

# Clinical implementation of medication review - screening to supervise effectiveness and appropriateness

Adapted from Dr Bertrand Guignard presentation

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# CONFLICT OF INTERESTS

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**Member of the editorial committee of  
PIM-Check**



# Learning session questions

Mr X., with medical history of COPD (classification GOLD 3), is admitted in internal medicine for community-acquired pneumonia, with moderate hypokalaemia (2.8 mmol/L). His admission prescription includes :

- Beclometasone 200 mcg BID
- Ciprofloxacin 400 mg BID PO
- Ceftazidime 6 g IV continuous infusion (solvent: NaCl 0.9% 100mL)
- KCl 40mmol IV 6h-infusion (solvent: NaCl 0.9% 500 ml) QD

What verbal advice can you give during the medical round ?

1. Ceftazidime and KCl are physically incompatible. Propose stopping and rinsing the infusion line before KCl administration  
True or false
2. Ciprofloxacin associated with hypokalaemia is at risk of torsade de pointes. Propose an electrocardiogram monitoring.  
True or False
3. Inhaled corticosteroids should not be prescribed as a first-line treatment and/or as a monotherapy to treat COPD. Consider prescribing beta2-agonist or anticholinergics as first line treatment  
True or False

# CLINICAL CASE

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# Clinical Case

Mrs X, 73 years old, 162 cm, 50 kg

## ✧ Admission pattern

- ✧ Back pain,
- ✧ Fever for 5 days,
- ✧ Increased frequency of urination

## ✧ Physical examination

- ✧ Fever (39.5° C),
- ✧ Tachycardia,
- ✧ Dyspnea on moderate levels of exertion
- ✧ BP : 140/90
- ✧ Heart rate : 110 beats per minute
- ✧ Respiratory rate : 28 breaths per minute

## ✧ Laboratory test results

- ✧ eGFR: 45mL/min/1.73m<sup>2</sup> (90 - 130 ml/min)
- ✧ White blood cells: 20 G/L (4 - 11 G/L)
- ✧ CRP: 344 (<10)
- ✧ Potassium: 2.7 mmol/L (3.5 - 5 mmol/L)

## ✧ Medical diagnostic

- ✧ Acute pyelonephritis with severe sepsis
- ✧ Cardiac decompensation (LVEF 30%)

## ✧ Past medical history

- ✧ Stable ischemic heart disease
  - ✧ STEMI (2011, with stent),
  - ✧ NSTEMI (2014, with stent)
- ✧ HBP
- ✧ Persistent atrial fibrillation (AF)
- ✧ Chronic kidney disease (eGFR : 45 mL/min)
  - ✧ Leading cause: High blood pressure
- ✧ Depression, anxiety, sleep disorders
- ✧ Ø OH, Ø Tobacco

# Clinical Case: treatment 48h after admission

## ▶ Medication history

- Aspirin 100 mg QD
- Hydrochlorothiazide 25 mg QD
- Omeprazole 40 mg QD
- Acenocoumarol QD dose adjusted according to INR
- Diltiazem extended-release 90 mg BID
- Fluoxetine 20 mg QD
- Furosemide 20 mg QD
- Oxazepam 15 mg QD
- OTC : paracetamol, ibuprofen

## ▶ Added at admission

- KCl 40 mmol TID IV infusion over 1h (solvent: NaCl 0.9% 250 ml)
- Magnesium sulfate 2 g continuous IV infusion (solvent: NaCl 0.9% 250 ml)
- Ceftriaxone 2 g IV infusion over 30 min QD (solvent: NaCl 0.9% 100 ml)
- Tramadol 25 mg QID PO, then 50 mg QID, poorly effective

# Drug-related problems (DRPs)

▶ Definition :

*“Event or circumstance involving drug therapy that **actually** or **potentially** interferes with desired health outcomes”*

# Drug-related problems (DRPs)

## Hepler CD, *et al.* definition (1990)

- 1) Untreated indication (under-prescription)
- 2) Drug use without indication (over-prescription)
- 3) Improper Drug Selection (mis-prescription)
- 4) Subtherapeutic Dosage
- 5) Overdosage
- 6) Adverse drug reaction
- 7) Drug interaction
- 8) Failure to receive a drug



