AAMI FOUNDATION HTSI
Healthcare Technology Safety Institute

Safety Innovations

Best Practice Recommendations for Infusion Pump-Information Network Integration

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About the Healthcare Technology Safety Institute (HTSI)

Founded within the AAMI Foundation, the 501(c)(3) charitable arm of AAMI, the HTSI is a community of leaders throughout the healthcare system that are dedicated to one common vision, "No patient will be harmed by healthcare technology."

HTSI's mission is "To engage the entire healthcare community in multi-disciplinary safety initiatives that strengthen the development, management, and use of healthcare technology for improved patient outcomes." HTSI engages the healthcare community in research, education, consensus, and partnerships related to the challenges facing healthcare technology industries, regulatory and accrediting bodies, clinicians, caregivers, and patients.

Best Practice Recommendations For Infusion Pump-Information Network Integration

Introduction

Closed-loop medication administration with infusion devices is being driven by the healthcare community in order to improve patient safety and to meet electronic health record (EHR) goals under the Meaningful Use provisions of the ARRA-HITECH act. Therefore, hospitals are exploring the following infusion pump functionalities that not only can reduce errors thus improving safety, but also reduce manual data entry:

- Auto-programming, in which orders are sent to the pump to be confirmed by a nurse before starting infusions
- Auto-verification, in which a nurse manually programs the infusion pump and then the programming is checked against a medication order
- Auto-documentation, in which pump programming, status, and alerts are automatically fed into the patient's electronic medication record for confirmation
- EHR alerting systems that bring together diverse patient information and pump data to generate combinational alerts in near real time

Although these integrative processes and functionalities facilitate accurate, timely, and complete charting of medication infusions, only a handful of healthcare facilities in the United States have adopted one or more of them. Why is integration of pumps with electronic/information systems so slow to take off? In this paper, authors provide current barriers to closed-loop medication administration and offer best practices from some of the early adopters.

The Must-Haves and Must-Dos for Pump Integration:

Infusion pump integration rests on five specific infrastructure requirements, which must be in place before a facility can move forward with any integration plans:

1. Reliable, pervasive, and secure wireless connectivity;
2. Electronic medication orders containing all infusion parameters;
3. High compliance with bedside barcode scanning for medication administration;
4. Electronic repositories for administration data; and
5. A highly reliable method of associating a pump channel with a patient and a medication.

Today's infusion pumps typically use wireless communication with a pump server or gateway. Wireless networks need to be pervasive, highly reliable, and offer adequate security protection and many facilities are often not ready to provide this level of wireless coverage. Some facilities (e.g. Veterans' Administration) need to comply with FIPS requirements for wireless

One of the strategic decisions hospitals have to make when integrating infusion pumps to the network is whether or not the available technology meets the organization's requirements for information security.

Food for Thought

The long life of infusion pumps, 7 to 10 years, reduces the window for the adoption of pump integration. Generally, the ability to implement integration is only available in the latest pumps. The opportunity to accomplish integration, therefore, must be planned as part of the budgeting process for new pumps and EHR software.

It would be wise to buy integration-capable pumps even if you are not ready to integrate. If you don't, you could wait a long time before you can integrate your pumps with your data or information network(s).

security, which require support from the facility, pump supplier, and router/server suppliers. One approach to addressing security concerns is for patient specific information to be documented and contained "outside" the pump (i.e., at the pump server or EHR level). If the pump does not contain a patient ID, medication order number, or other patient identifying data but only receives programming information, sends delivery information, serial number, and channel, the data transmission between the pump and its server may not comply with FIPS requirements.

Pump integration requires pervasive, reliable, and secure wireless coverage—if pumps can't communicate with the server via a wireless network, no integration can occur. However, facilities vary widely in wireless coverage and signal strength, and facilities need to make sure their systems can still function during times when the pump is out of communication or the pump server is unavailable. Infusion pumps typically have cache-and-forward capabilities to prevent data loss, with sufficient memory to store pump information until the pump can re-connect. Additionally, most wireless pumps have notification capabilities when communications between the pump and the server are lost. These notifications can be in the form of a visible icon on the pump showing that data transmission was interrupted or as a message directly from the server indicating interruption.

Although a "gold standard" approach to wireless integration would include assessment of coverage and potential interference at all bed locations, this may not be feasible for all facilities. One rough method of quickly assessing wireless coverage is through the support and use of voice over internet protocol (VOIP) communication devices. If patient care areas in the facility have been shown to offer adequate coverage and uptime for VOIP use, it is likely that they will offer sufficient support for infusion pump integration. Even after a wireless environment is made ready for networked pumps, facilities need to monitor their networks for "jamming" or other malicious activity that could prevent pervasive and

timely wireless transmission, and also routinely assess the impact that pump "traffic" itself is having on the network.

Along with adequate wireless coverage, facilities need prompt and seamless support from EHR and pump suppliers, especially when it comes to troubleshooting and site-specific customization during and after implementation. While pump suppliers generally view medical device integration (MDI) as a business driver (and therefore worthy of the time and effort necessary for a successful implementation), the story can be quite different when it comes to EHR suppliers. Be aware that many suppliers prioritize MDI far behind other initiatives like ancillary site support or public health reporting.

