	Policies & Procedures Title: SMART PUMP - MEDICATION AND PARENTERAL FLUID ADMINISTRATION I.D. Number: 1054
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DEFINITIONS

Clinical Care Area (CCA) - describes a grouping of drug entries that are available to specific departments, specialty or therapeutic treatment area. Medications included in each CCA have been carefully selected and provincially approved.

Dose Error Reduction Software (DERS) - a customized software program in the infusion device that reduces the risk of infusion related errors by incorporating hard and soft limits, multiple drug dose modes and starting dose rates and concentrations, each customized in a master drug library.

Drug Library - contains provincially defined drug infusion parameters such as commonly used concentrations and dosing limits, hard and soft limits.

Hard & Soft Limits -

Lower Hard Limit (LHL): the lower limit that cannot be overridden.

Lower Soft Limit (LSL): the lower limit that can be overridden

Upper Soft Limit (USL): the upper limit that can be overridden

Upper Hard Limit (UHL): the upper limit that cannot be overridden

MAR - refers to the Medication Administration Record, pharmacy generated Medication Administration Record or other record used for charting/documenting medication administration on a unit/department/therapeutic care area.

SMART Infusion System - SMART Pumps are infusion devices that contain several important safety features that can decrease the risk of medication errors at the point of client care by utilizing dose error reduction software.

SMART - Safer Medication Administration Through Technology

ROLES

Registered Nurses/Registered Psychiatric Nurses / Grad Nurses /Student Nurses/ paramedics / paramedic students / physicians / radiology technicians, and Licensed Practical Nurses who have successfully completed the IV Therapy/Blood and Blood Products Completer Course may operate smart pumps.

1. POLICY

- 1.1. **Education and Training:** All users operating the pump shall require initial mandatory training achieved by means of attending a session or completing e-learning that offers:
 - 1.1.1. Theoretical information about Smart Pump safety software and programming.
 - 1.1.2. Understanding of practices that accompany use of Smart Pumps.
 - 1.1.3. Hands-on practice with scenarios involving medications that are specific to the user's clinical care area.
 - 1.1.4. Training CCAs are available on the pump for training purposes.
- 1.2. All users operating the pump will complete a review of competence at least every **2** years.
- 1.3. Whenever possible, parenteral fluid and medications will be administered using a Smart Pump with DERS as per policy#1170- Medication - Administration.
(<https://www.saskatoonhealthregion.ca/about/NursingManual/1170.pdf>)
 - 1.3.1. Continuous infusions will be infused using line A. Intermittent infusions may be infused on line B if they are compatible with, and do not affect the efficacy of the medication infusing in line A. (Exception: chemotherapy drugs).
- 1.4. The use of the infusion pump's Drug Library is mandatory if the medication is listed in the programmed drug library.
- 1.5. Use the CCA that has been agreed upon by your unit or department. Some departments may need to use more than one CCA or choose from several weight- based CCAs. Medications in the Critical Care and Emergency CCAs are to be "administered and monitored by Critical Care Personnel only".
- 1.6. Documentation is required whenever "soft limits" are exceeded or "hard limits" are reached and when the "no drug selected" line is used.
- 1.7. If the order is outside the soft limits, consult with the physician to let them know. If the order is outside the hard limit, notify the physician that programming at this dose may be unsafe, and you cannot carry out the order as prescribed

2. PURPOSE

- 2.1. To ensure all infusions are administered correctly and safely by the most appropriate method.

3. PROCEDURE

- 3.1. The operation of the pump is to be used in accordance with the manufacturer's instructions. (https://www.hospira.com/en/images/430-97315-003_Plum_360_SOM_Dom_English_tcm81-96468.pdf)
- 3.2. **Managing Soft Limits:**

Soft Limits are set at the outside minimum and maximum boundaries of the dosing range for a specific drug. There may be times when the user of the pump is asked to program the pump outside of lower soft limits (LSL) or upper soft limits (USL).

Check the Physician's order.

- If a keystroke programming error occurred ("double bounce"), reprogram the pump.
- Once confirmed it is appropriate & safe for the patient, continue with the infusion.
- If a soft limit is hit when programming a medication ordered on an approved Preprinted Order Set, the physician does not need to be notified.
- Document the override on the Medication Administration Record (MAR or unit/area specific record).

