An Evidenced-Based Protocol for Eliminating Errors associated with Intravenous Medication Errors

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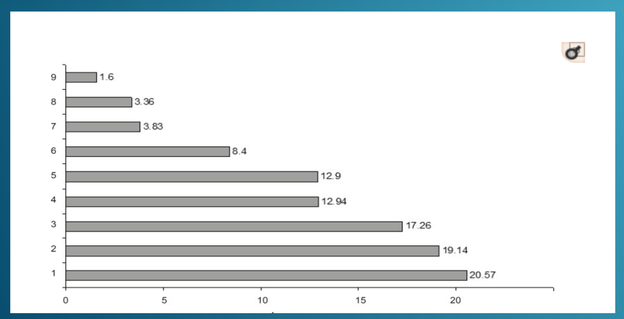
Objective

❖The main objective of this project is to develop an evidenced-based protocol for the preparation, administration, and monitoring of intravenous medications at a large urban teaching hospital.

Introduction

❖ While there is no concrete unanimous data regarding error rates with intravenous medications, research studies have shown that error rates on inpatient hospital units ranges from 44.8 percent (Ohashi, Dykes, Bates, McIntosh, Bates, Buckley, Wien, 2013) to 69.7 percent (Westbrook, Rob, Woods, Perry, 2017). Intravenous medication administration is one of the most common skills that nurses perform on a daily basis, with almost every patient on an inpatient unit receiving some form of intravenous medication. Although some of these medications may seem harmless, such as normal saline, they can all be fatal in certain situations. The WHO (2014) found that intravenous medication errors account for 85 percent of all fatalities that are caused by medication errors. These medication errors can have many causes, some being very basic, and some being more complex. Intravenous medication errors can have many different causes. Buckley, Bates, and Wien (2013) describes these errors being causes by one of many problems, such as, labeling errors, patient identification errors, pump handling or programming errors, missed dose errors or unauthorized medication errors. Nurses' perceptions of why medication errors occurred included physicians' medication orders are not clear, the names of many medications are similar, pharmacy did not label the medication correctly, poor communication, lack of staff to patient ratio, fatigue from hard work, nurses' heavy workload, and working night shift.

Intravenous Error Causes



1 – Wrong Infusion / Bolus Rate
2 – Not Disinfecting Vials / Tubing Outlets
3 – Not Wearing Gloves
4 – Not Monitoring For Reactions
5 – Using Wrong Diluents
6 – Using Wrong Amount of Diluent
7 – Incorrect Time
8 – Not Giving Whole Dose
9 – Incompatibility Error

Protocol

PROCEDURE 37-3 Administering an IV Solution

Equipment

Adding Solution to a Continuous Infusion Line
- Prepared IV solution and medication

Adding a Secondary Line, Additive Bag (IV Piggyback)
- Prepared and labeled medication solution bag from pharmacy
- Alcohol swab
- Secondary administration set
- Needleless locking cannula

Adding a Solution to an Existing Heparin or PI Lock
- Prepared IV solution system with needleless locking cannula
- Alcohol or iodophor swab
- Needleless injection cap (if one is not in place)
- 2 prefilled syringes of 2 ml each of normal saline
- Nonsterile gloves

Action	Rationale
1. Gather prepared equipment (solution labeled with the client's name, and time-taped for fluids to infuse per hour). Check the prescriber's order for the type and amount of solution.	1. Ensures correct fluids to be administered to the right client at the prescribed infusion rate.
2. Wash hands, and don gloves if you have to perform a venipuncture or connect the tubing to an existing PI. *Gloves are not necessary if you are adding fluids to an existing infusion line.*	2. Decreases risk of transmission of microorganisms.

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PROCEDURE 37-3 Administering an IV Solution (continued)

