

Intravenous to Oral Therapy Conversion

Malcolm P. Schuler, Pharm.D.

“Many hospitalized patients continue to receive intravenous medications longer than necessary. Earlier conversion from the intravenous to the oral route could increase patient safety, reduce costs, and facilitate earlier discharge from the hospital without compromising clinical care.”

Objective

To provide an objective criteria-based process for the appropriate conversion of intravenous drug therapy to the oral route in adult hospitalized patients.

Benefits of IV to PO Conversion

- Decreased incidence of infusion-related adverse events (e.g. phlebitis, line infections)
- Improved patient ambulation
- Improved patient comfort
- Decreased length of stay
- Decreased cost of care (direct and indirect)

Patient Selection Criteria

- Intact and functioning GI tract
Able to tolerate oral or enteral feeding (defined as tolerating at least a clear liquid diet or enteral feedings for 24 hours)
- Improving clinical status specific for drug therapy to be converted
- Criteria required for IV antibiotics prior to PO conversion:
 - Tmax < 100.4°F in the previous 24 hours
 - WBC is normalizing
 - Absence of neutropenia (defined as ANC < 500/mm³)
- Meets no exclusion criteria

Exclusion Criteria

- Patient is NPO, meaning at least one of the following:
 - Active NPO order in the chart
 - All medications by the non-oral route
 - No oral dietary or fluid intake
 - Ongoing, frequent operative procedures (including wound I & D) that require recurring NPO status

Exclusion Criteria (continued)

- Risk of aspiration without feeding tube access:
 - Inadequate gag reflex
 - Decreased level of consciousness/responsiveness, including comatose state
 - Uncontrolled seizures

Exclusion Criteria (continued)

- Non-functioning/inadequate GI tract function, including:
 - Gastrointestinal obstruction
 - Active order for complete bowel rest
 - Inflammatory bowel disease (acute exacerbation)
 - Acute pancreatitis

Exclusion Criteria (continued)

- Non-functioning/inadequate GI tract function (continued):
 - Fistula
 - Documented ileus
 - Active GI bleeding
 - Severe nausea, vomiting, or diarrhea

Exclusion Criteria (continued)

- Non-functioning/inadequate GI tract function (continued):
 - Continuous nasogastric suction
 - Malabsorption syndromes
 - Short bowel syndromes
 - Tube feeding residuals defined as greater than 250ml

Exclusion Criteria (continued)

- Other:
 - Patient refuses oral therapy
 - Patient has undergone bone marrow transplantation
 - Patient is hemodynamically unstable
 - ⊙ Requiring vasopressor agents
 - ⊙ Pulse > 120, respiratory rate > 24, systolic BP < 90

Exclusion Criteria (continued)

- For Antibiotic Conversion, the following diagnoses are excluded:
 - Central nervous system infections (including meningitis)
 - Endocarditis
 - Mediastinitis
 - Osteomyelitis
 - Cystic fibrosis exacerbations

Exclusion Criteria (continued)

- For Antibiotic Conversion, the following diagnoses are excluded (continued):
 - Persistent bacteremia or fungemia
 - Legionella pneumonia
 - Necrotizing fasciitis
 - Undrained abscess, inadequately drained abscess or emphysema

Ideal Characteristics of Oral Medications Included in an IV to PO Conversion Program

- Should have excellent bioavailability (ideally greater than 80%)
- Should be well tolerated upon administration
- Availability of multiple dosage forms (e.g., tablets and liquids)
- Dosing at a frequency equivalent to or less than the IV formulation
- Use should be supported by clinical data

Medications To Be Screened For IV to PO Conversion

- Azithromycin
- Chlorothiazide
- Ciprofloxacin
- Clindamycin
- Doxycycline
- Famotidine
- Fluconazole
- Folic Acid
- Levetiracetam
- Levofloxacin
- Linezolid
- Metronidazole
- Moxifloxacin
- Multivitamin
- Pantoprazole
- Rifampin
- Sulfamethoxazole/Trimethoprim
- Thiamine
- Voriconazole

