

Flush Reporting Use Cases

Author: Michael K. Workman

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1. WHAT IS A FLUSH?

Health care providers use IV flushes to clear out IV lines that deliver medicine directly into the veins of a patient. Flushes are administered before and after starting IV medication administrations. This has multiple effects such as:

- Ensures complete delivery of the medication
- Prevent adverse reactions between different medication administrations
- Prevent blockages in the IV lines
- Keeping the IV lines clean

The majority of flush steps are performed with Normal Saline, while diluted Heparin is less commonly used. Diluted Heparin is used to help prevent clotting but Heparin is a high risk medication.

2. DEFINITIONS

- APR – Auto Program Request also known as PCD-03 Communicate Infusion Order
- VTBI – Volume to be infused
- HIS – Health Information System provider of the eMAR and partner within the pump interoperable ecosystem
- eMAR – patients electronic Medical Administration Record
- PIG – Pump Interoperability Gateway and partner within the interoperable ecosystem
- KVO – Keep Vein Open

3. ASSUMPTIONS AND CONSIDERATIONS

- Intermittent Dose Volume = Diluent Volume
- Flush (PRN) Orders and Med Orders are not linked in HIS. This is a typical configuration
- Flush order and Med Order are linked. This is rare configuration
- Volume Infused is the volume that the pump has pushed and not the same as the volume that the patient has received.

4. MANUAL PROGRAMMING FLUSH AFTER INFUSION COMPLETE

4.1 Description

Disposable tubing is pre-primed with 0.5 mL of a solution. The syringe disposable is load into the pump and the medication begins infusing. The medication step results in medication container running to infusion complete, all the dose volume was infused but there is medication left in the tubing waiting to go to the patient.

4.2 Precondition(s)

- The Dose Volume is less than or equal to the volume in the disposable
- The Clindamycin infusion is back associated with patient chart in eMAR and nearing completion

4.3 Main Flow

1. The pump completes the VTBI and issues an Infusion Completion alarm
2. The pump stops infusing and the PIG reports to the HIS an infusion program complete event as follows:

<u>Reporting Data</u>	<u>Active Primary Step</u>
Infusion Event:	Complete
Status:	Standby
Order ID:	NULL
Infusate Name:	Clindamycin
Drug Amt.:	200.0000 mg
Dil. Vol. (mL):	2.0000
RATE (mL/h):	1.3333
VTBI (mL):	2.0000
Vol. Infused (mL):	2.0000

3. The Clinician responds to the Infusion Complete alarm at the bedside
4. The Clinician opens EMR and following BCMA process, scans patient and the flush syringe disposable.
5. The Clinicians signs administration of flush in the eMAR.
6. The Clinician turns to the pump.
7. The Clinician unloads the medication syringe on the pump, connects and loads the new flush syringe containing about 1 mL of Normal Saline.
8. The Clinician adds a flush option and programs 0.9 mL for the VTBI.
9. The Clinician starts the flush step for Clindamycin on the pump.
10. The pump starts the Clindamycin flush and PIG reports to the HIS a flush start event as follows:

<u>Reporting Data</u>	<u>Active Flush Step</u>
Infusion Event:	Start
Status:	Flushing
Med Order ID:	NULL

<i>Flush Order ID:</i>	NULL
<i>Infusate Name:</i>	Unknown
<i>Drug Amt.:</i>	----
<i>Dil. Vol. (mL):</i>	----
<i>RATE (mL/h):</i>	1.3333
<i>VTBI (mL):</i>	0.9000
<i>Vol. Infused (mL):</i>	0.0000

11. When the VTBI of 0.9 mL is reached, the pump stops infusing and the PIG reports a flush complete event as follows:

<u>Reporting Data</u>	<u>Active Flush Step</u>
<i>Infusion Event:</i>	Stop
<i>Status:</i>	Flushing
<i>Med Order ID:</i>	NULL
<i>Flush Order ID:</i>	NULL
<i>Infusate Name:</i>	Unknown
<i>Drug Amt.:</i>	----
<i>Dil. Vol. (mL):</i>	----
<i>RATE (mL/h):</i>	1.3333
<i>VTBI (mL):</i>	0.9000
<i>Vol. Infused (mL):</i>	0.9000

12. Clinician reviews I/O chart in eMAR and signs values for 2 mL of Clindamycin and 0.9 mL of “Generic flush” over the last 2.5 hours. Depending on HIS implementation, the generic flush may be associated with the Clindamycin.