Action	Rationale
3. Check the client's armband.	3. Ensures correct client.
4. Explain the procedure to the client.	4. Elicits client support and decreases anxiety.
5. Assess the puncture site. • Observe for redness and puffiness. • Palpate for tenderness.	5. Indicates signs of infiltration or infection.
6. Check patency of infusion site. • Verify that fluid is infusing. • Remove IV container from the pole and lower the container below the level of infusion site. • Observe for backflow of blood into the hub of the venous access device. • Replace container on IV pole.	6. Verifies patency of IV system with venous access device in the client's vein.
Adding Solution to a Continuous Infusion Line	
7. Check the date on the tubing tag; if the tubing needs changing, refer to Procedure 37-2.	7. Indicates when tubing replacement is due.
8. Hang the new bag of fluids on the IV pole and remove the cover from the port.	8. Provides easy access to the fluids.
9. Remove the current infusion bag of fluids from the IV pole.	9. Makes room for new bag.
10. While maintaining aseptic technique, remove the tubing spike from the port of the infusing bag of fluids and reinsert the tubing spike into the port on the new bag of fluids; push the full length of the spike into the port.	10. Maintains the sterility of the IV system.
11. Set the infusion rate.	11. Produces correct drip rate.
Manual Rate Regulation • Open regulator clamp; close slowly while observing the drip chamber until the fluid is dripping at a slow, steady pace. • Count the number of drops for a 15-second interval and multiply by 4; for example, if the drop factor of tubing is 10 drops/ml then the drop rate should be 21 drops/minute to infuse 1000 ml/8 hours (Figure 37-22). • Open the regulator clamp slowly to increase the drip flow rate; close the regulator clamp to decrease the drip rate to achieve 21 drops/minute. • Recount the drop rate after 5 and 15 minutes. • Proceed to steps 12–19.	• Determines patency of venous access device. • Determines number of drops falling per minute. • Controls drip rate with regular clamp. • Detects changes in rate due to expansion and contraction of tubing.

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PROCEDURE 37-3 Administering an IV Solution (continued)

Action	Rationale
Figure 37-22 Manual Rate Regulation: Counting the Number of Drops for a 15-Second Interval	
Dial-a-Flo Regulation • Turn Dial-a-Flo regulator until arrow is aligned with desired volume of fluid to infuse over 1 hour. • Check drip rate over 15 seconds, and multiply by 4. • Adjust height of IV pole if necessary. • Recount drip rate after 5 minutes and again after 15 minutes. • Proceed to steps 12–19.	• Regulates infusion of fluid at the desired rate. • Verifies calculated drip rate with infusion rate. • Facilitates flow by gravity; the higher the pole, the greater is the infusion rate. • Detects changes in rate due to expansion and contraction of tubing.
Infusion Controller or Pump Regulation • Insert tubing into infusion controller or pump in accord with manufacturer's instruction (Figure 37-23). • Close door to controller or pump and open all tubing clamps and regulators. • Set volume dials to regulate the volume to infuse per hour or drops per minute in accord with the type of machine. • If the controller or pump has an electronic eye, clamp it over the upper portion of the drip chamber that does not contain fluid. • Push the *start* or *on* bottom. • If desired, set the volume infusion alarm. • Proceed to steps 12–19.	• Ensures proper functioning of the device. • Allows controller or pump to regulate the infusion rate. • Determines amount of fluid the device will deliver. • Allows controller or pump to monitor drip rate. • Initiates the device's regulation of the fluid flow. • Sounds when the set volume has been infused.

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PROCEDURE 37-3 Administering an IV Solution (continued)

Action	Rationale
Figure 37-23 IV Tubing Threaded into an Infusion Pump with Controls Set	
Volume Control Chamber (Buretrol) Regulation • Close regulators both above and below the chamber. • If adding a new Buretrol, open regulator above the chamber and fill the chamber with 10 ml of fluid, close the top regulator, and slowly open the regulator below the chamber to remove air from the tubing. Close the bottom regulator (Figure 37-24).	• Allows for precise release of fluids into the chamber. • Facilitates priming the drip chamber and clearing the tubing below the chamber of air.
Figure 37-24 Volume Control Set	

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PROCEDURE 37-3 Administering an IV Solution (continued)

Action	Rationale
• Open the top regulator and fill the chamber with the volume of fluid to infuse in 1 hour or 2 hours if the volume is small. • Close top regulator and ensure that air vent is open. • Open bottom regulator and regulate drops to calculated drip rate in accord with the drop factor. • Count drip rate over 15 seconds and multiply by 4. • Time-tape the chamber if a controller or pump is not used. • Check chamber every 1 to 2 hours depending on the volume placed in the chamber. • Proceed with steps 12–19.	• Facilitates close monitoring of fluid volume. • Allows fluid to escape from the chamber. • Determines volume to infuse over an hour. • Verifies rate of infusion. • Facilitates easy check of fluid infusion and shows when to add fluid to the chamber. • Maintains fluid infusion and prevents air from entering the chamber and tubing if all fluid is infused.
12. On the time tape, write the time the fluids were initiated and your initials.	12. Facilitates easy check of fluid infusion progress as prescribed.
13. Monitor the volume delivered every 1 to 2 hours and compare with the time tape.	13. Ensures the actual volume being delivered.
14. If fluids are not infusing at the prescribed rate as indicated by time tape: • Check setting on controller or pump or Dial-a-Flo and adjust as indicated. • Increase height of IV pole. • Assess puncture site, reposition the venous access device, lower the IV fluid container below the puncture site and observe for a backflow of blood. Replace container on pole.	14. Ensures that prescribed amount of fluid is delivered. • Allows gravity to facilitate the drip rate. • Ensures that venous access device is still in the vein.
15. Instruct client to limit movement of puncture site and to notify a nurse of any problems or discomfort.	15. Facilitates early detection of problems.
16. Apply an armboard, if indicated (Figure 37-25).	16. Immobilizes the extremity receiving the infusion.
Figure 37-25 Positioning of Client with an IV Armboard	