Documentation is required:

- With the initial override
- At the beginning of each shift the override is in place
- Once only, if the override of the lower soft limit occurs during the weaning off of a medication

Example documentation on MAR

- Medication name:
- LSL or USL, override time & initial

3.3. Managing Hard Limits:

Hard Limits are set to keep a medication from being delivered at a dose that is typically outside of a therapeutic range and may cause risk to the patient. This is the process to follow when upper hard limit (UHL) or lower hard limit (LHL) is hit.

Check the Physician's order.

- If the order is outside the hard limit, notify the physician that programming at this dose may be unsafe, and you cannot carry out the order as prescribed.
- If the physician insists that the drug must be delivered at this dose:

In Critical Care settings

Consult with Charge Nurse/Pharmacy as to the appropriateness of the ordered dose.

Once confirmed it is appropriate and safe for the patient, continue with the infusion.

- Use the **"No Drug Selected"** line
- Choose the drug units carefully, and program all entries carefully, as there are no safety limits
- Call the Safety line: 1600 or 1-844-655-1600 and refer to Appendix C.
- Document use of "No Drug Selected" in nurses note, providing explanation of clinical indication, and actions taken

Outside of a Critical Care Setting

- Consult with Charge Nurse/Pharmacy as to the appropriateness of the ordered dose
- Once confirmed it is appropriate & safe for the patient, and if the monitoring guidelines can be met on your unit, use the **"No Drug Selected"** line
- Use the **"No Drug Selected"** line
- Choose the drug units carefully, and program all entries carefully, as there are no safety limits
- Call the Safety line: 1600 or 1-844-655-1600 and refer to Appendix C.
- Document use of "No Drug Selected" in nurses note, providing explanation of clinical indication, and actions taken

- If dose is **not** appropriate or safe, **do not infuse drug. Inform the physician that you are unable to proceed at the requested dosing.**
- Document actions taken in nurses notes.

3.4. Use of "NO Drug Selected"

It is the intention of Saskatchewan Smart Pump Program, that every drug that is infused intravenously in this province should be included in the pump's drug library. On rare occasions, the user may be required to use the drug library's "No Drug Selected" line.

- If the drug you are wishing to infuse is not found in your Clinical Care Area, refer to the Master Drug Library on the Saskatchewan Smart Pump webpage.
- If it cannot be found in another Clinical Care Area, refer to the provincial drug monographs or other drug resources and ensure that you are able to meet the monitoring requirements for that drug.
- If you are able to meet the monitoring requirements, choose "No Drug Selected" in the pump and program the infusion in the dosing units ordered.
- If the drug is a known study drug instituted in your clinical area, choose "No Drug Selected" and program the infusion in the dosing units ordered.

If "No Drug Selected" is being used for either of the 2 reasons stated above, you are required to:

- Call the safety line: 1600 or 1-844-655-1600 and follow facility protocol.
- Document use of "No Drug Selected" in nurses note, providing explanation of clinical indication, and actions taken
- Document the drug given on the MAR in the usual manner. "No drug selected" should also be written on the MAR
- If a change to the provincial drug library is necessary, email submission to smartpump@saskatoonhealthregion.ca.

3.5. Process to Achieve Complete Delivery of Medication in Intermittent Doses

- An Intermittent Infusion is defined as administration of a medication through non-continuous scheduling e.g. ceFAZolin 1 G Q8H, morphine 3 mg IV Q2H PRN. Administration of the full dose, including drug left in IV tubing is the most important factor in efficacy. Pharmacy is not able to determine or label Pharmacy prepared IV medications in mini-bags with the EXACT total volume in most cases. Commercial IV mini-bags contain overfill in order to ensure that the bag will contain the labeled volume until the expiry date. The amount of overfill in each bag varies by manufacturer, size of bag (50mL, 100mL, 250mL or 500mL), solution and proximity of expiry date.
- Pharmacy labels mini-bag products to clearly identify those which contain overfill and where the entire contents must be infused to ensure the full dose is received.
Sample label:
Bag Contains Overfill
INFUSE ENTIRE CONTENTS
- Good practice is to reprogram the pump to infuse an additional 10mls to empty the tubing. This final rate will be specific to the medication and patient characteristics

3.6. Management of overfill in continuous infusions. (10% rule in preparation)

- A Continuous Infusion is defined as administration of a medication at a prescribed rate without interruption, typically, but not always, titrated to effect, without regard to total dose.
- Consistency in preparation is key to ensure the drug concentration, and therefore effects are consistent from bag to bag and patients are not adversely affected due to bag change

Rule of 10% will apply when preparing continuous infusion bags. If the amount of medication to be added in mL to a bag is **greater than** 10% of the labelled volume of the

bag THEN remove and discard an equivalent volume from the said bag prior to adding the medication.