5. MANUAL PROGRAMMING FLUSH AFTER SYRINGE EMPTY

5.1 Description

Disposable tubing is primed with about 0.5 mL of medication from the 2 mL of the syringe disposable. This creates a situation in which the available volume in the medication syringe is less than what is needed to be infused. The medication disposable is then load into the pump and the remaining medication is administered. The infusion program results in medication container running to syringe empty, dose volume remaining to be infused and drug left in the tubing waiting to go to the patient.

5.2 Precondition(s)

- The Dose Volume is greater than the volume in the disposable
- The Clindamycin infusion is associated with patient chart in eMAR and nearing syringe empty

5.3 Main Flow

1. Before completing the programmed VTBI, the pump detects the bottom of the disposable and issues a Syringe Empty alarm
2. The pump stops and the PIG reports to the HIS an infusion program stop event as follows:

<u>Reporting Data</u>	<u>Active Primary Step</u>
Infusion Event:	Stop
Status:	Alarming
Order ID:	MED0101
Infusate Name:	Clindamycin
Drug Amt.:	200.0000 mg
Dil. Vol. (mL):	2.0000
RATE (mL/h):	1.3333
VTBI (mL):	2.0000
Vol. Infused (mL):	1.5121

3. The Clinician responds to the Syringe Empty alarm at the bedside
4. The Clinician opens EMR and following BCMA process, scans patient and the flush syringe disposable.
5. The Clinicians signs administration of flush in the eMAR.
6. The Clinician turns to the pump.
7. The Clinician unloads the empty medication syringe on the pump, connects and loads the new flush syringe containing about 1 mL of Normal Saline.
8. The Clinician adds a flush option and adjusts the VTBI to 0.9 mL.
9. The Clinician restarts the infusion program for Clindamycin on the pump.
10. The pump resumes the Clindamycin infusion and PIG reports to the HIS a start infusion event as follows:

<u>Reporting Data</u>	<u>Active Primary Step</u>
Infusion Event:	Start

Status:	Infusing
Order ID:	MED0101
Infusate Name:	Clindamycin
Drug Amt.:	200.0000 mg
Dil. Vol. (mL):	2.0000
RATE (mL/h):	1.3333
VTBI (mL):	2.0000
Vol. Infused (mL):	1.5121

11. When the pump completes the original Clindamycin dose volume of 2 mL, the PIG reports to the HIS:

a. The clindamycin Complete event as follows:

<u>Reporting Data</u>	<u>Active Primary Step</u>
Infusion Event:	Complete
Status:	Transitioning
State Change Cause:	Flush
Order ID:	MED0101
Infusate Name:	Clindamycin
Drug Amt.:	200.0000 mg
Dil. Vol. (mL):	2.0000 mL
RATE (mL/h):	1.3333
VTBI (mL):	2.0000
Vol. Infused (mL):	2.0000

b. Immediately followed by the Start event for Clindamycin flush as follows:

<u>Reporting Data</u>	<u>Active Flush Step</u>
Infusion Event:	Start
Status:	Flushing
Med Order ID:	MED0101
Flush Order ID:	NULL
Infusate Name:	Unknown
Drug Amt.:	----
Dil. Vol. (mL):	----
RATE (mL/h):	1.3333
VTBI (mL):	0.4121
Vol. Infused (mL):	0.0000

12. When the programmed VTBI of 0.9 mL is reached, the pump stops and the PIG reports a flush complete event as follows:

<u>Reporting Data</u>	<u>Active Flush Step</u>
Infusion Event:	Stop
Status:	Flushing
Med Order ID:	MED0101
Flush Order ID:	NULL
Infusate Name:	unknown
Drug Amt.:	----
Dil. Vol. (mL):	----

<i>RATE (mL/h):</i>	1.3333
<i>VTBI (mL):</i>	0.4121
<i>Vol. Infused (mL):</i>	0.4121

13. The Clinician reviews I/O chart in eMAR and signs values for 2 mL of Clindamycin and 0.4121 mL of “Generic flush” over the last 2 hours. The generic flush is associated with the Clindamycin.

