

Acute Care

ISMP Medication Safety Alert!®

Educating the Healthcare Community About Safe Medication Practices

Clinical experiences keeping infusion pumps outside the room for COVID-19 patients



Quite a few hospitals are using extension sets to position infusion pumps outside of COVID-19 patients' rooms (**Figure 1**) to conserve personal protective equipment (PPE) and reduce the frequency of exposure that nurses would ordinarily experience by going into patients' rooms to manage infusions. ISMP spoke to an intensive care unit (ICU) nurse at one hospital, and a pharmacist at another hospital, to learn more about their experiences with this practice. Both hospitals have been using this measure without major issues for about 2 weeks. A description of their experiences follows.

One hospital's experience

Vascular access. All patients with pumps in the hallway have a central line; midline or peripherally inserted central catheters are not being used. The nurse noted that peripheral intravenous (IV) lines may not work well due to flow rate issues.

Pump set-up. "Small bore" extension tubing is attached to the pump's primary administration set and run under the door. The hospital investigated using regular (macro-bore) extension sets with a larger inner diameter since the increased volume in the tubing may allow infusions to flow better. However, the macro-bore tubing did not fit as well under the door. Also, with the "small bore" extension tubing, there is less volume in the tubing between the infusion and patient. Thus, the solution from small-volume infusions appears to reach the patient more quickly, although resistance to flow is possible with very high infusion rates. (See the ECRI publication mentioned on page 3 for more information about tubing of different lengths and inner diameters.)

Three "small bore" extension sets totaling about 15 feet in length are added to the primary pump tubing to reach from the pump in the hallway to the patient. In some hospitals, a triport connector is attached to tubing for patients with more than one medication infusion. At this hospital, Y-site connectors are used, much as they would be with

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Figure 1. Pumps lined up outside patient rooms in a hospital ICU (March 2020).

COVID-19 Collaboration



Pharmacist order verification tips

When verifying medication orders, hospitals have suggested that pharmacists can help in the efforts to reduce the frequency of staff entering patient rooms and/or limit the time spent in the room, thus conserving personal protective equipment (PPE) and reducing staff exposure. By considering these strategies during order verification, pharmacists can also conserve medications, compounding materials, and administration sets that may be in short supply.

- **Consider recommending alternate methods of infusion (e.g., pumps without a drug library, manual flow-rate regulators, gravity infusions, burette drip chambers)** for plain intravenous (IV) fluids or IV medications that are not high-alert medications, if smart infusion pumps are in short supply.



If gravity infusions are required, see [page 4](#) for a **Table** that B. Braun has provided to help nurses count the number of drops of fluid needed for the required flow rate (mL/hour) using sets with varying drops per mL.

- **Switch patients from IV to oral medication** as soon as possible following your facility's IV to oral protocol.
- **Use IV push medication administration** when possible following your facility's IV push medication guidelines.
- **Coordinate and limit medication administration times** to minimize staff exposure and conserve PPE.
- **Review appropriate use of metered-dose inhalers (MDIs) or nebulizer therapy** based on the patient's COVID-19 status and your facility's MDI shortage guidance (and/or canister reassignment process, if applicable).

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secondary infusions, and all are covered with port protectors. Compatible medications can be run together, and up to three may be administered via the same line, including neuromuscular blocking agents, vasopressors, sedatives, and antibiotics. To prevent the risk of tripping on the tubing or potentially dislodging it, nurses secure disposable Chux pads over the tubing on the floor and at each connection, which serves as a visual reminder and protects the tubing. There are no Y-site connectors on the floor. Infusions are managed the same way in both positive- and negative-pressure patient rooms.

Site assessments and independent double checks. Each patient's IV site is checked every 2 hours when a nurse enters the room to reposition a patient. Nurses are still conducting parts of an independent double check for certain high-alert medications, requiring a second practitioner to verify the medication/solution, concentration/dose, and pump settings. While nurses still scan the barcode on a medication or solution for verification against the patient's medication administration record (MAR) on a workstation on wheels (WOW) outside the room, they are unable to scan the barcode on the patient's identification band. To work around this, a patient barcode is located outside the room for scanning. While recognizing this is not ideal, the hospital has carefully weighed the risk versus benefit and decided that this workaround is necessary at this time.

