Medication Safety: Smart Infusion Pumps

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Question
What is the best available evidence regarding the use of smart infusion pumps for intravenous medication administration?

Clinical Bottom Line
Smart infusion pumps are designed for intravenous (IV) medication administration. These devices are equipped with a database of intravenous medications (drug library) and software that includes inbuilt safety features designed to minimize IV medication dose errors.¹,²

• In 2009, the Institute for Safe Medication Practices (ISMP) published guidelines on the safe implementation and use of smart infusion pumps. These guidelines include a wide range of recommendations covering aspects such as implementation planning, staff education, rollout of devices, establishment of the medication library, policy development, and use of information collected by smart pumps.³ (Level 5)
• A systematic review evaluated the impact of smart infusion pumps on medication error rates and assessed both the benefits and negative effects of smart pumps.⁴ (Level 1)
  • The reviewers concluded that smart pumps reduce pump programming errors but do not eliminate them.
  • Benefits of using smart pumps included intercepting pump setting errors, reduction of adverse drug event rates, practice improvements, and cost effectiveness.
  • Negatives associated with smart pump use included low compliance rates of using the pumps, overriding of soft alerts, non-intercepted errors, or possibility of using the wrong drug library.
  • The reviewers identified opportunities for improvement of smart pumps including upgrading drug libraries, developing standardized drug libraries, decreasing the number of unnecessary warnings, and developing stronger approaches to minimize workarounds.
  • The reviewers also highlighted the importance of continuous quality improvement processes to improve smart pump use.
A multi-site observational study investigated the types and frequency of medication errors associated with smart infusion pumps.\(^5\) (Level 3)

- Despite the use of smart pumps, the study found a high error rate in administration of IV medication, with 60% of infusions having one or more errors associated with their administration.
- The most frequent errors related to use of unauthorized medication, bypassing the smart pump, and incorrect rate of administration, however, the majority of errors were classified as having relatively low potential for harm. Only 0.4% of errors were categorized as more serious errors.
- Many of the observed errors were violations of hospital policy, some not directly related to the use of smart pumps.

Characteristics of the Evidence

This evidence summary is based on a structured search of the literature and selected evidence-based health care databases. The evidence in this summary comes from:

- Literature reviews.\(^1,2\)
- Clinical practice guidelines.\(^3\)
- A systematic review including 22 studies, one of which was a randomized controlled trial (RCT).\(^4\)
- A multi-site observational study conducted in 10 hospitals in the USA, including a total of 478 patients and 1,164 medication administrations.\(^5\)

Best Practice Recommendations

- Smart infusion pumps may be recommended to reduce IV medication dose errors. (Grade B)
- Effective implementation of smart infusion pumps requires the development of policies and procedures around their use. (Grade A)
- Continuous quality improvement processes are recommended to improve smart infusion pump use. (Grade A)

References

2. Franklin BD. ‘Smart’ intravenous pumps: how smart are they? BMJ Qual Saf. 2016. (Level 5)