6. MANUAL PROGRAMMING FLUSH AFTER MICRO DOSE VOLUME PRIMED

6.1 Description

Disposable tubing is primed with small volume medication (dose vol. < tubing volume) and requires immediate start of flush disposable to deliver medication. The flush results in disposable running to infusion complete, all dose volume infused and no medication left in tubing

6.2 Precondition(s)

- The Dose Volume is less than the tubing volume
- Dose volume is manually pushed into tubing between pump and patient

6.3 Main Flow

1. The Clinician opens EMR and following BCMA process, scans patient and the medication disposable.
2. The Clinician signs administration of medication in the eMAR.
3. The Clinician turns to the pump.
4. After pushing all of the medication into the tubing below the pump, the Clinician loads **Flush disposable** into the pump.
5. Clinician selects Clindamycin from the pump library and proceeds to program the medication parameters
6. The Clinician reviews the program and starts infusion.
7. The pump starts infusing and the PIG reports a start event as follows:

<u>Reporting Data</u>	<u>Active Primary Step</u>
Infusion Event:	Start
Status:	Infusing
Order ID:	NULL
Infusate Name:	Clindamycin
Drug Amt.:	200.0000 mg
Dil. Vol. (mL):	2.0000
RATE (mL/h):	1.3333
VTBI (mL):	2.0000
Vol. Infused (mL):	0.0000

8. The Clinician back associates the infusion with the order in the EMAR
9. When the programmed VTBI of 2 mL is reached, the pump stops infusing and the PIG reports an Infusion Complete event as follows:

<u>Reporting Data</u>	<u>Active Primary Step</u>
Infusion Event:	Complete
Status:	Standby
Order ID:	NULL
Infusate Name:	Clindamycin
Drug Amt.:	200.0000 mg
Dil. Vol. (mL):	2.0000

<i>RATE (mL/h):</i>	1.3333
<i>VTBI (mL):</i>	2.0000
<i>Vol. Infused (mL):</i>	2.0000

10. The Clinician responds to the Infusion Complete alarm at the bedside
11. Clinician reviews I/O chart in EMAR and signs value for 2 mL of Clindamycin in patient chart.
12. The Clinician following BCMA process, scans patient and the flush syringe disposable.
13. The Clinicians signs administration of flush in the eMAR.
14. The Clinician turns to the pump.
15. The Clinician proceeds with the flush programming and enters 1 mL as the VTBI and selects START.
16. The pump starts infusing and the PIG reports an infusion start event as follows:

<u>Reporting Data</u>	<u>Active Flush Step</u>
<i>Infusion Event:</i>	Start
<i>Status:</i>	Flushing
<i>Med Order ID:</i>	NULL
<i>Flush Order ID:</i>	NULL
<i>Infusate Name:</i>	unknown
<i>Drug Amt.:</i>	----
<i>Dil. Vol. (mL):</i>	----
<i>RATE (mL/h):</i>	1.3333
<i>VTBI (mL):</i>	1.0000
<i>Vol. Infused (mL):</i>	0.0000

17. When the VTBI of 1 mL is reached, the pump stops infusing and the PIG reports a flush complete event as follows:

<u>Reporting Data</u>	<u>Active Flush Step</u>
<i>Infusion Event:</i>	Stop
<i>Status:</i>	Flushing
<i>Med Order ID:</i>	NULL
<i>Flush Order ID:</i>	NULL
<i>Infusate Name:</i>	unknown
<i>Drug Amt.:</i>	----
<i>Dil. Vol. (mL):</i>	----
<i>RATE (mL/h):</i>	1.3333
<i>VTBI (mL):</i>	1.0000
<i>Vol. Infused (mL):</i>	1.0000

18. Clinician reviews I/O chart in eMAR and signs values for 2 mL of Clindamycin and 1 mL of "Generic flush". Depending on HIS implementation, the generic flush may be associated with the Clindamycin.

