Patient Safety Tip of the Week

May 28, 2013

The Neglected Medications:

IV Fluids

For years we have pointed out that we often neglect to consider some interventions as "medications". These include oxygen, heparin flushes, and IV fluids. We've often written about the issues with oxygen therapy and heparin flushes but we really haven't done much with IV fluids.

So what's the big deal about IV fluids? Well, **NICE** (UK's National Institute for Health and Care Excellence) has pointed out that the quality and patient safety issues surrounding IV fluid therapy are so significant that they have just issued new draft **guidelines for managing IV fluids** (NICE 2013). They note that a study done in 1999 (NCEPOD 1999) had called attention to inadequacies in IV fluid management but that little progress has been made since (Findlay 2011).

Think about your own organization. You probably don't consider IV fluid mismanagement as a "medication error" and therefore probably have no way of tracking how often such occur. But think about your RCA's, case reviews, peer reviews, and M&M rounds. How often have you seen cases where your colorectal surgery patients go into pulmonary edema on POD 3 or 4? Or patients who become profoundly dehydrated during hospitalization because of inadequate attention to fluid balance? Or sepsis patients who get inadequate or untimely fluid resuscitation? Or patients who fall because of orthostatic hypotension where dehydration is a contributing factor? Or patients who develop electrolyte disturbances or aggravation of renal insufficiency? We'll also bet that the majority of discharge summaries on your CHF patients fail to mention the "dry weight" (presumably representing the optimal fluid balance state for that patient). Get the picture? The problems with fluid management are fairly widespread but, because we don't measure and track them, we continue to ignore them.

Quoting the NICE guideline: "Errors in prescribing IV fluids and electrolytes are particularly likely in emergency departments, acute admission units, and general medical and surgical wards because staff in these areas often have less relevant expertise than

those in operating theatres and critical care units. Surveys have shown that many staff who prescribe IV fluids know neither the likely fluid and electrolyte needs of individual patients, nor the specific composition of the many choices of IV fluids available to them. Standards of recording and monitoring IV fluid and electrolyte therapy may also be poor in these settings. IV fluid management in hospital is often delegated to the most junior medical staff who frequently lack the relevant experience and may have received little or no specific training on the subject."

The 1999 NCEPOD (National Confidential Enquiry into Perioperative Deaths) report noted **that as many as one in five patients on IV fluid/electrolyte therapy suffer complications or morbidity due to their inappropriate administration** (NCEPOD 1999). That report recommended that **fluid prescribing be elevated to the same status as drug prescribing**. A more recent NCEPOD report (Findlay 2011) showed that the 30 day mortality in those patients in whom the with inadequate pre-operative fluid management was 20.5% compared to 4.7% mortality in those with adequate pre-operative fluid therapy, reinforcing previous evidence of the beneficial effects of optimisation of fluid status prior to surgery.

We continue to see wide variation in the types of IV fluids used, rates, parameters, and indications and rationales for IV fluid regimens in our hospitals. Development of standardized order sets, whether paper-based or CPOE-based, had helped reduce the variation somewhat but considerable variation in practice patterns persists. Fluid management often appears to be an afterthought.

The NICE draft guideline has a short version, full version, and a document with evidence and appendices. They appropriately point out that many IV fluid therapy practices were historically seldom evidence-based nor subject to the randomized controlled clinical trials we expect for drug therapies. They do grade the strength of the recommendations they make in the guideline.

The guideline stresses **the "5 R's": Resuscitation, Routine maintenance, Replacement, Redistribution, and Reassessment**. It offers separate **algorithms** for: (1) assessing a patient's fluid and electrolyte needs, (2) resuscitation with fluids, (3) routine fluid maintenance, and (4) addressing existing deficits or excesses or ongoing abnormal losses. It provides a nice diagram demonstrating **sources of ongoing fluid losses** and discusses monitoring parameters and frequencies. It also recommends that your organization adopt **reporting of critical incidents resulting from fluid mismanagement** (it actually includes a table listing which consequences of fluid management should be considered for reporting).

The guideline has lots of recommendations regarding education, training, inservicing, and competency assessment for fluid management. It recommends that each organization or facility **designate a lead person** to oversee, audit and review IV fluid prescribing and patient outcomes.

It begins with the logical statement that you should **only prescribe IV fluids where a patient's needs cannot be met by oral or enteral routes** and you should stop them as soon as possible. We often see patients in our hospitals receiving IV fluids when they don't really need them. Note that in the US we often see inappropriate initiation of IV fluids to meet the criteria of utilization management guidelines! For example, the "criteria" for admission or continued hospitalization might "require" IV fluids at least at a certain rate. So we see lots of orders written for patients not really needing rates that high or not even needing IV fluids at all.