Conversion Chart

(Intended only as a guide)

Medication	PO Equivalent
Azithromycin	Not technically IV = PO but if pt. has gotten 1 dose of IV azithro, (because of its HUGE Vd and Long T _{1/2}), switch to oral therapy at same dose is OK.
Chlorothiazide Doxycycline Famotidine Fluconazole Folic Acid	IV = PO Same dose & same frequency For BOTH IV and PO

Conversion Chart (continued)

(Intended only as a guide)

Medication	PO Equivalent
Levetiracetam Levofloxacin Linezolid Metronidazole Moxifloxacin Pantoprazole Rifampin Thiamine	IV = PO Same dose & same frequency For BOTH IV and PO

Conversion Chart (continued)

(Intended only as a guide)

Medication	PO Equivalent
Sulfamethoxazole/Trimethoprim Voriconazole	IV = PO Same dose & same frequency For BOTH IV and PO (round up to nearest # of tablets)
Ciprofloxacin	200mg IV Q24 = 250mg PO Q24 200mg IV Q12 = 250mg PO Q12 400mg IV Q24 = 500mg PO Q24 400mg IV Q12 = 500mg PO Q12 400mg IV Q8 = 750mg PO Q12

Conversion Chart (continued)

(Intended only as a guide)

Medication	PO Equivalent
Clindamycin	IV = PO but can't give as high of a dose because of intolerability so will usually be OK with a lower dose as pt gets better IV dose: 600 – 900mg Q6-8H PO dose: 300 – 450mg Q6-8H
Multivitamin Injection	1 tablet Q24H

Epic and acuity scoring

- Patients on IV medications that we are targeting and who are not NPO will appear in the acuity scoring for that day.

The screenshot displays the Epic Hyperspace interface for 'Teresa's Acuity' (260 Patients). The table below shows patient acuity scores across various categories. A red box highlights the 'IV to PO Acuity' column for five patients, indicating they are on IV medications.

Patient Name	Patient Location	Anti-infec Acuity	CrCl Acuity	IV to PO Acuity	i-Vents Acuity	Kinetics Acuity	Heparin Acuity	Warfarin Acuity	RX Acuity score	RX Acuity Changed	RX Acuity Last Reviewed
<i>Waterbath, Frankie</i>	NOMH ICU	10		10					20	20	
<i>Testtube, Frankie</i>	NOMH ICU	10		10					20	20	
<i>Swab, Frankie</i>	NOMH ICU	10		10					20	20	
<i>Slide, Frankie</i>	NOMH ICU	10		10					20	20	
<i>Pipet, Frankie</i>	NOMH ICU	10		10					20	20	

Below the table, patient details for **Ablation, David #225849 (Acct: 73000002507)** are shown, including treatment team sticky notes and lab results.

Epic and acuity scoring

- A sticky note will be left for the physician to inform them this patient may be appropriate to IV to PO switch.
- The pharmacist leaving the sticky note will open and IV to po i-Vent, leave this i-Vent open until the medication is changed.
- Then i-Vents acuity will now have a 10 to signify there is a open i-Vent. The following pharmacist will check on these open i-Vents and close them when appropriate.
- Also remove sticky note when IV to po is addressed.

RX snapshot to see sticky notes

The screenshot shows the Epic Hyperspace interface for a patient named Frankie Waterbath. The patient's information includes: TRNLabFrankie, N., DOB: 05/16/1958, Sex: Male, Hospital: Diabetes mellitus, Allergies: No Known Allergies, Ht: 5'9" (1.75...), BSA: 2.02..., On Dialysis?: --, CSN: 336119, MRN: 241448, Age: 54 y.o., and Provider Team... The interface displays the 'Rx Snapshot' view, which includes a navigation bar with 'Rx Snapshot' highlighted in a red box. Below the navigation bar, there are sections for 'Treatment Team Sticky Notes' and 'Sticky Notes to Physicians', both with red boxes around their respective 'Add/Edit comment' links. The 'All Medication Messages in the last 12 hours' section shows 'No recent messages for this patient'. The 'Problem List' section is also visible, listing conditions like Hypertension (Chronic), Diabetes mellitus (Chronic), and CAD (coronary artery disease) (Chronic) with their respective codes, priorities, and last modified dates.