7. AUTO PROGRAMMING FLUSH AFTER INFUSION COMPLETE

7.1 Description

Disposable tubing is pre-primed with 0.5 mL of a solution. The syringe disposable is load into the pump and the medication begins infusing. The medication step results in medication container running to infusion complete, all the dose volume was infused by pump but there is medication volume left in the tubing waiting to go to the patient.

7.2 Precondition(s)

- A PRN flush order exists in the HIS
- The Dose Volume is less than the volume in the disposable
- The Clindamycin infusion was associated with patient chart in eMAR and nearing completion

7.3 Post Condition(s)

7.4 Main Flow

1. The pump completes the VTBI and issues an Infusion Completion alarm
2. The pump stops infusing and the PIG reports to the HIS an infusion program complete event as follows:

<u>Reporting Data</u>	<u>Active Primary Step</u>
<i>Infusion Event:</i>	Complete
<i>Status:</i>	Standby
<i>Order ID:</i>	NULL
<i>Infusate Name:</i>	Clindamycin
<i>Drug Amt.:</i>	200.0000 mg
<i>Dil. Vol. (mL):</i>	2.0000
<i>RATE (mL/h):</i>	1.3333
<i>VTBI (mL):</i>	2.0000
<i>Vol. Infused (mL):</i>	2.0000

3. The Clinician responds to the Infusion Complete alarm at the bedside
4. The Clinician opens EMR and following BCMA process, scans patient, flush syringe disposable, and the pump.
5. Clinician sends a FLUSH APR PRN-order for Normal Saline to the pump

Flush APR Details	
<i>Clinician ID:</i>	RatchedRN
<i>Patient ID:</i>	W.Yueh
<i>Order Type:</i>	PrnFlush
<i>Order ID:</i>	FLUSHIE2000
<i>Flush Solution:</i>	Normal Saline
<i>VTBI.:</i>	0.5000

6. The PIG validates and accepts the Flush Request.

7. The Clinician turns to the pump.
8. Clinician unloads the medication syringe and connects and loads the flush syringe containing about 2 mL of Normal Saline.
9. The Clinician reviews auto-populated parameters and starts the flush step for Clindamycin on the pump.
10. The pump starts the Clindamycin flush and PIG reports to the HIS a flush start event as follows:

<u>Reporting Data</u>	Active Flush Step
Infusion Event:	Start
Status:	Flushing
Med Order ID:	NULL
Flush Order ID:	FLUSHIE2000
Infusate Name:	Normal Saline
Drug Amt.:	----
Dil. Vol. (mL):	----
RATE (mL/h):	1.3333
VTBI (mL):	0.5000
Vol. Infused (mL):	0.0000

11. The Clinician returns to the eMAR to sign the administration of the flush.
12. When the VTBI of 0.5 mL from the APR is reached, the pump stops infusing and the PIG reports a flush complete event as follows:

<u>Reporting Data</u>	Active Flush Step
Infusion Event:	Stop
Status:	Flushing
Med Order ID:	NULL
Flush Order ID:	FLUSHIE2000
Infusate Name:	Normal Saline
Drug Amt.:	----
Dil. Vol. (mL):	----
RATE (mL/h):	1.3333
VTBI (mL):	0.5000
Vol. Infused (mL):	0.5000

13. Clinician reviews I/O chart in eMAR and signs values for 2 mL of Clindamycin and 0.5 mL of Normal Saline infused over the last 2 hours. Depending on HIS implementation, the saline flush may be associated with the Clindamycin.

8. AUTO PROGRAMMING FLUSH AFTER SYRINGE EMPTY

8.1 Description

Disposable tubing is primed with about 0.5 mL of medication from the 2 mL of the syringe disposable. This creates a situation in which the available volume in the medication syringe is less than what is needed to be infused. The medication disposable is then load into the pump and the remaining medication is administered. The infusion program results in medication container running to syringe empty, dose volume remaining to be infused and drug left in the tubing waiting to go to the patient.