The rule of 10% applies only to **continuous infusions** (intermittent doses require labelling to administer entire contents) to ensure consistency of the final concentration.

For example: If 25mL of drug is to be added to a 100mL minibag, remove 25mL from the minibag prior to adding the medication.

A new bag can be hung as required and there is no need to confirm that the entire contents have been administered for such CONTINUOUS infusions. This is in contrast with intermittent infusions that require entire contents of syringe or mini- bag and tubing to be administered to ensure that the full dose is received, and then the line flushed (example vancomycin).

Exceptions to the 10% rule include:

- Sodium Bicarbonate for IV infusion
- Calcium Gluconate for CRRT
- Acetylcysteine

3.7. **Process for requesting additions or changes to Drug Library and/or Monographs.** The following information is required when requesting a change to the Drug Library or Monographs.

- Unit requesting change
- Addition or Change being requested
- Reason for change
- Supporting information or documentation of why change is needed
- Person requesting change and contact information

Submit to smartpump@saskatoonhealthregion.ca .

3.8. **Cleaning & maintenance of Plum 360 Pump.** See Appendix A

3.9. **Process for Drug Library Updates (Drug Library Push).** See Appendix B

4. REFERENCES


Accreditation Canada: Medication Management Standards
<https://accreditation.ca/sites/default/files/rop-handbook-2017.pdf>
<https://accreditation.ca/sites/default/files/rop-handbook-2016v2.pdf>

Healthcare Human Factors: Smart Medication Delivery Systems: Infusion Pumps
Patricia L. Trbovich, Jennifer Jeon, Anthony Easty, April 2009
http://ehealthinnovation.org/wp-content/uploads/SmartMedicationDeliverySystems_FullReport1.pdf

Institute for Safe Medication Practices - Canada (2003). Infusion Pumps – Opportunities for Improvement. ISMP Canada Safety Bulletin. <https://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2003-07InfusionPumps.pdf>

Institute for Safe Medication Practices (2009). Proceedings from the ISMP summit on the use of smart infusion pumps: guidelines for safe implementation and use. Institute for Safe Medication Practices. <http://www.ismp.org/tools/guidelines/smartpumps/printerversion.pdf>

Appendix A


 WORK STANDARD	Name of Activity: Clean and Disinfect the Plum 360 Infuser Role performing Activity: Unit Support Worker or other designated staff member		
	Location: All areas utilizing Plum 360 IV Pumps (SMART Pumps)		Department: All Patient units
	Document Owner: Nursing Practice and Education		Region/Organization where this Work Standard originated: Saskatoon Health Region
	Date Prepared: Feb 11, 2016	Last Revision: Feb 17, 2016	Date Approved:

Work Standard Summary: Clean and Disinfect the Plum 360 Infuser between each patient use.

Task	<p>Task Definition For proper maintenance of the Plum 360 Infuser observe the following cleaning and sanitizing guidelines. To avoid damage to the infuser please follow the directions listed below.</p> <p>Caution:</p> <ul style="list-style-type: none"> ➤ Do not immerse the Plum 360 Infuser in any fluids or cleaning solutions towards the opening of the instrument. ➤ Do not use cleaning chemicals containing combinations of isopropyl alcohol and dimethyl benzyl ammonium chloride. ➤ Never use sharp objects to clean any part of the infuser. <p>Disinfectant – Accelerated Hydrogen Peroxide (AHP) commercial wipes</p> <p>Q-tip’s (swabs) - soak Q-tip in the Accel wipe and squeeze the top of the Q-tip to remove excessive water.</p>
1.	PPE – isolation gown, safety glasses and nitrile gloves
2.	Remove any type of tubing or lines from pump including stickers and tape. Ensure that the Plum 360 Infuser is disconnected from the main power.
3.	Use approved disinfectant wipes to clean. Clean the pole from top to bottom and clean the wheels. Some pumps are stored on the pole so you may need to remove from the pole; and proceed to clean the pump.