Hyperspace - NOMH PHARMACY - Playground - TERESA N.

Epic

Order Entry In Basket My i-Vents Order Hx Label Hx Master Daily Schedule Today's Pts Dashboard Track Board Patient Station

Print Log Out

Waterbath, Frankie

Waterbath, Frankie TRNLabFrankie, N... DOB: 05/16/1958 Sex: Male Hospital, Allergies: Ht: 5'9" (1.75... BSA: 2.02... On Dialysis?: --
CSN: 336119 MRN: 241448 Age: 54 y.o. Provider Team... Diabetes mellitus, ... No Known Allergies Wt (kg): 83.9 CrCl: None

Rx Snapshot

Patient Summary Chart Review Results Review Notes Allergies Immunizations MAR Medications Order Review Order Entry

Index Rx Snapshot Springboard Report ADT Events Treatment Team Labs Ancillary Orders Index Report: Rx Snapshot

Waterbath, Frankie #241448 (Acct: 73000020288) (54 y.o. M) (Adm: 12/08/12) NOMH ICU-TRNLabFrankie-NONE

Treatment Team Sticky Notes [Add/Edit comment] Sticky Notes to Physicians [Add/Edit comment]

All Medication Messages in the last 12 hours [View All]

No recent messages for this patient

Problem List Never Reviewed

	Codes	Priority	Noted - Resolved	Last Modified
Hypertension (Chronic) Relevant Medications metoprolol (TOPROL-XL) 25 MG 24 hr tablet simvastatin (ZOCOR) 40 MG tablet	401.9		12/9/1997 - Present	12/8/2012 by Stethoscope, Sam, MD
Diabetes mellitus (Chronic) Relevant Medications insulin aspart (NOVOLOG) 100 unit/mL injection	250.00		12/8/2004 - Present	12/8/2012 by Stethoscope, Sam, MD
CAD (coronary artery disease) (Chronic)	414.00		12/8/2008 - Present	12/8/2012 by Stethoscope, Sam, MD

Add/Edit to add sticky note

Hyperspace - NOMH PHARMACY - Playground - TERESA N.

Order Entry In Basket My i-Vents Order Hx Label Hx Master Daily Schedule Today's Pts Dashboard Track Board Patient Station

Waterbath, Frankie

Waterbath, Frankie TRNLabFrankie, N... DOB: 05/16/1958 Sex: Male Hospital, Allergies: Ht: 5' 9" (1.75... BSA: 2.02 ... On Dialysis?: --
 CSN: 336119 MRN: 241448 Age: 54 y.o. Provider Team... Diabetes mellitus, ... No Known Allergies Wt (kg): 83.9 CrCl: None

Rx Snapshot

Index Rx Snapshot Springboard Report ADT Events Treatment Team Labs Ancillary Orders Index Report: Rx Snapshot

Patient Summary

Chart Review

Results Review

Notes

Allergies

Immunizations

MAR

Medications

Order Review

Order Entry

Order Set

Verify Orders

Clinical Knowledge...