8.2 Precondition(s)

- A PRN flush order exists in the HIS
- The Dose Volume is greater than the volume in the disposable
- The Clindamycin infusion is associated with patient chart in eMAR and nearing syringe empty

8.3 Main Flow

1. Before completing the programmed VTBI, the pump detects the bottom of the disposable and issues a Syringe Empty alarm.
2. The pump stops and the PIG reports to the HIS, an infusion program stop event as follows:

<u>Reporting Data</u>	<u>Active Primary Step</u>
Infusion Event:	Stop
Status:	Alarming
Order ID:	MED0101
Infusate Name:	Clindamycin
Drug Amt.:	200.0000 mg
Dil. Vol. (mL):	2.0000
RATE (mL/h):	1.3333
VTBI (mL):	2.0000
Vol. Infused (mL):	1.5121

3. The Clinician responds to the Syringe Empty alarm at the bedside.
4. The Clinician opens EMR and following BCMA process, scans patient, flush syringe disposable, and the pump.
5. Clinician sends a FLUSH APR PRN-order for Normal Saline to the Pump

Flush APR Details	
Clinician ID:	RatchedRN
Patient ID:	W.Yueh
Order Type:	PrnFlush
Flush Order ID:	FLUSHIE2000
Flush Solution:	Normal Saline
VTBI:	1.0000

6. The PIG validates and accepts the Flush Request.

7. The Clinician turns to the pump.
8. The Clinician unloads the empty medication syringe on the pump, connects and loads the scanned flush syringe containing about 1 mL of Normal Saline.
9. The Clinician reviews auto-populated parameters and restarts the Clindamycin infusion.
10. The pump resumes the Clindamycin infusion and PIG reports to the HIS, a start infusion event as follows:

<u>Reporting Data</u>	<u>Active Primary Step</u>
Infusion Event:	Start
Status:	Infusing
Order ID:	MED0101
Infusate Name:	Clindamycin
Drug Amt.:	200.0000 mg
Dil. Vol. (mL):	2.0000
RATE (mL/h):	1.3333
VTBI (mL):	2.0000
Vol. Infused (mL):	1.5121

11. The Clinician returns to the eMAR to sign the administration of the flush.
12. Later when the Clindamycin volume infused reaches 2 mL = dose volume, the PIG reports to the HIS:
 - a. Clindamycin complete event as follows:

<u>Reporting Data</u>	<u>Active Primary Step</u>
Infusion Event:	Complete
Status:	Transitioning
Order ID:	MED0101
Infusate Name:	Clindamycin
Drug Amt.:	200.0000 mg
Dil. Vol. (mL):	2.0000 mL
RATE (mL/h):	1.3333
VTBI (mL):	2.0000
Vol. Infused (mL):	2.0000

- b. Immediately followed by a Start event for Clindamycin flush as follows:

<u>Reporting Data</u>	<u>Active Flush Step</u>
Infusion Event:	Start
Status:	Flushing
Med Order ID:	MED0101
Flush Order ID:	FLUSHIE2000
Infusate Name:	Normal Saline
Drug Amt.:	----
Dil. Vol. (mL):	----
RATE (mL/h):	1.3333
VTBI (mL):	0.5121
Vol. Infused (mL):	0.0000

13. When the VTBI of 1 mL from the APR is reached, the pump stops infusing and the PIG reports a flush complete event as follows:

<u>Reporting Data</u>	<u>Active Flush Step</u>
<i>Infusion Event:</i>	Stop
<i>Status:</i>	Flushing
<i>Med Order ID:</i>	MED0101
<i>Flush Order ID:</i>	FLUSHIE2000
<i>Infusate Name:</i>	Normal Saline
<i>Drug Amt:</i>	----
<i>Dil. Vol. (mL):</i>	----
<i>RATE (mL/h):</i>	1.3333
<i>VTBI (mL):</i>	0.5121
<i>Vol. Infused (mL):</i>	0.5121

14. The Clinician reviews I/O chart in eMAR and signs values for 2 mL of Clindamycin and 0.5121 mL of Normal Saline infused. The saline flush is associated with the Clindamycin.