# Drug-related problems (DRPs)

## DRPs added in some other countries

- 1) Untreated indication (under-prescription)
- 2) Drug use without indication, **duplication** (over-prescription)
- 3) Improper Drug Selection (mis-prescription)
- 4) Subtherapeutic Dosage
- 5) Overdosage
- 6) Adverse drug reaction
- 7) Drug interaction
- 8) Failure to receive drug
- 9) **Contra-indication**
- 10) **Insufficient drug monitoring**
- 11) **Improper route of administration**
- 12) **Improper drug form**
- 13) **Improper treatment duration**

# Drug therapy appropriateness

## Medication Appropriateness Index (MAI)

Table 1. Medication Appropriateness Index\*

To assess the appropriateness of the drug, please answer the following questions and circle the applicable score:				
1. Is there an indication for the drug? Comments:	1 Indicated	2	3 Not Indicated	9 DK†
2. Is the medication effective for the condition? Comments:	1 Effective	2	3 Ineffective	9 DK
3. Is the dosage correct? Comments:	1 Correct	2	3 Incorrect	9 DK
4. Are the directions correct? Comments:	1 Correct	2	3 Incorrect	9 DK
5. Are the directions practical? Comments:	1 Practical	2	3 Impractical	9 DK
6. Are there clinically significant drug–drug interactions? Comments:	1 Insignificant	2	3 Significant	9 DK
7. Are there clinically significant drug–disease/condition interactions? Comments:	1 Insignificant	2	3 Significant	9 DK
8. Is there unnecessary duplication with other drug(s)? Comments:	1 Necessary	2	3 Unnecessary	9 DK
9. Is the duration of therapy acceptable? Comments:	1 Acceptable	2	3 Unacceptable	9 DK
10. Is this drug the least expensive alternative compared to others of equal utility? Comments:	1 Least expensive	2	3 Most expensive	9 DK

\*Complete instructions in the use of the scale are available upon request.

†Don't know.



# What are we going to talk about today ?

- ▶ Drug – Drug Interactions
- ▶ Doses adjustment
- ▶ Drug administration
- ▶ Adverse drug reactions
- ▶ Inappropriate prescribing:
  - ▶ Under-prescriptions
  - ▶ Over-prescriptions
  - ▶ Mis-prescriptions

# DRUG – DRUG INTERACTIONS

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# Drug – Drug Interactions (DDI)?

## ▶ Medication history

- Aspirin 100 mg QD
- Hydrochlorothiazide 25 mg QD
- Omeprazole 40 mg QD
- Acenocoumarol QD dose adjusted according to INR
- Diltiazem extended-release 90 mg BID
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- Furosemide 20 mg QD
- Oxazepam 15 mg QD
- OTC : paracetamol, ibuprofen

## ▶ Added at admission

- KCl 40 mmol TID IV 1h-infusion (solvent: NaCl 0.9% 250 ml)
- Magnesium sulfate 2 g IV continuous infusion (solvent: NaCl 0.9% 250 ml)
- Ceftriaxone 2 g IV infusion over 30 min (solvent: NaCl 0.9% 100 ml)
- Tramadol 25 mg QID PO, then 50 mg QID, poorly effective

# Drug – Drug Interactions: Sources

## ▶ Software and Apps



- ▶ Lexi-Interact (Lexi Comp's):  
[www.lexi.com](http://www.lexi.com)



- ▶ Micromedex Drugs interactions:  
[www.micromedexsolutions.com](http://www.micromedexsolutions.com)



- ▶ Epocrates:  
[www.epocrates.com](http://www.epocrates.com)

## ▶ Tables

- ▶ Cytochrome Tables:  
[www.hug-ge.ch/sites/interhug/files/structures/pharmacologie\\_et\\_toxicologie\\_cliniques/documents/interactions\\_medicamenteuses\\_et\\_cyp450.pdf](http://www.hug-ge.ch/sites/interhug/files/structures/pharmacologie_et_toxicologie_cliniques/documents/interactions_medicamenteuses_et_cyp450.pdf)

## ▶ Books

- ▶ Stockley's Drug Interactions
- ▶ Drugdex

## ▶ Specific tools



- ▶ HIV: [www.hiv-druginteractions.org](http://www.hiv-druginteractions.org)



- ▶ HCV: [www.hep-druginteractions.org](http://www.hep-druginteractions.org)