Admission

Discharge

Waterbath, Frankie #241448 (Acct: 73000020288) (54 y.o. M) (Adm: 12/08/12) NOMH ICU-TRNLabFrankie-NONE

Treatment Team Sticky Notes [\[Add/Edit comment\]](#) **Sticky Notes to Physicians** [\[Add/Edit comment\]](#)

PHARMACY: This patient appears to be appropriate for IV to PO switch of the moxifloxacin. Please switch to moxifloxacin 400mg po daily if deemed appropriate. Thanks, Teresa Nash, PharmD

Last edited by **Teresa Nash** on 12/09/12 at 1 225 [View All](#)

All Medication Messages in the last 12 hours

No recent messages for this patient

Problem List Never Reviewed

	Codes	Priority	Noted - Resolved	Last Modified
Hypertension (Chronic) Relevant Medications metoprolol (TOPROL-XL) 25 MG 24 hr tablet simvastatin (ZOCOR) 40 MG tablet	401.9		12/9/1997 - Present	12/8/2012 by Stethoscope, Sam, MD
Diabetes mellitus (Chronic) Relevant Medications insulin aspart (NOVOLOG) 100 unit/mL injection	250.00		12/8/2004 - Present	12/8/2012 by Stethoscope, Sam, MD
CAD (coronary artery disease) (Chronic) Relevant Medications metoprolol (TOPROL-XL) 25 MG 24 hr tablet simvastatin (ZOCOR) 40 MG tablet	414.00		12/8/2008 - Present	12/8/2012 by Stethoscope, Sam, MD
Postsplenectomy sepsis	995.91		12/8/2012 - Present	12/8/2012 by Stethoscope, Sam, MD

Lab Result (24h ago through now)

NONE

Current Inpatient Medication Orders

D/C	Current Inpatient Medication Orders	Link	Status	Route	Frequency	PRN Reason	Start	End
D/C	0.9% NaCl infusion		Dispensed	IV	Continuous		12/08 0900	
D/C	morphine injection 4 mg		Dispensed	IV	Every 2 hours PRN	severe pain 7-10/10 pain scale	12/08 0952	

Do a new i-Vent

The screenshot shows the Epic EMR interface for a patient named Waterbath, Frankie. The patient's information includes: TRN Lab Frankie, N...; DOB: 05/16/1958; Sex: Male; Hospital: Diabetes mellitus, ...; Allergies: No Known Allergies; Ht: 5' 9" (1.75...); BSA: 2.02...; On Dialysis?: --; Wt (kg): 83.9; CrCl: None.

The 'Medications (Admitted on 12/8/2012)' section is active, showing a table of 'Current Facility-Administered Medications (5 listed)'. The table has columns for V, G, C, I, Medication, Dose, Route, Frequency, Start, End, D/C Reason, and Order Set. A red box highlights the 'New i-Vent' button in the top right of the medication section. Another red box highlights the row for 'moxifloxacin (AVELOX) 400 mg/250 mL IVPB 400 mg', which is currently set to 'Intravenous' and 'Once @ 250 mL/hr over 60 Minutes'.

V	G	C	I	Medication	Dose	Route	Frequency	Start	End	D/C Reason	Order Set
✓	✓			0.9% NaCl infusion		Intravenous	Continuous @ 100 mL/hr	12/8/2012 0900			
✓	✓			morphine injection 4 mg	4 mg	Intravenous	Every 2 hours PRN for severe pain 7-10/10 pain scale	12/8/2012 0952			
✓	✓			moxifloxacin (AVELOX) 400 mg/250 mL IVPB 400 mg	400 mg	Intravenous	Once @ 250 mL/hr over 60 Minutes	12/8/2012 0900	after 1 dose(s)		
✓	✓			norepinephrine (LEVOPHED) 16 mcg/mL in dextrose 250 mL infusion	0.1 mcg/kg/min x 83.9 kg	Intravenous	Continuous @ 21.5 mcg/hr	12/8/2012 1000			
✓	✓			ondansetron (ZOFTRAN) injection 4 mg	4 mg	Intravenous	Every 6 hours PRN for Nausea, Vomiting Given	12/8/2012 0953			

Leave i-Vent open

Hyperspace - NOMH PHARMACY - Playground - TERESA N.

