter of IV fluid. However, now that our eyes are opened to this finding, it becomes easier to see how therapies routinely given in general acute care may be given to subgroups of patients in whom those therapies are inappropriate. Individual experience tells us this is plausible. Communication among clinical team members is often suboptimal. Acute care of sick patients can be driven by standard reactions rather than thoughtful assessment of physiology. The variation among hospitals further suggests that at least some of the delivery of IV fluids among congested patients with heart failure reflects variations in the culture of care. Now that this relatively common practice is revealed, it behooves us to better understand exactly why it is happening; this understanding can then guide efforts to extinguish truly inappropriate care.

Gaining this deeper view is where the myopic window of billing data falls short. In particular, Premier, Inc. lacks important information about dynamic renal function, vital signs, and other factors that can and should influence IV fluid use. This not only affects the ability to understand individual patient differences, but thereby also limits the ability to adjust for associations with outcomes and for hospital-level differences reflective of patient mix. Restriction of the cohort by billing diagnoses for critical care and end-stage renal disease, as well as adjustment for administrative diagnosis codes for chronic kidney disease, hypertension, and obesity, is a limited fix. This lack of

clinical detail is probably most prominent among those patients with the most complex pathophysiology (e.g. acute hypotension, new renal dysfunction), who are also the patients most likely to experience adverse clinical events. Although the patients look relatively similar by administrative coding, it remains to be seen what proportion of this IV fluid administration is guided by habit, dynamic clinical indications, or diagnostic uncertainty.

One of the most common challenges in the delivery of inpatient care is the determination of optimal intravascular volume status: Is the patient wet or dry? Natriuretic peptides, ultrasound measures of cardiac filling pressures, and invasive monitoring have in some ways increased the information available to help determine whether patients are congested or not and in some ways have diminished the ability of clinicians to make rapid assessment of volume status from the bedside. Perhaps more concerning, our increasingly specialized, siloed, and automated health system has become quite good at the delivery of discrete therapies, but perhaps less good at coordinating the care of the whole patient.

All in all, mixing furosemide and saline is no yin and yang. Pointing out the frequency with which U.S. hospitals give IV fluid and loop diuretics to patients presenting with worsening heart failure suggests a way forward to our goal of improving acute care. Specific to heart failure, we need to pay particular attention to what matters most: a thoughtful approach to the control of fluid status. General to hospitalized patients, we need to remember that medicine is an art: good care is grounded in physiology, guided by evidence, and tailored to the patient. In the end, we deliver an incredible number and diversity of therapies well in the modern U.S. health care system. The pressing question is whether the totality of therapies makes sense in each individual.

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