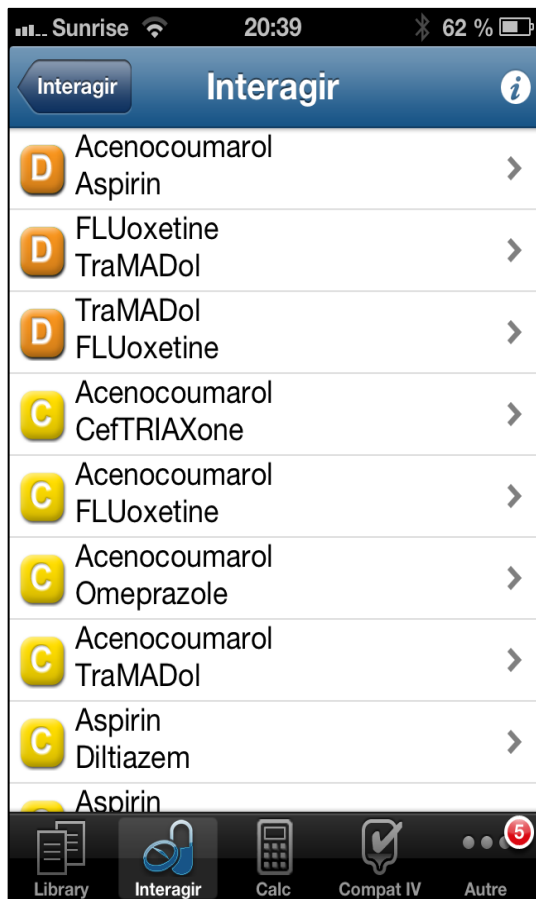


- ▶ Opioids DDIs:  
[www.opioiddruginteractions.com](http://www.opioiddruginteractions.com)