Order Entry In Basket My i-Vents Order Hx Label Hx Master Daily Schedule Today's Pts Dashboard Track Board Patient Station

Waterbath, Frankie

Waterbath, Frankie CSN: 336119 TRNLabFrankie, N... MRN: 241448 DOB: 05/16/1958 Age: 54 y.o. Sex: Male Hospital, Diabetes mellitus, ... Allergies: No Known Allergies Ht: 5' 9" (1.75... Wt (kg): 83.9 BSA: 2.02 ... On Dialysis?: --

Intervention

General Information

Types: 1 Route change - IV/SQ/IM to PO
2

Status: Open

Significance: medium

Value: 60.00

Time spent: 10 minutes

Response: Accepted

Outcomes: 1 Optimized Therapy
2

Linked Items

Linked patient: WATERBATH,FRANKIE

Order
moxifloxacin (AVELOX) 400 mg/250 mL IVPB 400 mg
Order Name + Add

Documentation

Left sticky note to change moxi iv to po

Associated Users

User	Role
1 NASH, TERESA	
2	

Scratch Notes

Accept Cancel

Note the new i-Vent acuity

The screenshot displays the Epic Hyperspace interface for a user named TERESA N. The main window shows a table of patient acuity data for 'Teresa's Acuity' (260 Patients). A red box highlights the 'i-Vents Acuity' column, which shows a value of 10 for the patient 'Waterbath, Frankie'. Below the table, the 'Rx Snapshot' report is visible, showing patient information and a sticky note from the pharmacy regarding a medication switch.

Patient Name	Patient Location	Anti-infec Acuity	CrCl Acuity	IV to PO Acuity	i-Vents Acuity	Kinetics Acuity	Heparin Acuity	Warfarin Acuity	RX Acuity score	RX Acuity Changed	RX Acuity Last Reviewed
Waterbath, Frankie	NOMH ICU	10		10	10				30	30	
Testtube, Frankie	NOMH ICU	10		10					20	20	
Swab, Frankie	NOMH ICU	10		10					20	20	
Slide, Frankie	NOMH ICU	10		10					20	20	
Pipet, Frankie	NOMH ICU	10		10					20	20	

Waterbath, Frankie #241448 (Acct: 73000020288) (54 y.o. M) (Adm: 12/08/12) **NOMH ICU-TRNLabFrankie-NONE**

Treatment Team Sticky Notes [Add/Edit comment] **Sticky Notes to Physicians** [Add/Edit comment]

PHARMACY: This patient appears to be appropriate for IV to PO switch of the moxifloxacin. Please switch to moxifloxacin 400mg po daily if deemed appropriate.
Thanks, Teresa Nash, PharmD
Last edited by **Teresa Nash** on 12/09/12 at 1225

All Medication Messages in the last 12 hours [View All]

No recent messages for this patient

Problem List

Never Reviewed

When iv is switched to po – close i-vent

Hyperspace - NOMH PHARMACY - Playground - TERESA N.

Epic | Order Entry | In Basket | My i-Vents | Order Hx | Label Hx | Master Daily Schedule | Today's Pts | Dashboard | Track Board | Patient Station

Waterbath, Frankie

Waterbath, Frankie TRNLabFrankie, N... DOB: 05/16/1958 Sex: Male Hospital, Allergies: No Known Allergies Ht: 5'9" (1.75... BSA: 2.02 ...
 CSN: 336119 MRN: 241448 Age: 54 y.o. Provider Team... Diabetes mellitus, ... Wt (kg): 83.9 CrCl: None

Medications (Admitted on 12/8/2012)

Filters | Clear Filters | Med Notes | Reorder Rx | Modify | Discontinue | Adjust Times | Order Hx | Dispense | Label Hx | New i-Vent | **Edit i-Vent** | Add to i-Vent | In

Current | Encounter | History | Prior to Admission

Current Facility-Administered Medications (5 listed)

