Patient Safety Alert

Date: December 3, 2024

To: All Clinical Staff

From: Mary-Ellen Lee, RNBN
Provincial Patient Safety Lead

cc: Dr. José François, MD MMedEd FCFP
Provincial Chief Medical Officer
Shared Health | Soins Communs

Re: **Variations in Intravenous Acetylcysteine Protocols Can Lead to Infusion Errors and Serious Harm**

This alert is to highlight the importance of communicating which acetylcysteine (also known as N-Acetylcysteine, or NAC, or Mucomyst) dosing protocol is initiated upon any transfer between hospital or medical services.

Acetylcysteine parenteral infusion is used to treat toxic ingestion of acetaminophen. Variations in protocols exist and rapid infusions can lead to acetylcysteine toxicity resulting in serious patient harm and even death.

See/print page 3 for recommendations

Situation
Manitoba patients presenting with acetaminophen toxicity are often transferred between sites.

Manitoba sites are using different acetylcysteine dosing protocols.

- **Rural sites** use a one-bag–2-dose protocol endorsed by Ontario Poison Centre (OPC).
- **Winnipeg sites** use a three-bag–3-dose protocol.

Miscommunication and/or lack of knowledge about acetylcysteine dosing protocols are known contributors to adverse patient safety events that have resulted in serious harm including acetylcysteine toxicity or fluid overload.

Risk is highest at transitions of care, including transfers between hospital units and facilities.

Background

There is a lack of consistency in acetylcysteine dosing protocols within Manitoba and nationally across toxicology services. There are two different toxicology consultations pathways in Manitoba and Saskatchewan uses a third service. Each service utilizes a different acetylcysteine dosing protocol for the management of acetaminophen toxic ingestions. All protocols include stepwise adjustment of infusion rates of the medication.

There is no standard acetylcysteine dosing protocol within Manitoba and variations in dosing protocols, including how doses are ordered and documented into charts and on to medication administration records (MARs), contribute to serious patient safety risks.

Use of a one-bag–2-dose protocol to administer both steps (loading dose and maintenance infusions) has been identified as a contributing factor for acetylcysteine overdose. The risk of continuing the loading dose infusion rate beyond the intended 4-hour time, without decreasing to the lower maintenance rate, is a known concern for adverse drug safety events and potential patient harm.

ISMP Canada called for collaboration across Canada to develop a consistent approach for the treatment of acetaminophen toxic ingestion. Manitoba continues to determine a pathway towards a standard acetylcysteine dosing protocol.

Assessment

The greatest risk to patient safety is at points of transfer of care and between facilities, where different acetylcysteine dosing protocols are used based on recommendations from Poison Control consultation services and hospital protocols. There is also higher risk when pump programming drug libraries are not customized to the dosing protocol ordered.

Confusion may also arise when healthcare providers work at different sites that follow different consultation pathways and/or dosing protocols.

Work is ongoing to standardize acetylcysteine treatment in Manitoba. Until standardization occurs, teams must remain aware of patient safety risks.

Variations in Intravenous Acetylcysteine Protocols can Lead to Infusion Errors and Serious Harm

RECOMMENDATIONS - Identified in consultation with Pharmacy and Medical Leadership

Use clear documentation (order writing, MARs, chart notes, etc.) and communication to confirm mutual understanding of the patient care plan at points of transition in care.

1.) Do not write or activate an order written as “per acetylcysteine / NAC Protocol”. Orders must include weight-based dosing, the separate steps of the dosing protocol being used and time frames for duration of infusions.
2.) Transcribe each step of the dosing protocol onto the MAR.
3.) Ensure clear, consistent resources are available for staff on acetylcysteine dosing protocols, including order sets and parenteral drug monographs.
Monitor patients for signs and symptoms of acetylcysteine toxicity, hyponatremia and/or fluid overload.
4.) **Clearly communicate the acetylcysteine dosing protocol that is being followed at transitions of care (change of shift, staff breaks, transfers between units or facilities)**. Communication must include which step and dose of the protocol the patient is currently receiving, the dose(s) ordered, and next steps of treatment.
5.) Complete independent double checks for dose, dose preparation and pump programming, per high alert medication policy.
6.) Partner with patient/family – share the steps and timelines of the dosing protocol being used. Share the signs and symptoms of concern and encourage them to alert the healthcare team of any concerns.

Acetylcysteine Infusion Toxicity	Patient Impact
▪ Toxic dose of acetylcysteine as a result of too much drug administered too quickly	▪ Cerebrotoxicity, hemolytic uremic syndrome, anaphylactoid reactions, vomiting, seizures, cerebral edema, and/or death
▪ Intravenous fluid overload and/or hyponatremia as a result of incorrect mixing and/or administration of acetylcysteine infusion(s)	▪ Variable depending on weight and comorbidities, especially concerning for pediatric patients ▪ Hyponatremia - symptoms are similar to those described above

Thank you for your attention to this safety matter. Please reach out to your clinical practice leads (e.g., nurse educator) and your pharmacy team members with any questions or suggestions.