	<p>4. Clean the exterior surface of the infuser with an Accel wipe. If the infuser is visibly soiled clean removing the soil first and then disinfect use a new wipe.</p> <ul style="list-style-type: none"> ○ When disinfecting, have a clean wipe for both hands to avoid recontamination. Wipe all surfaces with a disinfectant wipe. ○ Rest the infuser on one side to expose the bottom. Use a swab to clean hard to reach areas. Wipe bottom surface. ○ Lift the infuser wipe the surface where resting and place upright. Wipe the top and side of surfaces. Turn the infuser to view back. ○ Be sure to clean the threaded pole clamp shaft by rotating the knob back and forth, clean the knob. Including power cord. Let air dry. ○ Turn the infuser upright to view the front. Carefully wipe the keypad and display screen, swabbing the crease. ○ Wipe the cassette door and area above the door. Use a swab to clean hard to reach spots. <i>Note: do not allow cleaning fluid to flow behind the cassette door.</i>
	<p>5. To clean the cassette receptacle; to clean inside the cassette receptacle use Q-tip's (soak Q-tip with AHP wipe and squeeze the top of the Q-tip to remove excessive water).</p> <ul style="list-style-type: none"> ○ Open the cassette door latch by pressing the yellow marked door release tab; gently press the cassette door down until it opens completely. ○ Carefully swab the pins, sensors, and surrounding areas without tilting the infuser backwards. <p>Note: <i>If a sensor is damaged or a pin is damaged or broken off the infusion mechanism assembly needs to be replaced CES - (Clinical Engineering Services)needs to repair.</i></p> <ul style="list-style-type: none"> ○ Using swabs clean the interior surface of the door and the area between the metal door guide and the cassette door. <p>Note: <i>Use particular care cleaning the area between the door and the metal door guide, and when cleaning the pivot infusion mechanism that attaches the door to the infuser.</i></p> <ul style="list-style-type: none"> ○ Clean the door roller ○ Clean the door lever, and use swabs to clean the crevices around it. <p>Note: <i>Do not allow fluid into the internal part of the infuser.</i></p>
	<p>6. Cleaning the power cord Velcro strap</p> <ul style="list-style-type: none"> ○ Soak the power cord Velcro strap in cleaning fluid until the dried soil is softened ○ Use a cloth or brush to dislodge soil if needed ○ Wipe off excess cleaning fluid, and let the strap air dry.
	<p>7. If the Plum 360 Infuser is stored on IV pole ensure that is attached securely before putting into storage. Once put into the proper storage area ensure that the infuser is plugged in and switch the infuser Off using the ON/OFF key.</p>

Appendix B

 WORK STANDARD	Name of Activity: Routine Drug Library Update Pushed to Pump Role performing Activity: Frontline Staff & Clinical Engineering		
	Location: All areas utilizing Plum 360 IV Pumps (SMART Pumps)	Department: Clinical Engineering	
	Document Owner: Manager Clinical Engineering	Region/Organization where this Work Standard originated: Saskatoon Health Region	
	Date Prepared: Jan 26, 2016	Last Revision: Dec. 20, 2016	Date Approved:

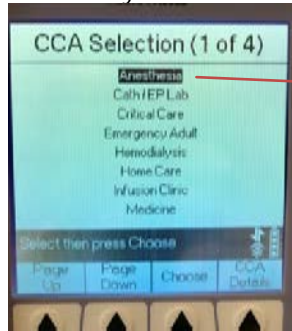
Purpose: Ensure all Plum 360 IV Pumps receive Drug Library Updates

Work Standard Summary: Processes to update and confirm updates have been completed for the standardized Drug Library on Plum 360 IV Pumps.

