Center for **H**uman **P**henomic **S**cience	University of Pennsylvania Health System	**CHPS SOP 28**
Standard Operating Procedure	Medication Flush Terminology	**Page 1 of 7**

PURPOSE: The purpose is to define terminology around investigational product (IP) end of infusion and flush in order to standardize practice of IP administration on the CHPS unit while also following research protocol administration instructions.

SCOPE: CHPS staff and Clinical Study Teams

PROCEDURE: Includes terminology and explanations regarding implementation.

Terminology:

End of Infusion

"End of infusion" of an IP intravenous (IV) infusion is considered to be reached when the full volume of study drug stated on the study drug IV bag label has been infused per the IV pump.

If the IP bag empties before the full volume has been reached, the nurse will ensure the drug remaining in the IV tubing will be infused by "chasing" the drug with compatible diluent (0.9% sodium chloride or dextrose 5%). The method by which the remaining drug will be "chased" (replacing the IP bag with a bag of diluent or infusing diluent via IV push into the IP bag) will depend upon the IP preparation by the Investigational Drug Service Pharmacy.

This definition aligns with a study protocol stating a variation of the following: “flush the administration tubing with 0.9% sodium chloride such that the entire IP bag content is administered.”

See Example A for clarity.

Exception

The exception is when the full IP volume has been reached as indicated on the IV pump, yet there is still study drug remaining in the IV bag. In this exceptional instance, "end of infusion" is reached when the remaining excess IP is infused and the IP bag is empty.

The time of end of infusion documented on the nursing worksheet source document will be the same time as the "infusion complete" of the IP documented in the MAR.

See Example B for clarity.

Center for **H**uman **P**henomic **S**cience	University of Pennsylvania Health System	**CHPS SOP 28**
Standard Operating Procedure	Medication Flush Terminology	**Page 2 of 7**

Flush

Following the end of infusion per the CHPS SOP definition, a standard "flush" is performed by infusing an additional 20-30ml of diluent through the IP IV tubing.

The time of the flush start will be documented in the nursing worksheet source document as well as in the MAR as after the end of the infusion.

See Example A for clarity.

Implementation:

CHPS-Defined “End of Infusion” as a Default

Unless otherwise defined by the study team on the nursing worksheet source document, “end of infusion” as defined in this SOP will be used to determine timed post-infusion study assessments (including but not limited to vital signs, PK samples, and ECGs).

IV Line Priming

End of infusion does not change depending on whether the IV line is primed with drug or diluent (including when the drug arrives from IDS without tubing and the CHPS nurse spikes the IP bag and primes the tubing at the bedside).

Undercutting

It is within each CHPS nurse’s independence of practice to choose whether or not to “undercut” while infusing an IP. Undercutting is when the nurse programs the pump volume as 20-30ml less than the total volume to avoid the IV line running dry. When the pump alarms, the nurse is alerted to check if the IP bag is dry, swaps the IP bag for a bag of diluent, and programs the pump for the remainder of the total volume of IP. Whether or not the nurse undercuts does not affect the end of infusion time or flush time.

Center for Human Phenomic Science	University of Pennsylvania Health System	CHPS SOP 28
Standard Operating Procedure	Medication Flush Terminology	Page 3 of 7

When Protocol-Defined "End of Infusion" Differs from CHPS-Defined "End of Infusion"

If the study protocol definition of "end of infusion" does not align with the definition of "end of infusion" per the CHPS SOP, the protocol-defined "end of infusion" will be referred to as "**per-protocol end of IP**."

Study teams are required to refer to the protocol-defined end of infusion as "per-protocol end of IP" on their nursing worksheets.

The nursing worksheet source document will state what the "per-protocol end of IP" is considered per protocol, and will clearly state that the time of "per-protocol end of IP" shall be used when determining post-infusion study assessments (including but not limited to vital signs, PK samples, and ECGs).

See Example C for clarity.

Documentation

The times documented in the nursing worksheet source document and MAR for the start of infusion, end of infusion, start of flush, and end of flush will agree.

If the protocol does not require the flush start and end time to be documented, then the flush start and end time do not need to be included on the nursing worksheet source document.

See Examples A&B for clarity.

When "per-protocol end of IP" is used, the "infusion completed" time for both the IP and the flush in the MAR will agree with the "per-protocol end of IP." This is important when determining PKs, especially those 24+ hours post-infusion.

The nurse may choose (but is not required) to add a comment to their MAR documentation that explains how the per-protocol end of IP was defined.

See Example C for clarity.