What Can a Healthcare Facility Do Now to Get Ready for Infusion Pump Integration?

First, establish correct and consistent use of both bedside barcoding [e.g., barcode enabled point of care (BPOC) or bar code medication administration, (BCMA)] and electronic IV medication orders that hold all pieces of data required for an infusion to begin. Although Computerized Provider Order Entry (CPOE) is certainly a path to electronic IV medication orders, a facility does not necessarily need to have CPOE in play to integrate infusion pumps into the EHR. However, a facility must have some type of electronic IV medication order available for entry into the system. For example, electronic orders can either be created through CPOE or through a pharmacist entering an electronic order after verifying a non-electronic order from a physician. Until BPOC/BCMA and electronic IV medication orders (CPOE or other) are accomplished, do not attempt to integrate your pumps with your information network.

Next, establish executive support for integration and give a clear mandate for safety to a single individual who can serve as an integration champion. The integra

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tion champion must 'own' the CPOE, eMAR, BPOC, and any other order and documentation system and serve as a single point-person to all suppliers concerning medical device integration. The champion must have the authority (granted by the facility's decision makers, e.g., executives) and backing of the clinical users to carry out integration readiness efforts.

To support the integration champion, establish a standing department that is responsible for Medical Device Integration (MDI) and is led by the integration champion. An integration team should be established that consists of representatives such as nurses, physicians, pharmacists, clinical program managers, dieticians, medical informatics professionals, medical researchers, risk managers, HIM, quality improvement managers, IT managers, purchasers, and clinical engineers. The size and makeup of the team should be adjusted according to the integration project. Such a group should have the following duties:

1. Identifying devices that have information that is useful to clinicians
2. Setting clinical priorities for integration
3. Overseeing design and development, making sure that the integration of pump devices into documentation and alerting systems meets the requirements of all care areas using pumps
4. Budgeting for development and equipment purchases
5. Purchasing specifications and assistance for new devices
6. Installing new or updated software to support device integration
7. Ensuring ongoing maintenance for installed device integration systems and collecting and analyzing data on the efficiency of installed systems.

After BPOC/CPOE, a champion with a mandate, and a team of support have been achieved, then proceed with readying your devices and systems.

RECOMMENDATIONS

Regardless of whether a facility is selecting new suppliers or attempting integration with existing suppliers, the following steps should be taken.

1. Device readiness

- Purchasing authorities in your facility must buy the appropriate devices and interface equipment.
- Clinical Engineering and IT must be able to support the connected devices.
- Equipment management must be able to supply enough equipment to areas that use integration. It is confusing to have only some of the equipment (of the same type) capable of interface.
- Devices should be identified and labeled with a short 4 or 5 digit asset number (not the serial number) that is human readable (and rememberable) and scanable to facilitate ease of use during integration. The asset number should ideally be programmed into the device and is separate from the serial number. Clinical Engineering and Equipment Management are responsible for maintaining the labels.

2. Pharmacy readiness

- Move towards radical standardization on concentrations and formulations towards a goal of one or two concentrations that support "most" (98%) patients.
- Ensure that CPOE, pharmacy, pump drug libraries, and other related systems reflect this new formulary and establish a plan for updating all systems in response to formulary changes.

3. IT Infrastructure readiness

- Assess and upgrade wireless coverage in care areas and pump storage locations.
- Assess and upgrade database infrastructure.
- Assess server/client hardware and software requirements.

- Create an information security and privacy policy that you can send to suppliers whose devices or systems include protected health information.
- Determine wireless capabilities and identify potential interference sources.

4. Nursing readiness
- Study and describe current infusion administration workflows in various care areas. Keep these observations in a document that you share with pump and EHR suppliers.
- Develop use cases for pump integration that cover infusion pump use in all areas. Keep these observations in a document that you share with pump and EHR suppliers.
- Establish a plan for compliance monitoring over time.

5. EHR readiness
- BPOC system needs to be able to accept a scanned-in pumping channel during the "5 rights" bar code scanning process. This is the most efficient way for the EHR to link the patient, the IV medication and the pump, and will probably require an upgrade or update to the BPOC configuration and workflow.

- Pharmacy-verified electronic orders must be available to the BPOC system that includes pump programming parameters.
- The system has to be able to receive pump data from the pump server and integrate it into infusion charting and the patient record.

Conclusion

Although infusion pump and network integration has been slow in the U.S., it will likely remain a high priority for healthcare facilities to improve patient care and to comply with the Meaningful Use requirements. It was the intent of this white paper to outline the major steps to successful integration and to emphasize the need for pervasive and highly reliable secure wireless networks that offer adequate security protection, electronic medication orders containing all infusion parameters; high compliance with bedside barcode scanning for medication administration; electronic repositories for administration data; and a highly reliable method of associating a pump channel with a patient and a medication.

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