

Intravenous Acetaminophen Usage among Surgical Patients: A Patient Safety Initiative

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1 Background

On November 2, 2010, the FDA approved IV Acetaminophen for relief of pain and/or fever after surgery. The use of Intravenous Acetaminophen reduces the need for opioid consumption and is becoming a popular multimodal approach to decrease post-operative pain. By decreasing opioid consumption, IV Acetaminophen reduces the risk of adverse effects from opioid use including the possibilities for constipation, nausea, vomiting, sedation, and respiratory depression. IV Acetaminophen is systemic and evidence suggests it has a more rapid onset due to earlier and greater cerebrospinal fluid penetration than both oral and rectal Acetaminophen. (Golembiewski, J., & Mueller, 2011)

The max dose for Intravenous Acetaminophen in adults is 4,000mg/24 hours and 75mg/kg in 24 hours for children and adults less than 50kg. Administration of IV acetaminophen in doses higher than recommended may result in hepatic injury. The maximum recommended daily dose of acetaminophen includes all routes of acetaminophen administration and all acetaminophen-containing products administered, including combination products. Dosing errors could result in accidental overdose and increase chances of hepatotoxicity. (The Official Site of OFIRMEV, 2014)

Age group	Dose given every 4 hours	Dose given every 6 hours	Maximum single dose	Maximum total daily dose of acetaminophen (by all routes)
Adults and adolescents (13 years old and older) weighing ≥50 kg	650 mg	1000 mg	1000 mg	4000 mg in 24 hours
Adults and adolescents (13 years old and older) weighing <50 kg	12.5 mg/kg	15 mg/kg	15 mg/kg (up to 750 mg)	75 mg/kg in 24 hours (up to 3750 mg)
Children 2 to 12 years of age				

With the use of IV Acetaminophen becoming a relatively new standard of practice for managing post-operative pain, we investigated its use within Johns Hopkins Hospital. The focus of the investigation was on dosing appropriateness – specifically, total dose (all routes) per 24 hours, and conversion to enteral dosing when tolerating oral/enteral diet.

There are many aspects within the hospital that may contribute to medication errors including communication, systems flaw, handoffs between units and providers, and nurse's critical thinking skills when administering medication. An organized and thoughtful approach when it comes to patient handoffs is crucial in decreasing the chances of a medication overdose.

"A handoff or handover is the transfer of responsibility for care from one healthcare professional to another" (Ray, 2009). To facilitate safe transport of patients, handoff tools have been developed to convey important patient information that could be overlooked including labs, medications and status. The content of a handoff tool can also address communication gaps between providers.

2 Methods

Design

A retrospective chart review of surgical patients prescribed intravenous acetaminophen between January, 2013 and April, 2014. Data points included type of surgery; date, time, and route of all enteral/intravenous acetaminophen dosing; and order details including route, dose frequency and duration, and ordering provider.

A literature review regarding handoff techniques was conducted to identify common sources of medication and handoff errors.

Setting

A Northeastern tertiary academic medical center with 1000 beds.

Sample

Patients admitted to the Department of Surgery between January, 2013 and April, 2014 who were prescribed intravenous acetaminophen.

3 Preliminary Results

Over 17,000 orders were placed during the study period, and over 46,000 enteral or parenteral acetaminophen doses were recorded as "given" over the course of 6000+ patient admissions. Preliminary review of the data reveals a small percentage of patients receiving more than 4,000 milligrams of acetaminophen in 24 hours. As data has not yet been completely validated, overdose frequency and amount are yet to be determined.

As we work through the process of validating data and reviewing cases, we have identified system and human factors that may contribute to the dosing errors. These include 1) concurrent orders for parenteral and enteral acetaminophen dosing, and as they are separate orders, no "gray out" on the eMAR to alert to recent dosing by the alternate form; 2) default times for dosing "every 6 hours" varies between ICU and floor units, leading to administration sooner than allotted dosing interval; 3) pharmacy systems allowing release of additional IV doses, and 4) nursing handoff within and between units without notice of "last dose" administration.

As of now, data collection does not yet allow for evaluation of whether there is appropriate and/or timely conversion from IV to enteral dosing.

4 Preliminary Conclusions

Possible medication errors we are identifying are likely due to a mix of system and human factors. System factors may be a challenge to correct, as they require the support of multiple groups and resources to make a single change. Human factors may be addressed more easily, and can be focused on increasing awareness and communication. Suggestions include:

- Education re: checking for documentation of dosing by any available form before giving a medication, especially one that has a frequency or total dose/day limitation

- Develop a standardized tool for patient handoff between staff within and between units
- Further training on the prevalence of medication errors and contributing factors

System-based safety concerns to be addressed include the lack of cross-warning for nursing between enteral and parenteral dosing time frames, and the release of five IV doses for an order that should only allow four doses.

5 Future Directions

By identifying the contributing factors leading to medication overdosing, particularly with IV and enteral acetaminophen, we can prevent the problem from happening in the future with other medications.

This continued study will not only bring to light the system which fails to recognize overdosing, but also recognize where improvements need to be implemented within the units. Staff education regarding overdosing will be beneficial for the hospital's culture and set new standards to provide quality and safe patient care.

6 References

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