Center for **H**uman **P**henomic **S**cience	University of Pennsylvania Health System	**CHPS SOP 28**
Standard Operating Procedure	Medication Flush Terminology	**Page 4 of 7**

Examples:

Example A

IP Xa contains 25 mg in 100 ml 0.9% sodium chloride ordered to be infused over 60 min. The nurse programs the IV pump rate for 100 ml/hr and volume for 100 ml. The nurse begins the infusion at 13:00.

At 13:45, the nurse sees the IP bag is empty, but there are still 25 ml of volume remaining in the infusion per the IV pump. The nurse disconnects the IP bag from the IV tubing and connects a bag of 0.9% sodium chloride in its place so that the tubing does not run dry as the remainder of the IP is infused into the patient.

At 14:00, the pump beeps to signal the volume has reached zero. It is at this time, that the **end of infusion** has occurred.

The nurse then programs the pump volume for an additional 30ml, maintaining the rate at 100 ml/hr. This is considered the **flush**. The nurse starts the flush at 14:00.

At 14:18, the pump beeps indicating the volume is zero. This is considered end of flush.

The nurse documents in the MAR and on the source document the following time points:

Start of Infusion: 13:00
End of Infusion: 14:00
Start of Flush: 14:00
End of Flush: 14:18

Center for **H**uman **P**henomic **S**cience	University of Pennsylvania Health System	**CHPS SOP 28**
Standard Operating Procedure	Medication Flush Terminology	**Page 5 of 7**

Example B

IP Xb contains 30mg in 150 ml 0.9% sodium chloride ordered to be infused over 30 min. The nurse programs the IV pump rate for 300 ml/hr and volume for 150 ml. The nurse begins the infusion at 11:00.

At 11:30, the pump beeps indicating the volume has reached zero. The nurse sees there is still about 1/3 of drug remaining in the IP bag. This scenario is the **exception**. The nurse programs the pump for 50ml volume and maintains the rate at 300ml/hr.

At 11:40, the nurse sees the IP bag is now empty. Because this is the exception scenario, the nurse documents 11:40 as the **end of infusion**.

The nurse then disconnects the IP bag from the IV tubing and connects a bag of 0.9% sodium chloride in its place. The nurse programs the IV pump volume for 30 ml and maintains the rate at 300ml/hr. This is considered the **flush**. The nurse starts the flush at 11:40.

At 11:46, the pump beeps indicating the volume is zero. The is considered end of flush.

The nurse documents in the MAR and on the source document the following time points:

Start of Infusion: 11:00
End of Infusion: 11:40
Start of Flush: 11:40
End of Flush: 11:46

Center for **H**uman **P**henomic **S**cience	University of Pennsylvania Health System	**CHPS SOP 28**
Standard Operating Procedure	Medication Flush Terminology	**Page 6 of 7**

Example C

Study Protocol Xc details that "the end of infusion will occur when IP Xc-containing saline infusion bag is empty."

The clinical research coordinator (CRC) references the CHPS SOP and identifies that the Protocol Xc use of the term "end of infusion" differs from the CHPS SOP.

In this instance, when preparing the nursing worksheet source document, the CRC refers to the protocol-defined end of infusion as "per-protocol end of IP."

The nursing worksheet states the following:

"**Per-protocol end of IP** will occur when IP bag is empty, not when end of infusion is reached per CHPS SOP. Please use **per-protocol end of IP** time point when determining timing for post-infusion PK, VS, and ECG collections."

The MAR order reads as follows:

INVESTIGATIONAL Xc 50mg in sodium chloride 0.9% (NSS) 100 ml infusion
Dose: 50mg : 100ml/hr : intravenous : Once

Sodium chloride (NSS) 0.9% flush 30 ml
Dose: 30 ml : intravenous : Once

The nurse starts the IP Xc infusion at 10:00.

At 10:45, the nurse sees the IP bag is empty. Even though there are still 25 ml of volume remaining in the infusion per the IV pump, this is considered **per-protocol end of IP.**

The nurse disconnects the IP bag from the IV tubing and connects a bag of 0.9% sodium chloride. The nurse then programs the pump volume for 30 ml, maintaining the rate at 100 ml/hr, to administer the 30 ml flush per the MAR. This is considered the **flush**. The nurse starts the flush at 10:45.

At 11:03, the pump beeps indicating the volume is zero. This is considered end of flush.

Center for **H**uman **P**henomic **S**cience	University of Pennsylvania Health System	**CHPS SOP 28**
Standard Operating Procedure	Medication Flush Terminology	**Page 7 of 7**

Example C cont.

The nurse documents in the MAR and on the source document the following time points:

Start of Infusion: 10:00
End of Infusion: 10:45
Comment: *based on per-protocol end of IP when bag ran dry*
Start of Flush: 10:45
End of Flush: 11:03