The algorithm for assessment and reassessment is quite good and includes many parameters and clinical and laboratory signs that might suggest the need for more aggressive fluid resuscitation, such as the NEWS score (see our September 11, 2012 Patient Safety Tip of the Week "In Search of the Ideal Early Warning Score" for links to all our previous columns on early warning scores). The guideline also offers advice on when to assess things like urine sodium or look for hyperchloremic acidosis, etc.

It has good recommendations into consideration of various clinical and laboratory parameters in determing the best compostion of the IV fluids. It has good information about what to include in IV fluids (eg. including some glucose in maintenance IV fluids helps limit starvation ketosis) and what not to include (eg. recent large randomised controlled trials suggest that crystalloids are superior to 6% hydroxyethyl starch for resuscitation and the latter increases mortality and complication rates).

The guideline also stresses that when patients are transferred to another service or location, a review of their fluid status and management should be part of the handoff.

We have some of our own comments about the guideline and about fluid management in general.

First, we are delighted to see one specific clinical test included in the assessment algorithm of the NICE guideline. That is the **passive leg raising test**. Back in the late 1970's, armed with just a little knowledge about baroreceptor physiology, we used to challenge our colleagues who relied upon pulmonary capillary wedge pressure measurements via invasive Swan-Ganz catheters vs. our using the simple bedside passive leg raising maneuver. We were usually able to predict better than the Swan-Ganz which patients needed more fluid vs. which ones already had too much! It's great to see this simple useful bedside test make its way into these protocols.

We're also happy to see they have included assessment for **postural hypotension** in their assessment algorithm. We can't tell you how many patients with syncope or dizziness we have seen over the years where no one had bothered to check for postural hypotension. And even in those rare patients in whom the physician has ordered monitoring for postural hypotension, it is rarely assessed in the proper manner. For the proper technique you can go to one of our many tirades on the topic of orthostatic hypotension (the most recent being in our January 15, 2013 Patient Safety Tip of the Week "Falls on Inpatient Psychiatry").

The NICE guideline makes almost no mention of use of **technology**. We actually suspect that problems managing fluid status may have actually worsened as an unintended consequence of technology. In the old days, the first thing we saw when we opened a patient's chart or walked into their room was **a flow sheet** that had their vital signs, their I&O's (input and output), and their weight all represented in graphic form. It was pretty easy to spot bothersome trends. Many of today's EHR's, however, don't provide such graphically displayed data (or at least don't make it easy to get to such displays in just a click). Theoretically, computers should make it easier to track fluid status. The computer should be able to be programmed to compare the fluid input to the measured output and perform a calculation of the estimated insensible losses, then display the net fluid deficit or excess in a graphic form along with the patient's weight. You could even program in alerts when deficits or excesses are above whatever limit you set (or at least display those unwanted values in red), keeping in mind we want to avoid alert fatigue. So IT vendors get with it!!!

Another somewhat surprising barrier to accurate I&O recording has been the change in the nature of the nursing shift. Traditionally we have been used to ordering "Intake and Output qShift" and were used to seeing the values recorded every 8 hours. Now that 12-hour shifts (and other alternatives) have appeared, the recordings are less frequent and it is more difficult to promptly see any trends. For example, if we round on our patients at 7AM and 5PM we might now see only one I&O recording for the current day and not recognize until the following morning that there is a disparity.

Not everyone needs I&O's measured every day. It is time-consuming for nurses to do these measurements. So, while it may be important to order I&O's when a patient is first begun on IV fluids, their fluid status and the need for frequent continued measurements should be reassessed daily. As they stabilize, particularly when they get to the routine maintenance stage, you should consider whether the monitoring frequency can be reduced.

Note that the currently issued NICE guideline is a "draft" and might change prior to final implementation. So you should check back with the NICE website in a few months (anticipated publication date is November 2013) to see if any substance changes have been made. But the draft document is an excellent start and should get you thinking about ways to improve fluid management in hospitalized patients in your organization. We think you'll find the algorithms and recommendations very helpful. It's a nuts and bolts type document that takes a very practical approach to an area of patient safety that we have all overlooked for far too long.

References:

NICE (UK's National Institute for Health and Care Excellence). Intravenous fluid therapy: guideline consultation. (draft guideline) May 21, 2013
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