V	G	C	I	Medication	Dose	Route	Frequency	Start	End	D/C Reason	Order Set
✓				0.9% NaCl infusion		Intravenous	Continuous @ 100 mL/hr	12/8/2012 0900			
✓				morphine injection 4 mg	4 mg	Intravenous	Every 2 hours PRN for severe pain 7-10/10 pain scale Given	12/8/2012 0952			
✓				moxifloxacin (AVELOX) 400 mg/250 mL IVPB 400 mg	400 mg	Intravenous	Once @ 250 mL/hr over 60 Minutes	12/8/2012 0900	after 1 dose(s)		
✓				norepinephrine (LEVOPHED) 16 mcg/mL in dextrose 250 mL infusion	0.1 mcg/kg/min × 83.9 kg	Intravenous	Continuous @ 31.5 mL/hr	12/8/2012 1000			
✓				ondansetron (ZOFTRAN) injection 4 mg	4 mg	Intravenous	Every 6 hours PRN for Nausea, Vomiting Given	12/8/2012 0953			

Waterbath, Frankie TRNLabFrankie, N... DOB: 05/16/1958 Sex: Male Hospital, Allergies: Ht: 5' 9" (1.75... BSA: 2.02 ... On Dialysis?: --
CSN: 336119 MRN: 241448 Age: 54 y.o. Provider Team... Diabetes mellitus, ... No Known Allergies Wt (kg): 83.9 CrCl: None

- ←
-
- Patient Summary
- Chart Review
- Results Review
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- Allergies
- Immunizations
- MAR
- Medications
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- Order Entry
- Order Set
- Verify Orders
- Clinical Knowledge...
- Admission
- Discharge

Intervention ? To Sidebar Close

Created by: Teresa Nash on 12/9/2012 12:29 Intervention Histo

General Information

Types: 1 Route change - IV/SQ/IM to PO
2

Status: Closed

Significance: Medium

Value: 60.00

Time spent: 10 minutes

Response: Accepted

Outcomes: 1 Optimized Therapy
2

Linked Items

Linked patient: Waterbath, Frankie

Order: moxifloxacin (AVELOX) 400 mg/250 mL IVPB 400 mg Remove

Order Name + Add

Associated Users

User	Role
1 NASH, TERESA	
2	

Scratch Notes

Insert SmartText

Documentation File to Note

Switched iv to po

===view-only below this line===

>> NASH, TERESA 12/9/2012 12:29
Left sticky note to change moxi iv to po

Accept Cancel

When iv is switched to po – remove sticky note

The screenshot displays the Epic EMR interface for patient **Waterbath, Frankie** (CSN: 336119, TRN: TRNLabFrankie, N... MRN: 241448, DOB: 05/16/1958, Sex: Male, Hospital: Diabetes mellitus, ... Allergies: No Known Allergies, Ht: 5' 9" (1.75... BSA: 2.02... On Dialysis?: -- Wt (kg): 83.9 CrCl: None).

The **Rx Snapshot** section shows a **Sticky Note** with the following text: "PHARMACY: This patient appears to be appropriate for IV to PO switch of the moxifloxacin. Please switch to moxifloxacin 400mg po daily if deemed appropriate. Thanks, Teresa Nash, PharmD Last edited by Teresa Nash on 12/09/12 at 1225".

A **Rx Snapshot - Comments** dialog box is open, showing a list of comments. The **Accept** button is highlighted with a red box.

Comment	Last Modified
[Redacted]	12/8/2012 by Stethoscope, Sam, MD
[Redacted]	12/8/2012 by Stethoscope, Sam, MD
[Redacted]	12/8/2012 by Stethoscope, Sam, MD
[Redacted]	12/8/2012 by Stethoscope, Sam, MD

PRN Reason	Start	End
severe pain 7-10/10 pain scale	12/08 0900	12/08 0952
	12/08 0900	12/08 1000