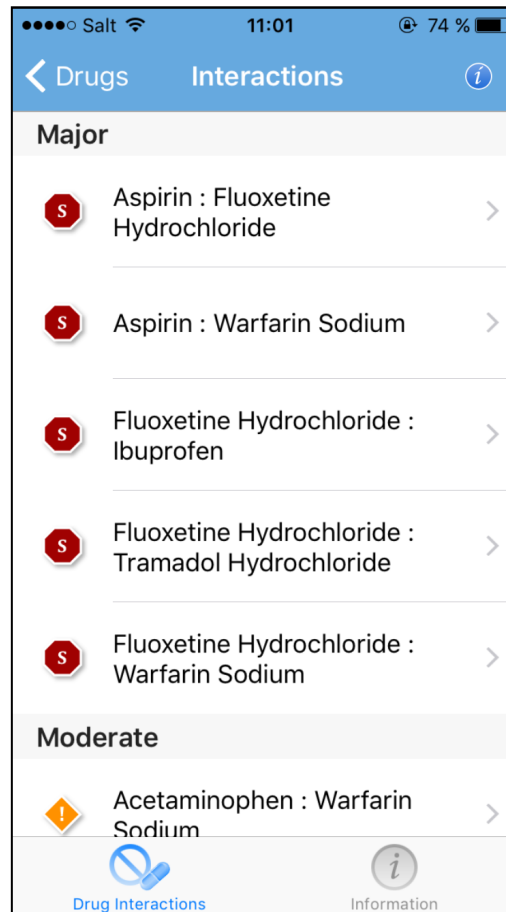


# Drug – Drug Interactions: Sources

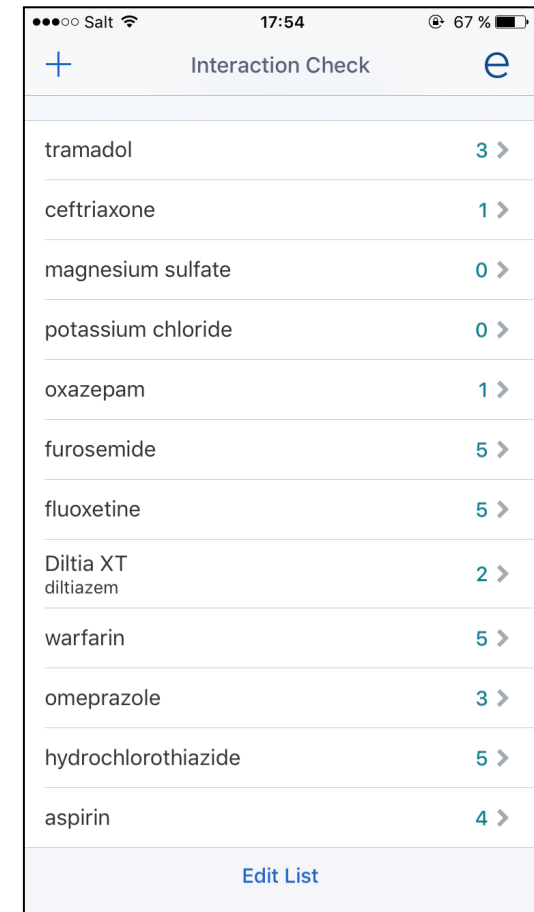
## Lexi-Interact



## Micromedex Drugs



## Epocrates





# Drug – Drug Interactions: Software comparisons

	Compendium	Lexi-Interact	Epocrates	Thériaque
INN search	Non	Oui	Oui	Oui
Brand Name search	Oui	Oui (noms commerciaux américains)	Oui (noms commerciaux américains)	Oui (noms commerciaux français)
Levels of risk rating	4 (6)	5	4	4
Colour code	Oui (rouge-orange-jaune)	Non	Oui (rouge-bleu)	Non
Risk Rating	✓	✓	✓	✓
Interaction frequency	X	X	X	X
Interaction mechanism	✓	✓	X	✓
Interaction effect	✓	✓	✓	✓
Clinical management	✓	✓	✓	(✓) → dépend du médicament
References	✓	✓	X	(✓) → seulement Thesaurus
Update	Tous les 14 jours	Continueuse?	Continueuse?	Quotidienne
Smartphone app	X	✓	✓	X

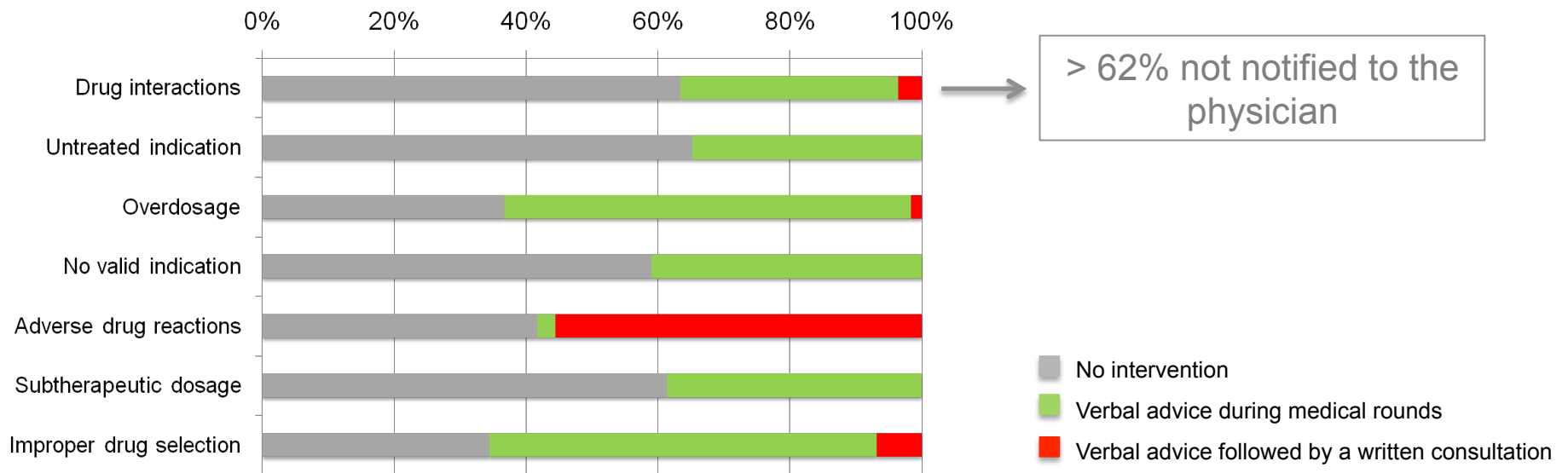
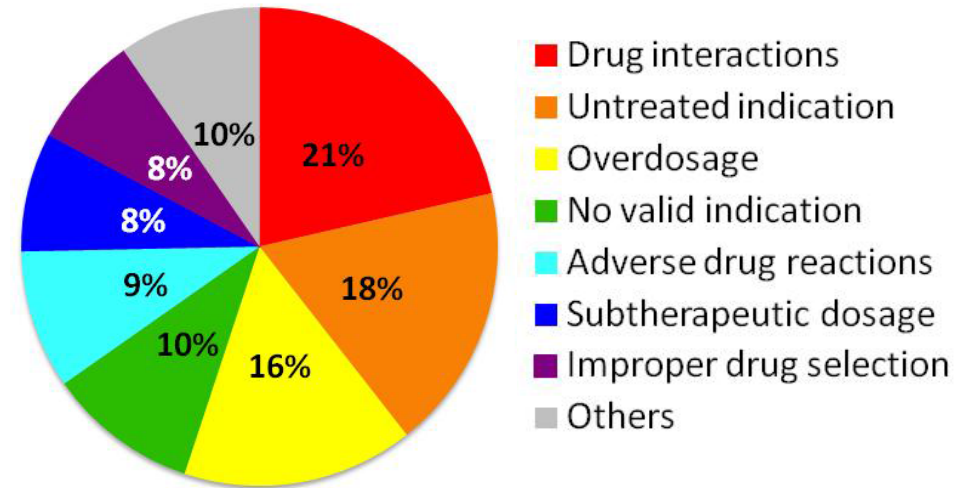
	Compendium suisse des médicaments	Lexi-Interact	Epocrates	Thériaque
True positives	50	59	58	45
False positives	0	0	2	1
True negatives	12	12	10	11
False negatives	12	3	4	17
Sensitivity	80%	95%	94%	73%
Specificity	100%	100%	83%	92%

