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Smart Infusion Pumps and Clinical Data: Evaluating Medication Errors to Improve Patient Safety

Seojeong Kim PharmD Candidate[1], Michelle Sullivan[2], Rhona Sloss[2], Monica Miller[1], Ellen Schellhase PharmD, FCCP[1]

[1]Purdue University College of Pharmacy,

[2]Departments of Critical Care and Pharmacy, St Bartholomew's Hospital

INTRODUCTION & AIM

Although smart infusion pumps were developed to reduce administration errors compared to traditional infusion devices by incorporating dose error reduction systems and drug libraries, the errors persist. A comprehensive catalog of 18 distinct error types has been identified in the literature.[1] This study was done as a quality improvement initiative at a large cardiology-specialized hospital, undertaken to identify opportunities for safer medication administration practices.

METHOD

A retrospective data review was conducted using incident reports related to infusion pump errors recorded between 2021 and 2025. A total of 69 individual medication errors were analyzed. Each incident was evaluated according to the level of harm associated with the event, categorized as follows: No harm; Low harm – required additional observation or minor treatment; Moderate harm – caused significant but not permanent harm; Severe harm or death – resulted in permanent harm or death. Medication errors were categorized by type, and the medications most frequently implicated were identified

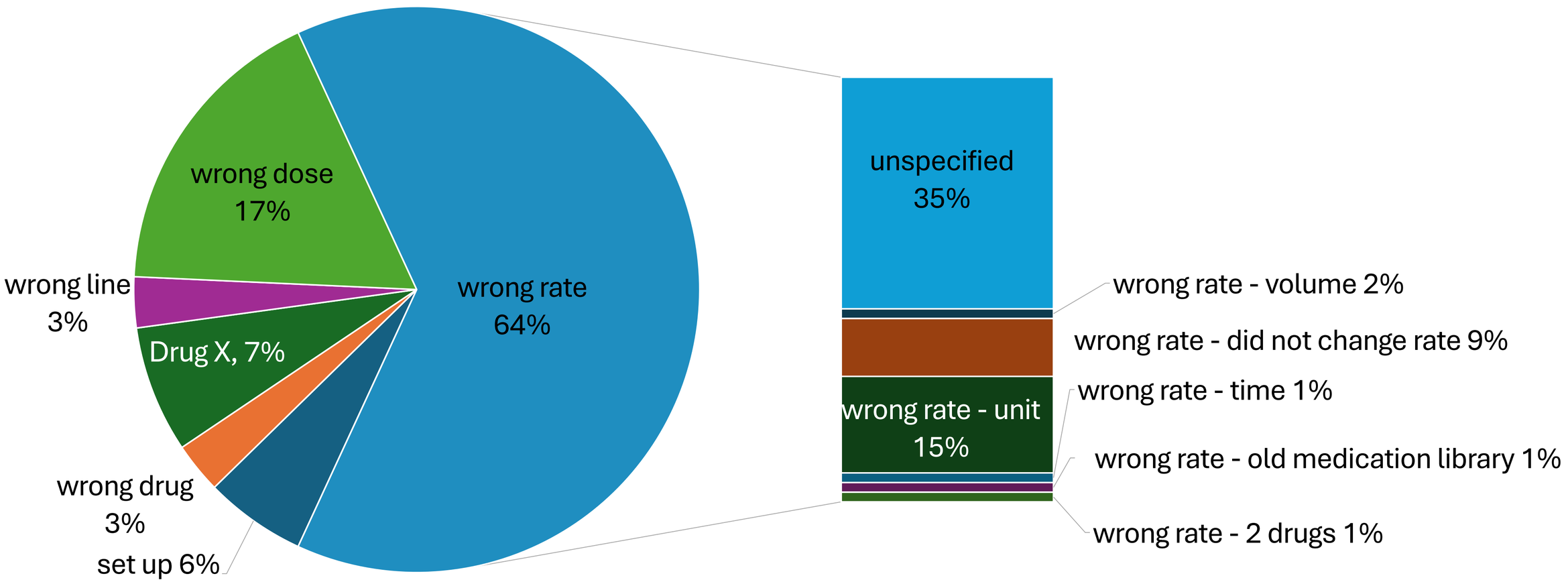
CONCLUSION

No harm	Low harm	Moderate harm	Severe harm
59	4	6	0

Table 1. Harm Classification by Severity

Furosemide	Noradrenaline	Amiodarone	Heparin
14	7	6	5

Table 2. Top Medications in Errors



Graph 1. Distribution of medication error categories

Drug X: bypass of the drug library during medication selection
Set up: Errors occurring while physically preparing the infusion by staff, unrelated to the line selection or the device failure
2 drugs: Two-drug error in which infusion rates were inadvertently interchanged between medications

RESULTS & DISCUSSION

While these findings highlight important trends, the data are insufficient to support definitive quantitative conclusions. This underscores the multifaceted and highly contextual nature of these incidents.

FUTURE WORK

Future studies should prospectively evaluate interventions targeting human error, including education, workflow optimization, and strategies to reduce selection and calculation errors during pump use.

REFERENCES

1. Kirkendall ES, Timmons K, Huth H, Walsh K, Melton K. Human-Based Errors Involving Smart Infusion Pumps: A Catalog of Error Types and Prevention Strategies. Drug Saf. 2020;43(11):1073-1087. doi:10.1007/s40264-020-00986-5