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PROCEDURE 37-3 Administering an IV Solution (continued)

Action	Rationale
17. Position the client for comfort and place the call light in easy reach.	17. Promotes client comfort and safety.
18. Wash hands and dispose of used supplies.	18. Decreases transmission of microorganisms.
19. Document on the client's medical record: • Time of initiation of fluid infusion • Type and volume of fluid infusing • Infusion device used, if applicable • Status of the venous access insertion site • Problems encountered: for example, if venous access device is repositioned • Client's tolerance to the fluid infusion • Client teaching and learning	19. Provides a record of the nursing intervention and the client's response.
Adding a Secondary Line, Additive Bag (IV Piggyback) Refer to Chapter 29, Procedure 29-7.	
Adding a Solution to an Existing Heparin or PI Lock	
20. Repeat steps 1–5.	
21. Hang IV solution on IV pole.	21. Provides easy access to system.
22. Don nonsterile gloves and cleanse needleless injection port with alcohol or iodophor swab. Allow to dry.	22. Reduces risk of transmission of microorganisms.
23. Insert saline syringe into port, slowly aspirate, and observe for blood; flush system and observe for swelling at puncture site.	23. Indicates a patent system and, with the presence of blood and lack of swelling, that the needle is probably in the vein.
24. Connect needleless locking cannula into injection port, open tubing clamp, and adjust rate as indicated in step 11.	24. Ensures administration of solution at the correct drip rate.
25. Dispose of equipment and gloves in proper receptacle and wash hands.	25. Reduces risk of transmission of pathogens.
26. When secondary bag and drip chamber are empty, don gloves, close the clamp, and disconnect the needleless locking cannula from the port's lock.	26. Indicates infusion of the solution.
27. Flush port with second saline syringe and place sterile needleless injection cap on the port.	27. Clears the line and reduces the risk of contaminating the port.
28. Dispose of equipment and gloves in proper receptacle and wash hands.	28. Reduces risk of transmission of pathogens.
29. Record fluid administration on MAR and client response in nurses' notes.	29. Documents nursing intervention and any client adverse reactions.

Literature Review and Evidenced Grading System

❖Our literature consisted of numerous type of articles, with the total number of articles coming to 32. 28 of these articles were quantitative in nature and 4 of these articles were qualitative in nature. The Evidence Grading System used assigns levels to evidence regarding the effectiveness of an intervention. The hierarchy ranges from level Ia., which is the strongest evidence, to level VII as the weakest evidence. The authors utilized research from levels Ib, IIb, IV, V, and VII on the Evidence Grading System to support the developed protocol. Level Ib consists of systematic review of nonrandomized trials. Level IIb consists of single nonrandomized trials. Level IV consists of a single correlational or observational study. Level V includes systematic reviews of descriptive, qualitative, or physiologic studies. Level VI involves single descriptive, qualitative, or physiologic studies.

Clinical Implications

❖ Provide education to the nursing education coordinator at a large urban teaching hospital on the steps of preparation, administration, and monitoring of intravenous medications.

❖ This nursing education coordinator will then disburse this knowledge and evidenced based protocol to the nursing staff across all sites at a large urban teaching hospital.

❖ Research will then be conducted to compare and contrast the rate of intravenous medication errors prior to the evidenced based protocol being implemented and after the evidenced based protocol was implemented.

❖ This protocol can then be disbursed throughout various hospitals in the area in an attempt to decrease the rate of intravenous medication errors.

Advantages and Disadvantages

❖ Advantages
- ❖ Provides a safe systematic process for administration of intravenous medication to patients on inpatient hospital units and other environments where intravenous medications may be needed.
- ❖ Minimizes the potential for various medication errors that can range from mislabeled information, to wrong dosage being given, to not monitoring the patient after medication is given.
- ❖ Also protects the nurse and the hospital from possible consequences of medication error and injuries to patients.

❖ Disadvantages
- ❖ Possibly more time consuming for nurses and patients, which could cause stress on both parties.
- ❖ Could increase the chances of patients receiving their scheduled medications during an inproper time, which is a medication error in itself.