Responding to pump alarms. One unexpected result of locating pumps in the hallway is that pump alarm issues have been reduced. Nurses can easily hear and see when pumps are alarming in the hallway, making it easier to respond quickly and without entering the patient's room. In some hospitals with negative airflow units, white noise may make it difficult for nurses to hear pump alarms inside patient rooms, requiring high-volume settings. Having pumps in the hallway does not require such an adjustment.

Another hospital's experience

At another hospital, the process of positioning infusion pumps in the hallway is similar, but the doors and front walls of patient rooms are glass, and nurses perform a dual verification of the patient's barcoded identification band during initial set-up of the pump in the hallway. An isolation nurse inside the room scans the patient's identification band, which is verified through the glass wall by a nurse outside of the room. This nurse then prints a second barcoded identification band, verifies the band again with the isolation nurse in the room, and then attaches the second identification band securely around the IV pole for subsequent scanning outside of the room. Some hospitals also require the patient's name and date of birth on the pump to reduce the risk of making changes to the wrong pump or administering medications or solutions to the wrong patient.

Weighing the pros and cons

Many hospitals have considered using extension sets to locate pumps in the hallway to conserve PPE and reduce staff exposure, but have decided against it for various reasons.

Shortage of extension sets. As expected, the use of extension sets has skyrocketed. Product vendors could not have known that pumps would be moved to hallways and

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■ **Use alternatives for medications in short supply** following your facility's formulary guidance for alternatives during drug shortages.

■ **Review COVID-19 treatment closely**, as recommendations change often.

**Sterile water bags for ventilators**

Some organizations have reported that a 2 liter bag of sterile water for humidification hung on the articulated arm of a ventilator has caused the arm to break due to the weight of the bag. Similar concerns have been reported with smaller 1 liter bags. The ISMP *2020-2021 Targeted Medication Safety Best Practice for Hospitals* (www.ismp.org/node/160, #10) recommends avoiding use of 1 liter bags of sterile water (labeled for "injection," "irrigation," or "inhalation") outside the pharmacy because they look very similar to 1 liter bags of intravenous (IV) solutions. Instead, ISMP recommends using a 2 liter bag for humidification with ventilators to reduce the risk of mix-ups with IV bags and accidental IV administration of sterile water, which is likely to cause patient harm.

Ventilator arms, which are designed to support the lightweight circuit only, were never intended to hold sterile water bags (1 or 2 liter) used for humidification. The weight of the bags could pull on the circuit and the patient's airway, and easily break the arm. Many ventilators come with their own attached pole, which is sturdy enough to support a 2 liter bag; however, the pole may be an "add-on" purchase. Although less than ideal, others have hung the 2 liter bag on a separate IV pole, labeling both the sterile water bag and its tubing closest to the patient with a warning that notes, "For Respiratory Use Only." Hospitals using humidification systems that accommodate hard-sided sterile water bottles or use passive humidification systems (when appropriate), such as heat moisturizer exchangers (HMEs) and HMEs with filters, may not encounter this problem.

**Evaluate critical medication supplies**

As ever-increasing numbers of COVID-19 patients on ventilators require sedation, now is the time for currently unaffected hospitals

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that 3 or more extension sets would be needed to do this. We spoke with some vendors who told us that extension sets were either on backorder or allocated for previous customers. They have stepped up manufacturing to meet the demand, though, and some vendors are producing longer extension sets (e.g., 12 feet). Check with your pump vendor about availability.

If a decision is made to locate pumps in the hallway, ECRI notes that any brand of luer-lock extension tubing can be attached to a pump manufacturer's proprietary primary administration set. Also, manufacturers may offer long primary administration sets suitable for use. Check with the pump manufacturer for any additional pump-specific considerations, and conduct a small pilot test of the process before widescale use.