62 pairs of interactions, 12 pairs without interaction

Adapted from : Ing Lorenzini K et al. Quel programme informatique de détection des interactions médicamenteuses néfastes ? Rev Med Suisse. 2012 Oct 17;8(358):1978-82.

# Drug – Drug Interactions: Software limits

6 months  
 2 internal medicine wards  
 1 visit per week  
 145 patients included  
 69 years old (21-99)  
 1523 lines of prescription  
 383 DRPs identified



# Lexi-Interact

Lexicomp® Lexi-Interact™

Lookup

Enter item name to lookup.

Analyze New List

- [Acenocoumarol](#)
- [Aspirin](#)
- [CefTRIAXone](#)
- [DiltiazEM CD](#)
- [FLUoxetine](#)
- [Furosemide](#)
- [Ginkgo Biloba](#)
- [HydroCHLOROthiazide](#)
- [Ibuprofen](#)
- [Magnesium Sulfate](#)
- [Omeprazole](#)
- [Oxazepam](#)
- [Paracetamol \(INT\)](#)
- [Potassium Chloride](#)
- [TraMADol](#)

•Display complete list of interactions for an individual item by clicking item name.  
•Add another item(s) [Lookup] to Analyze for potential interactions between items in the list.  
•Remove item from the list by clicking the check mark next to the item name.

## Lexi-Comp Online™ Interaction Analysis

### Customize Analysis

Only interactions at or above the selected [risk rating](#) will be displayed. [A: ▼]  
View interaction detail by clicking on link.

#### Acenocoumarol

- [D] [Aspirin](#) (Salicylates)
- [C] [CefTRIAXone](#) (Cephalosporins)
- [C] [FLUoxetine](#) (Agents with Antiplatelet Properties)
- [C] [FLUoxetine](#) (Selective Serotonin Reuptake Inhibitors)
- [D] [Ginkgo Biloba](#) (Ginkgo Biloba)
- [D] [Ibuprofen](#) (NSAID (Nonselective))
- [C] [Omeprazole](#) (Omeprazole)
- [C] [Paracetamol \(INT\)](#) (Acetaminophen)
- [C] [TraMADol](#) (TraMADol)