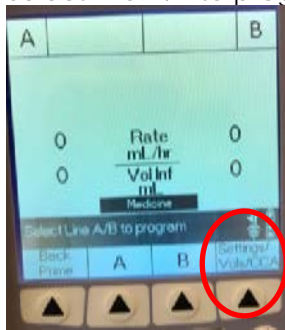
1.	Areas will be informed when a new Drug Library Update will be pushed out.
2.	Routine Drug Library Updates will occur on the 1st Wednesday of every month at 1000h. Routine Drug Library Updates may not occur every month.
3.	All pumps not engaged in patient care will be moved to the wireless access area in facility.
4.	Steps for installation: <ul style="list-style-type: none"> • All pumps are to be plugged into electrical socket. • Pumps should be turned on. • The WiFi symbol and MedNet server symbols should appear – identifying that system connections have been made. This symbol is located right beside the battery life display icon.  <ul style="list-style-type: none"> • Please note that the pumps will “beep” while turned on. This is a normal operational alarm message. • Turn the pumps off after 15 minutes. • The pumps will automatically turn on, download the Drug Library, Pump will say “Installing”. • The pumps will then turn off automatically. • Once install is finished turn pump back on.
5.	If pump is in use at the time the Drug Library is scheduled to be pushed: <ul style="list-style-type: none"> • When not in use/or when safe to do so, turn pump off. • If the drug library has been pushed to the pump, the pump will turn itself back on and install the new version of the drug library, then turn itself back off. • If the drug library was not pushed to the pump, refer to step 4 and follow the steps to update the pump.

6. To verify that the Drug Library version has been updated to the new version, check the version number.

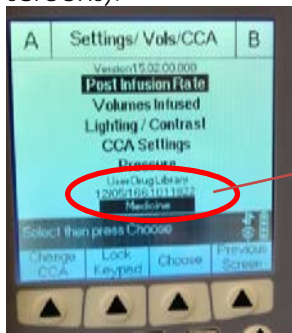
- Select any CCA.



- Select line A/B to program, then select "Settings/Vols/CCA".



- The most recent drug library update will be displayed on the final line, including the date of the push and the version number (there must be a cassette in the pump to view these screens).



12/05/16 = Date new version of the drug library was put on the server
6.10 = version number for Hospira MedNet software
11822 = 360 Drug Library version number

7. If version number is not the latest version, the pump is to be removed from service and the Clinical Engineering department is to be contacted. This is similar to any other repair due to a malfunction of the pump.

- RUH – 655-1409
- SCH – 655-8550
- SPH – 655-5188
- Rural centers may contact any of the above

Appendix C

Protocols for use of "No Drug Selected"

1. LTC:

- a. Consult with Charge Nurse/Pharmacy as to the appropriateness of the ordered dose. (Note: If dose is not appropriate or safe, do not infuse drug. Inform the physician that you are unable to proceed at the requested dosing.)
- b. Once it has been confirmed that the drug and dose ordered is appropriate and safe for the resident, and if the monitoring guidelines can be met, use the "No Drug Selected" line.
- c. Choose the drug units carefully, and program all entries carefully, as there are no safety limits.
- d. Document actions taken in the notes section of the chart.
- e. Call the Safety line: 1600 or 1-844-655-1600.
- f. Complete an AEMS report.

2. Rural Acute Care:

- a. Consult with Charge Nurse/Pharmacy as to the appropriateness of the ordered dose. (Note: If dose is not appropriate or safe, do not infuse drug. Inform the physician that you are unable to proceed at the requested dosing.)
- b. Once it has been confirmed that the drug and dose ordered is appropriate and safe for the resident, and if the monitoring guidelines can be met, use the "No Drug Selected" line.
- c. Choose the drug units carefully, and program all entries carefully, as there are no safety limits.
- d. Document actions taken on Notes form.
- e. Call the Safety line: 1-844-655-1600.
- f. Complete a Medication Incident Information Report form.

3. Rural ED:

- a. Consult with Charge Nurse/Pharmacy as to the appropriateness of the ordered dose. Once confirmed it is appropriate and safe for the patient, continue with the infusion.
- b. Use the "No Drug Selected" line.
- c. Choose the drug units carefully, and program all entries carefully, as there are no safety limits.
- d. Document use of "No Drug Selected" providing explanation of clinical indication, and actions taken.
- e. Call the Safety line: 1-844-655-16000.
- f. Complete a Medication Incident Information Report form.