Ontario
CRITICAL Incident Learning
Improving quality in patient safety

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Distributed to:

- Chief executive officers
- Chiefs of staff
- Board chairs
- Quality/patient safety leads
- Directors of pharmacy
- Directors of nursing

Suggested Action Items

- Ask the Pharmacy and Therapeutics Committee to evaluate protocols and order sets developed for fluid and electrolyte management on a regular basis.
- Ensure that clinical leadership committees review protocols to ensure that staff members are able to identify and safely manage the risks associated with fluid and electrolyte therapy.
- Review off-hour laboratory service demands and resources to ensure timely and effective responses.

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Fluid Management

Most patients who are receiving inpatient care require fluid and electrolyte management, a process that is often thought of as simple and routine. However, evaluation of fluid status and replacement of fluids are complex activities, and there can be profound clinical consequences for patients if these tasks are not well managed. Electrolyte disturbances and pulmonary edema are but a few of the potential adverse sequelae that may develop while managing a patient's illnesses, comorbid conditions, and requirements for hydration.

Determining an optimal regimen for replacing fluids and electrolytes involves clinical assessment of fluid volume status and measurements of fluid input and fluid loss. Appropriate imaging and laboratory measurement of electrolytes and organ function are also required.

The safe use of replacement fluids and electrolytes requires a respect for the unique needs of each patient. It also demands a systematic approach to assessment, monitoring, and correction of any deficits.

Call to Action for Hospitals

Make fluid-related safety a priority:

- Recognize that the complexity of the processes associated with fluid and electrolyte management is widely underappreciated.
- Ensure that laboratory infrastructure supports timely collection and transportation of samples, and measurement and reporting of electrolytes and other indicators of fluid status.

Make systems-based changes to enhance safety:

- Anticipate procedures or clinical conditions that may require enhanced observation of fluid status, and create standardized protocols and processes to support this heightened awareness.
- Create protocols and order sets for fluid and electrolyte management, ensuring that they include appropriate laboratory testing and monitoring.

Sustain high-quality practice:

- Make the assessment of fluid status a regular part of clinical practice and vital-sign monitoring.
- Ensure that organizations have a robust process that monitors staff competence and compliance in executing protocols/order sets consistently.

Case Summary

A healthy woman was admitted for an operative procedure that was known to have the potential to cause an electrolyte imbalance. Laboratory tests performed after the procedure revealed a low sodium level, which led to a decision to stop intravenous (IV) infusion of fluids. Repeat blood work a few hours later indicated a rapid increase of the sodium level. To reduce the high sodium levels, the physician ordered desmopressin, a medication that encourages the body to retain water. A third laboratory test result a few hours later showed an even higher sodium level, and a more aggressive fluid infusion (5% dextrose in water) was ordered, followed by administration of another dose of desmopressin and large volumes of IV solution.

The patient's sodium values subsequently declined to within normal limits. Over the next few hours, she started vomiting and reported tingling in the face and scalp. Several hours later, she became confused and began to have seizures; admission to the ICU was required. At that point, the sodium level was determined to be dangerously below the normal range. Rapid changes in fluids and electrolytes were deemed to have caused cerebral edema in this patient.

Learning from Analysis

Analysis of the incident identified a number of contributing factors that led to suboptimal fluid management in this patient. A key factor was the lack of a systematic approach to assessing fluid status and electrolyte levels and initiating corrections when necessary.

The facility also identified a knowledge deficit on the part of healthcare practitioners regarding the clinical manifestations of a low sodium level (e.g., nausea, vomiting, muscle spasms, confusion, and decreased level of consciousness[1]) and the seriousness of this condition. Knowledge deficits related to the rationale for following strict IV rates when correcting fluid and electrolyte imbalances also existed. Other contributing factors that may have delayed diagnosis were the inability to quickly collect and transport blood specimens between the clinical care and laboratory areas and an existing protocol that required the laboratory to call the clinician only with the first abnormal result and not subsequent results out of normal range.

Following this incident, the facility developed education for nursing and medical staff about the risks, identification, and management of hyponatremia. The facility is also considering development of a formal protocol for managing hyponatremia.

Conclusion

Fluid and electrolyte management is a common clinical endeavour in the acute care setting, yet its risks are underappreciated. A proactive approach to identifying patients at high risk of fluid and electrolyte imbalance, combined with systematic methods for assessing and correcting fluid and electrolyte status, can reduce the potential for harm to patients.

Individual practitioners and administrators in Ontario healthcare facilities are encouraged to closely examine the processes used for fluid and electrolyte management in their facilities and to address identified deficiencies using a multidisciplinary approach.

[1] Sterns RH. Disorders of plasma sodium—causes, consequences, and correction. New Engl J Med 2015;372(1):55-65.

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Collaborating parties of the Ontario Critical Incident Reporting program

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