#### Aspirin

- [D] [Acenocoumarol](#) (Vitamin K Antagonists)
- [C] [DiltiazEM CD](#) (Calcium Channel Blockers (Nondihydropyridine))
- [C] [FLUoxetine](#) (Selective Serotonin Reuptake Inhibitors)
- [C] [Furosemide](#) (Loop Diuretics)
- [D] [Ginkgo Biloba](#) (Ginkgo Biloba)
- [D] [Ibuprofen](#) (NSAID (Nonselective))

#### CefTRIAXone

- [C] [Acenocoumarol](#) (Vitamin K Antagonists)

#### DiltiazEM CD (DiltiazEM)

- [C] [Aspirin](#) (Salicylates)
- [B] [Ibuprofen](#) (NSAID (Nonselective))
- [C] [Magnesium Sulfate](#) (Magnesium Salts)

#### FLUoxetine

- [C] [Acenocoumarol](#) (Anticoagulants)
- [C] [Acenocoumarol](#) (Vitamin K Antagonists)
- [C] [Aspirin](#) (Aspirin)
- [D] [Ginkgo Biloba](#) (Herbs (Anticoagulant/Antiplatelet Properties))
- [C] [HydroCHLOROthiazide](#) (Thiazide and Thiazide-Like Diuretics)
- [D] [Ibuprofen](#) (NSAID (Nonselective))
- [C] [Omeprazole](#) (CYP2C9 Inhibitors (Moderate))
- [C] [Oxazepam](#) (CNS Depressants)
- [C] [TraMADol](#) (TraMADol)
- [C] [TraMADol](#) (TraMADol)

#### Furosemide

- [C] [Aspirin](#) (Salicylates)
- [D] [Ibuprofen](#) (Nonsteroidal Anti-Inflammatory Agents)
- [C] [TraMADol](#) (Analgesics (Opioid))

#### Ginkgo Biloba

- [D] [Acenocoumarol](#) (Vitamin K Antagonists)
- [D] [Aspirin](#) (Salicylates)
- [D] [FLUoxetine](#) (Agents with Antiplatelet Properties)
- [B] [HydroCHLOROthiazide](#) (Thiazide and Thiazide-Like Diuretics)
- [D] [Ibuprofen](#) (Agents with Antiplatelet Properties)
- [D] [Ibuprofen](#) (Nonsteroidal Anti-Inflammatory Agents)

#### HydroCHLOROthiazide

- [C] [FLUoxetine](#) (Selective Serotonin Reuptake Inhibitors)
- [B] [Ginkgo Biloba](#) (Ginkgo Biloba)
- [C] [Ibuprofen](#) (Nonsteroidal Anti-Inflammatory Agents)
- [C] [TraMADol](#) (Analgesics (Opioid))

#### Ibuprofen

- [D] [Acenocoumarol](#) (Vitamin K Antagonists)
- [D] [Aspirin](#) (Salicylates)
- [B] [DiltiazEM CD](#) (Calcium Channel Blockers)
- [D] [FLUoxetine](#) (Selective Serotonin Reuptake Inhibitors)
- [D] [Furosemide](#) (Loop Diuretics)
- [D] [Ginkgo Biloba](#) (Herbs (Anticoagulant/Antiplatelet Properties))
- [D] [Ginkgo Biloba](#) (Herbs (Anticoagulant/Antiplatelet Properties))
- [C] [HydroCHLOROthiazide](#) (Thiazide and Thiazide-Like Diuretics)

#### Magnesium Sulfate

- [C] [DiltiazEM CD](#) (Calcium Channel Blockers)
- [C] [Oxazepam](#) (CNS Depressants)
- [C] [TraMADol](#) (CNS Depressants)

#### Omeprazole

- [C] [Acenocoumarol](#) (Vitamin K Antagonists)
- [C] [FLUoxetine](#) (CYP2C9 Substrates)

#### Oxazepam

- [C] [FLUoxetine](#) (Selective Serotonin Reuptake Inhibitors)
- [C] [Magnesium Sulfate](#) (Magnesium Sulfate)
- [C] [TraMADol](#) (CNS Depressants)

#### Paracetamol (INT) (Acetaminophen)

- [C] [Acenocoumarol](#) (Vitamin K Antagonists)
- [B] [TraMADol](#) (Analgesics (Opioid))

#### Potassium Chloride

No interactions identified with others in the selection list.