Other considerations. Examples of other issues to consider when deciding whether to locate pumps in the hallway include the following:

- Barcode scanning at the bedside may not be possible.
- Fewer trips into the patient's room will result in fewer opportunities to directly monitor and interact with the patient.
- Certain components of independent double checks will become more difficult or impossible in some situations.
- The length and inner diameter of long extension tubing can impact flow rates and the time medications and solutions take to reach a patient without flushing.
- Occlusion alarms may be delayed at low flow rates and become excessive at high flow rates.
- Inadvertent bolus doses may be administered when the tubing is flushed.
- Electrical cords and extension tubing can become a tripping hazard. (Some hospitals extend the tubing above or through the side of the door to keep it off the floor. One hospital made an airtight hole in the wall, with engineering staff oversight, to put tubing and equipment wires through to reduce the risk of tripping, disconnection, and power issues.)
- There may not be adequate outlets in the hallway to keep pumps charged.
- Pumps in the hallway should not be used for two patients in a single room.

Conclusion

Healthcare providers are experiencing an unprecedented time, where nearly every decision presents challenges and potential risks, from reusing PPE to administering some solutions and medications via gravity. And it's certainly not an easy decision regarding whether to position infusion pumps in the hallway. At the same time, this measure is working at some hospitals that have decided that the risk is worth the benefit. If you identify other strategies or risks associated with this measure, please send them to us so we can evaluate and circulate updated information and guidance.

ECRI Considerations for using infusion pumps outside of patient rooms

On April 1, ECRI published a special report, **Large-Volume Infusion Pumps—Considerations When Used with Long Extension Sets Outside Patient Rooms to Help Reduce Staff PPE Use** (www.ismp.org/ext/400), which provides expert technical advice regarding the use of long extension sets to position infusion pumps outside of patient rooms. The document explains the types of extension tubing available and provides guidance on selection, describing how each type may affect priming volume, flow rate accuracy, and downstream occlusion alarms. The document also describes the implications of this practice for various professionals. ECRI has tested several major, large-volume infusion pumps with 20 feet of microbore tubing. The performance has been acceptable with commonly used flow rates, but there are factors (e.g., fluid viscosity) described in the document to consider in certain conditions.

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to evaluate their supplies of critical care medications typically used for this purpose. Bainbridge Health, a company that analyzes medication data available from smart infusion pumps, has noticed a significant increase in the usage, sometimes 7-fold higher, of sedating medications. Product manufacturers are aware of the increased need for these medications and have increased production to meet the demand.

On a related note, we have learned that the US Drug Enforcement Administration (DEA) is now cooperating with manufacturers to increase the allocation of controlled medications to meet increasing demands during the COVID-19 pandemic.



From "common canister" to "canister reassignment"

Some organizations refer to the metered-dose inhaler (MDI) "common canister" protocol we wrote about last week as a "canister reassignment" protocol to differentiate it from past processes in which a respiratory therapist or nurse would reuse the canister from patient-to-patient after disinfection with an alcohol prep pad. Today, the protocol that some are considering due to a shortage of bronchodilator inhalers is different: the canister remains with a patient throughout his or her hospitalization and then undergoes a thorough, dual disinfection process and inspection before being re-dispensed to another patient for use during his or her entire hospitalization. We will refer to this process as "canister reassignment" going forward.

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GRAVITY FLOW RATE DRIP CHART

Flow Rate (mL/hr)	10 drops=1 mL (drops/min)	15 drops=1 mL (drops/min)	20 drops=1 mL (drops/min)	60 drops=1 mL (drops/min)
10	2	2	3	10
25	4	6	8	25
50	8	12	17	50
75	12	19	25	75
100	17	25	33	100
125	21	31	42	125
150	25	37	50	150
200	33	50	67	200
250	42	62	83	250
500	83	125	167	500
1,000	167	250	333	1,000

- Confirm tubing set drip rate on set package, i.e., 10, 15, 20, or 60 drops/mL
- Recommended that all gravity infusion bags be time taped for additional flow confirmation
- Alterations of bag height distance to patient will affect flow rate

