



Economic Impact of Smart Infusion Pump Interoperability

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BACKGROUND

- Medication errors, adverse drug events (ADEs), and preventable ADEs (pADEs) are prevalent occurrences in hospitals and most commonly occur for intravenous (IV) medications.^{1,2}
- Manual infusion smart pumps are commonly used to administer intravenous (IV)-drugs in inpatient hospital settings but may be associated with medication administration errors leading to pADEs and patient harm.³
- Smart infusion pumps also may result in a loss of outpatient infusion administration charge capture due to inaccurate manual documentation.⁴
- The introduction of smart infusion pump interoperability with electronic health records (HER) has shown evidence of reducing medication administration errors while improving outpatient infusion administration charge capture.

OBJECTIVE

- To estimate the economic impact of implementing smart infusion pump interoperability to EHRs for a hypothetical health-system in the United States.

METHODS

Study Design

- An economic model was developed to assess the financial impact of implementing smart infusion pump interoperability for a health-system.
- A 5-year time-horizon was used in the model, with results also presented annually.

Population

- All costs and charges were adjusted to 2024 U.S. dollars.⁵
- The hypothetical health-system in the model consists of six hospitals with 1,500-beds and 35,000-annual admissions.

Patient Safety

- The incidence of pADEs were set at 0.59 per 100 inpatient admissions, with 54% being from infusions.^{6,7}
- The incremental cost of pADEs was estimated at \$9,471.⁸⁻¹¹
- Interoperability was estimated to reduce pADEs incidence by 35.1%.¹²

Outpatient Administration Charge Capture

- The annual outpatient administration charges were derived from pre-post retrospective study and standardized to the number of beds at the hospital in the study, using a per-bed cost of \$35,847.⁴
- Multiplying this value by the 1,500 beds in the hypothetical health-system resulted in annual total outpatient administration charges of \$53,770,500.⁴
- Baseline rates of lost charges pre-interoperability was found to be 11.9% of expected charges.⁴
- Interoperability was found to reduce lost charges by 37.8%.⁴

RESULTS

FIGURE 1: Patient Safety Domain of the Economic Model

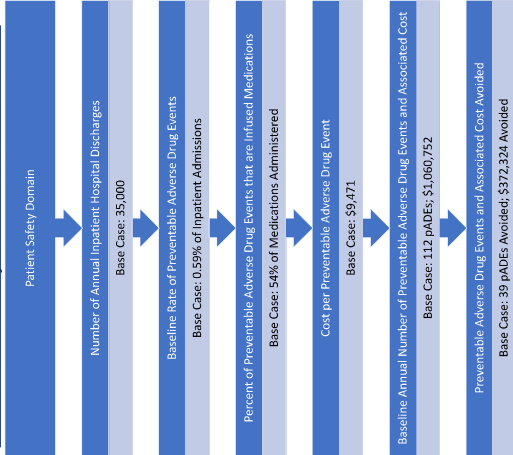


TABLE 1: Patient Safety & Charge Capture Results

Cost Savings/Recouped Charges Results	
Patient Safety	
Number of Annual pADEs Avoided	39
5-Year Number of pADEs Avoided	196
Annual Cost Savings	\$372,324
5-Year Cost Savings	\$1,861,620
Charge Capture	
Annual Outpatient Infusion Administration Charges Recouped	\$2,419,673
5-Year Outpatient Infusion Administration Charges Recouped	\$12,098,365

FIGURE 2: Charge Capture Domain of the Economic Model

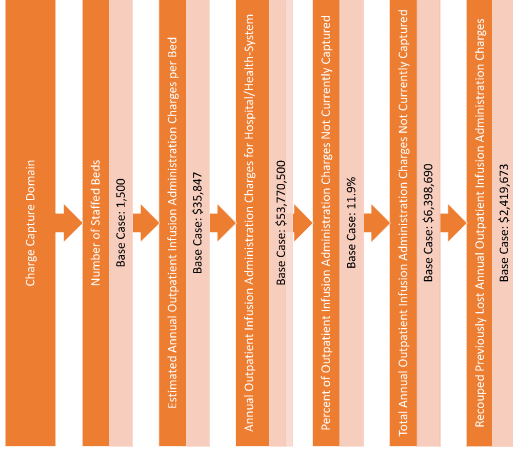
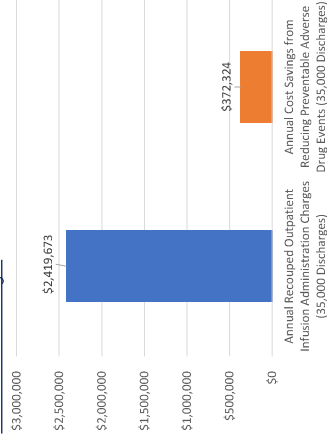


FIGURE 3: Annual Cost Savings from Reduced Preventable Adverse Drug Events & Recouped Outpatient Infusion Administration Charges



DISCUSSION

- This economic analysis demonstrates the financial benefits of implementing smart infusion pump interoperability to EHRs in a hypothetical U.S. health-system.
- One aspect not included in the economic model due to data limitation is the potential workflow and operational efficiency of interoperability.
- An important contextual consideration in the outpatient infusion administration charge capture assessment is that the outcome measures charges, not actual costs or revenue.
 - Health-systems utilizing this economic model can apply their specific cost-to-charge ratio for outpatient administration charges to the charges recouped in this analysis to identify what their true revenue would be.
- Another consideration is that this model does not include investment costs, requiring readers to weigh the estimated cost savings against the actual cost of implementation.

CONCLUSION

- Implementing bidirectional smart infusion pump interoperability may lead to improved patient safety through reducing pADEs and improved outpatient administration charge capture.
- Health-systems should consider the safety and economic implications of smart infusion pump interoperability when deciding whether to invest in this technology.

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