Smarter Dosing, Safer Practice: Optimizing Hydromorphone Injection Use at Humber River Health

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Humber River Health

Background

Hydromorphone is a semi-synthetic opioid used in the management of moderate to severe acute pain. Due to the unavailability of a lower concentration, Humber River Health (HRH) historically utilized hydromorphone 2 mg/mL injection, despite internal data indicating that up to 97% of administered doses were 1mg or less. To better align with actual dosing patterns, HRH introduced the 1 mg/mL formulation in November 2024.

One Day Audit of Daily Hydromorphone Doses Administered
Total Orders: 158

- Total Doses Greater Than 1mg Administered
- Total Doses Equal to 1mg Administered
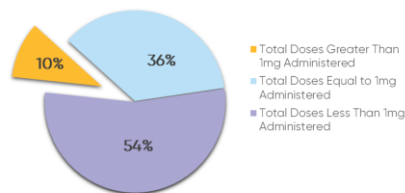- Total Doses Less Than 1mg Administered

Figure 1: One day pre-implementation audit was conducted highlighting opportunities where a hydromorphone 1mg/mL formulation could have been used.
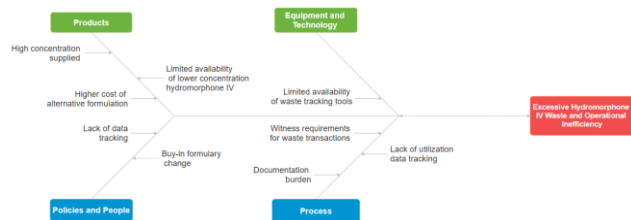

Figure 2: Fishbone diagram visualizing the multitude of factors that led to excessive hydromorphone IV waste and operational inefficiency.

Aim

To reduce hydromorphone injectable waste by 50% and waste transactions by 30% by May 2025.

Family of Measures

Outcome
Total hydromorphone injectable waste (mg) over two 6-month periods: a pre-implementation phase (Dec 2023–May 2024) and post-implementation phase (Dec 2024–May 2025).

Process
Number of waste transactions per 1,000 doses dispensed over two 6-month periods: a pre-implementation phase (Dec 2023–May 2024) and post-implementation phase (Dec 2024–May 2025).

Balancing
Cost of hydromorphone injectable administered, over two 6-month periods: a pre-implementation phase (Dec 2023–May 2024) and post-implementation phase (Dec 2024–May 2025).

Implementation of Change Concepts

PDSA Cycle 1: Analysis of Baseline Data
- An automated dispensing unit (Omnicell) transaction report and Meditech orders report was run for all hydromorphone 2mg/mL injectable orders and transactions.
- Opportunity noted given mismatch in orders and medication supplied format.

PDSA Cycle 2: Formulary Update
- Added hydromorphone 1mg/mL injection with structured implementation tracking and sign-off from stakeholders: including stepwise min/max purchasing adjustment, EMR item build and testing, and physical space assessment in each Omnicell.

PDSA Cycle 3: Meditech Enhancements
- Updated order sets with integrated Clinical Decision Support (CDS) text.
- Usability testing, it was noted that default route for the new injection was epidural. This was changed to IV.

PDSA Cycle 4: Targeted Education Sessions for Staff
- SBAR email sent to physicians, in-person education delivered to nurses and pharmacists.

PDSA Cycle 5: Audit
- Two-week daily audit of inpatient hydromorphone injectable orders using Meditech reports.
- Review and prospective order verification feedback provided to inpatient pharmacist regarding the product format chosen.
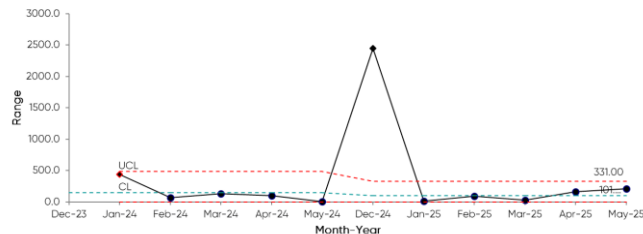- Feedback provided on 19/82 orders.
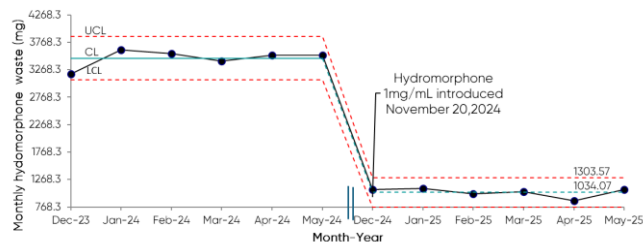
Figure 3: Control chart analysis indicated a 70% drop in cumulative wastage. *Note: the outlier on the mR-chart is a result of implementation efforts in December 2024.*

Impact/Results

Waste Reduction
Cumulative hydromorphone injection waste dropped from 20,872.75 mg to 6,402.40 mg over six months– a 70% reduction (14,470.35 mg).

Operational Efficiency
Waste transactions fell from 643 to 328 per 1,000 doses dispensed– a 49% decrease.

Slightly Higher Costs
Hydromorphone 2mg/ml unit costs $1.09 vs. hydromorphone 1mg/ml unit costs $1.35, resulting in total costs of $32,102.34 before and $40,741.22 after.
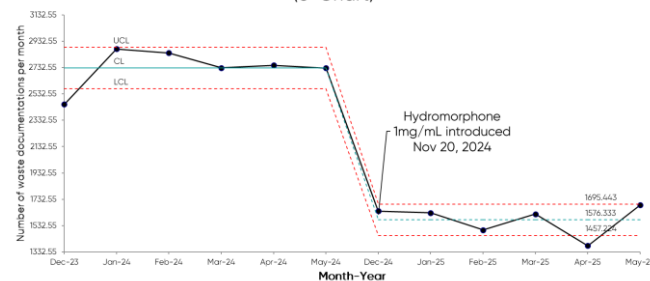

Figure 4: Control chart analysis indicated a 49% drop in transactions, potentially indicating improved workload efficiencies.

Discussion

As per standard hospital practice, a pre-emptive email communication to stakeholders regarding the change was disseminated. The 1 mg/mL format was successfully implemented, but adoption was initially inconsistent. To address this, a two-week daily audit was conducted post-implementation to monitor prescribing practices and encourage correct format selection. Tailored education sessions for pharmacists, pharmacy technicians, and nursing educators continued throughout the audit period to support consistent practice. System-level supports, including forcing functions and CDS tools in Meditech, reinforced compliance.

Reducing hydromorphone waste and removing excess drug from clinical areas potentially improved safety and enhanced nursing workflow by reducing waste documentation and witness coordination. Future analysis will assess workload impacts and cost management.

This structured approach provides a model for other opioid stewardship initiatives focused on patient safety and resource optimization.

References

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