#### TraMADol

- [C] [Acenocoumarol](#) (Vitamin K Antagonists)
- [C] [FLUoxetine](#) (CYP2D6 Inhibitors (Strong))
- [C] [FLUoxetine](#) (Serotonin Modulators)
- [C] [Furosemide](#) (Diuretics)
- [C] [HydroCHLOROthiazide](#) (Diuretics)
- [C] [Magnesium Sulfate](#) (Magnesium Sulfate)
- [C] [Oxazepam](#) (CNS Depressants)
- [B] [Paracetamol \(INT\)](#) (Acetaminophen)



Hôpitaux  
Universitaires  
Genève

# Micromedex Drugs Interactions

## Fluoxetine + tramadol

← Drugs Interactions ⓘ

**Major**

- Ⓢ Aspirin : Fluoxetine Hydrochloride >
- Ⓢ Aspirin : Warfarin Sodium >
- Ⓢ Fluoxetine Hydrochloride : Ibuprofen >
- Ⓢ Fluoxetine Hydrochloride : Tramadol Hydrochloride >
- Ⓢ Fluoxetine Hydrochloride : Warfarin Sodium >

**Moderate**

- ⚠ Acetaminophen : Warfarin Sodium >

Drug Interactions ⓘ Information

← Interactions Interaction ⓘ

Fluoxetine Hydrochloride : Tramadol Hydrochloride

**Severity:** Major  
**Onset:** Rapid  
**Documentation:** Good

**Interaction Effect:**  
Concurrent use of FLUOXETINE and TRAMADOL may result in an increased risk of seizures, opioid toxicity, and serotonin syndrome (hypertension, hyperthermia, myoclonus, mental status changes), and increased concentrations of tramadol and decreased concentrations of tramadol active metabolite, M1.

**Clinical Management:**  
Use caution with concomitant use of fluoxetine and tramadol. Concomitant use of tramadol with SSRIs, serotonin norepinephrine reuptake inhibitors

Drug Interactions ⓘ Information

## Aspirin + ibuprofen

← Interactions Interaction ⓘ

Aspirin : Ibuprofen

**Severity:** Moderate  
**Onset:** Not Specified  
**Documentation:** Good

**Interaction Effect:**  
Concurrent use of ASPIRIN and IBUPROFEN may result in decreased antiplatelet effect of aspirin and additive risk of bleeding.

**Clinical Management:**  
Ibuprofen can interfere with the irreversible platelet inhibition effects of aspirin via competition at the platelet cyclooxygenase-1 (COX-1) binding site. This interaction may increase the risk of adverse thrombotic events in patients who receive daily low-dose aspirin as preventive therapy. If regular combined

Drug Interactions ⓘ Information

# Drug – Drug Interactions

## ▶ Medication history

- Aspirin 100 mg QD
- Hydrochlorothiazide 25 mg QD
- Omeprazole 40 mg QD
- Acenocoumarol QD dose-adjusted according to INR
- Diltiazem extended-release 90 mg BID
- Fluoxetine 20 mg QD
- Furosemide 20 mg QD
- Oxazepam 15 mg QD
- OTC : paracetamol, **ibuprofen**

## ▶ Added at admission

- KCl 40 mmol TID IV 1h-infusion (solvent: NaCl 0.9% 250 ml)
- Magnesium sulfate 2 g IV continuous infusion (solvent: NaCl 0.9% 250 ml)
- Ceftriaxone 2 g IV infusion over 30 min (solvent: NaCl 0.9% 100 ml)
- ~~Tramadol 25 mg QID PO, then 50 mg QID, poorly effective~~
- **Buprenorphine 0.1 mg TID + 0.1 mg BID if needed**

# DOSES

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# Doses: Sources

## ▶ Software and Apps



- ▶ Lexi Comp's: [www.lexi.com](http://www.lexi.com)



- ▶ Micromedex (Drugdex):  
[www.micromedexsolutions.com](http://www.micromedexsolutions.com)



- ▶ European Medicines Agency:  
[www.ema.europa.eu](http://www.ema.europa.eu)

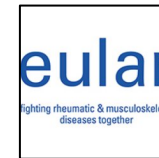


- ▶ U.S. Food and Drug Administration:  
[www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm](http://www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm)

