



IV drug errors

Incredibly common and costly

The Institute of Medicine (IOM) of the National Academies Committee on Identifying and Preventing Medication Errors estimated that at least 1.5 million preventable Adverse Drug Events (ADEs) occur each year in the United States ¹. Medication errors alone, occurring either in or out of the hospital, are estimated to account for 7,000 deaths annually ⁹.

"Five rights" (5Rs) of medication administration

- right drug
- right dose
- right time
- right route
- right patient

Patients who suffered unintended drug events remained in the hospital an average of 8 to 12 days longer than patients who did not experience such mistakes. These added days mean their hospital stays cost \$16,000 to \$24,000 more (in pre-2000 dollars) ¹⁰. The IOM Committee estimated that ADEs accounted for \$3.5 billion (in 2006 dollars) of additional costs to hospitals using a rate of 400,000 ADEs per year in hospitalized patients.

An estimated 90% of patients receive an infusion while hospitalized ⁶. Many of the highest risk medications (heparin, insulin, morphine, etc.) are delivered by IV infusion. IV infusion is associated with 54% of potential adverse drug events, 56% of medication errors, and 61% of the serious and life-threatening errors. Fifty eight percent of IV errors happen during drug administration ¹².

IV drug error rates are high

A systematic review and meta-analysis of nine published studies indicated the overall probability of making at least one error in intravenous therapy was 73% ⁷. The probability of an error in preparation was 43% with reconstitution of drug and diluent the single highest step introducing error (31%). The probability of an administration error was 61%.

2010 Meta-analysis of 9 studies

Probability of error in IV preparation = 43%
Probability of error in IV administration = 61%

An observational study in a structured, nonclinical environment revealed qualified health care professionals made concentration errors in 34.7% of morphine infusion preparations ⁸. In one 8-hour assessment at a major teaching hospital, 67% of the IV infusions had one or more errors ⁶. A study of 4,200 charts in Massachusetts community hospitals revealed a 10.4% ADE rate, equating to one ADE per 10 inpatients ³.

Safety equipment has issues

In a 2002 controlled trial of smart pumps ¹¹, intravenous medication errors and adverse drug events were frequent and some could be detected using smart pumps. Since the serious medication error rate was 2.03 per 100 patient-pump-days during the control period and 2.41 during the intervention period, when smart pumps' decision support functions were in use, the authors concluded there was no measurable impact on the

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serious medication error rate. They also pointed out several limitations including poor compliance with the drug library which was bypassed 24% of the time.

Infusion devices account for up to 35% of all medication errors that result in significant harm (Class 4 and 5). The most common errors are manually programming incorrect infusion parameters, failure to ensure the right patient receives the right medication, and tampering of infusion parameters by unauthorized users⁵. The FDA received 56,000 reports of infusion pump incidents, including 710 deaths, and issued 87 infusion pump recalls between 2005 and 2009⁴. Hospitals spend as much as \$500,000 per hospital per year just on servicing infusion pumps. Clinicians override 90% of pump alerts.

FDA issues with infusion pumps

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- 87 recalls