9. AUTO PROGRAMMING FLUSH AFTER MICRO VOLUME PRIMED

9.1 Description

Disposable tubing is primed with small volume medication (dose vol. < tubing volume) and requires immediate start of flush disposable. The flush results in disposable running to infusion complete, all dose volume infused and no medication left in tubing

9.2 Precondition(s)

- The Dose Volume is less than the tubing volume
- Dose volume is manually pushed into tubing between pump and patient

9.3 Post Condition(s)

9.4 Main Flow

1. The Clinician opens EMR and following BCMA process, scans patient, medication syringe disposable, and the pump.
2. Clinician sends a medication APR for Clindamycin to the Pump
3. The Clinician turns to the pump.
4. After pushing all of the medication into the tubing below the pump, the Clinician loads **Flush disposable** into the pump.
5. The Clinician reviews auto-populated parameters and starts the Clindamycin infusion.
6. The pump starts infusing and the PIG reports a start event on the pump as follows:

<u>Reporting Data</u>	<u>Active Primary Step</u>
Infusion Event:	Start
Status:	Infusing
Order ID:	NULL
Infusate Name:	Clindamycin
Drug Amt.:	200.0000 mg
Dil. Vol. (mL):	2.0000
RATE (mL/h):	1.3333
VTBI (mL):	2.0000
Vol. Infused (mL):	0.0000

7. The Clinician returns to the eMAR to sign the administration of the Clindamycin medication.
8. When the programmed VTBI of 2 mL is reached, the pump stops infusing and the PIG reports an Infusion Complete event as follows:

<u>Reporting Data</u>	<u>Active Primary Step</u>
Infusion Event:	Complete
Status:	Standby
Order ID:	NULL
Infusate Name:	Clindamycin
Drug Amt.:	200.0000 mg
Dil. Vol. (mL):	2.0000

<i>RATE (mL/h):</i>	1.3333
<i>VTBI (mL):</i>	2.0000
<i>Vol. Infused (mL):</i>	2.0000

9. The Clinician responds to the Infusion Complete alarm at the bedside
10. Clinician reviews I/O chart in eMAR and sees a row for 2 mL of Clindamycin in patient chart.
11. The Clinician opens EMR and following BCMA process, scans patient, flush syringe disposable, and the pump.
12. Clinician sends a FLUSH APR order for Normal Saline to the Pump.

Flush APR Details	
<i>Clinician ID:</i>	RatchedRN
<i>Patient ID:</i>	W.Yueh
<i>Order Type:</i>	PrnFlush
<i>Order ID:</i>	FLUSHIE2000
<i>Flush Solution:</i>	Normal Saline
<i>VTBI.:</i>	0.5000

13. The PIG validates and accepts the Flush Request.
14. The Clinician turns to the pump.
15. The Clinician reviews auto-populated parameters and starts the flush step for Clindamycin on the pump.
16. The pump starts the Clindamycin flush and PIG reports to the HIS a flush start event as follows:

<u>Reporting Data</u>	Active Flush Step
<i>Infusion Event:</i>	Start
<i>Status:</i>	Flushing
<i>Med Order ID:</i>	NULL
<i>Flush Order ID:</i>	FLUSHIE2000
<i>Infusate Name:</i>	Normal Saline
<i>Drug Amt.:</i>	----
<i>Dil. Vol. (mL):</i>	----
<i>RATE (mL/h):</i>	1.3333
<i>VTBI (mL):</i>	0.5000
<i>Vol. Infused (mL):</i>	0.0000

17. The Clinician returns to the eMAR to sign the administration of the flush.
18. When the VTBI of 0.5 mL is reached, the pump stops infusing and the PIG reports a flush complete event as follows:

<u>Reporting Data</u>	Active Flush Step
<i>Infusion Event:</i>	Stop
<i>Status:</i>	Flushing
<i>Med Order ID:</i>	NULL
<i>Flush Order ID:</i>	FLUSHIE2000
<i>Infusate Name:</i>	Normal Saline

<i>Drug Amt.:</i>	----
<i>Dil. Vol. (mL):</i>	----
<i>RATE (mL/h):</i>	1.3333
<i>VTBI (mL):</i>	0.5000
<i>Vol. Infused (mL):</i>	0.5000

19. The Clinician reviews I/O chart in eMAR and signs values for 2 mL of Clindamycin and 0.5 mL of Normal Saline infused. The saline flush is associated with the Clindamycin.