- ▶ National drug databases, SmPCs

## ▶ Guidelines

- ▶ National and international scientific societies and regulatory agencies



## ▶ Specific tools

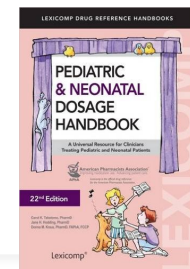
- ▶ Renal failure

ICAR : [www.sitegpr.com](http://www.sitegpr.com)

The renal drug database:  
[renaldrugdatabase.com](http://renaldrugdatabase.com)

- ▶ Pediatrics:

Pediatric & Neonatal dosage handbook (Lexicomp) [www.lexi.com](http://www.lexi.com)



# Doses?

## ▶ Medication history

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- Oxazepam 15 mg QD
- OTC : paracetamol

## ▶ Added at admission

- KCl 40 mmol TID IV 1h-infusion (solvent: NaCl 0.9% 250 ml)
- Magnesium sulfate 2 g IV continuous infusion (solvent: NaCl 0.9% 250 ml)
- Ceftriaxone 2 g IV infusion over 30 min (solvent: NaCl 0.9% 100 ml)
- Buprenorphine 0.1 mg TID + 0.1 mg BID if needed



# Doses?

## Omeprazole

Omeprazole: Drug information Lexicomp®

[Access Lexicomp Online here.](#)

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(For additional information [see "Omeprazole: Patient drug information"](#) and [see "Omeprazole: Pediatric drug information"](#))

NSAID-induced ulcer prophylaxis (off-label use): Oral: 20 mg once daily for up to 6 months (Cullen 1998)

## Furosemide

**Table 7.3** Doses of diuretics commonly used in patients with heart failure

Diuretics	Initial dose (mg)	Usual daily dose (mg)		
<b>Loop diuretics<sup>a</sup></b>				
Furosemide	20–40	40–240		
Bumetanide	0.5–1.0	1–2		
Torsemide	5–10	10–20		
<b>Thiazides<sup>b</sup></b>				
Bendroflumethiazide	2.5	2.5–10		
Hydrochlorothiazide	25	12.5–100		
Metolazone	2.5	2.5–10		
Indapamide <sup>c</sup>	2.5	2.5–5		
<b>Potassium-sparing diuretics<sup>d</sup></b>				
	+ACE-I/ ARB	-ACE-I/ ARB	+ACE-I/ ARB	-ACE-I/ ARB
Spironolactone/ eplerenone	12.5–25	50	50	100– 200
Amiloride	2.5	5	5–10	10–20
Triamterene	25	50	100	200

ACE-I = angiotensin-converting enzyme inhibitor, ARB = angiotensin receptor blocker.

<sup>a</sup>Oral or intravenous; dose might need to be adjusted according to volume status/weight; excessive doses may cause renal impairment and ototoxicity.

<sup>b</sup>Do not use thiazides if estimated glomerular filtration rate <30 mL/min/1.73 m<sup>2</sup>, except when prescribed synergistically with loop diuretics.

<sup>c</sup>Indapamide is a non-thiazide sulfonamide.

<sup>d</sup>A mineralocorticoid antagonist (MRA) i.e. spironolactone/eplerenone is always preferred. Amiloride and triamterene should not be combined with an MRA.

# Doses?

## ▶ Medication history

- Aspirin 100 mg QD
- Hydrochlorothiazide 25 mg QD
- Omeprazole ~~40 mg~~ 20 mg QD
- Acenocoumarol QD dose-adjusted according to INR
- Diltiazem extended-release 90 mg BID
- Fluoxetine 20 mg QD
- Furosemide ~~20 mg~~ 40 mg QD
- Oxazepam 15 mg QD
- OTC : paracetamol

## ▶ Added at admission

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- Magnesium sulfate 2 g IV continuous infusion (solvent: NaCl 0.9% 250 ml)
- Ceftriaxone 2 g IV infusion over 30 min (solvent: NaCl 0.9% 100 ml)
- Buprenorphine 0.2 mg TID + 0.1 mg TID if needed

# DRUG ADMINISTRATION

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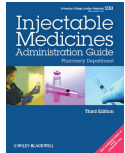
# Drug administration?

- ▶ Parenteral administration
  - ▶ Which solvent (compatibility) ?
  - ▶ Which concentration (vascular irritation) ?
  - ▶ Which infusion rate (systemic intolerance) ?
  - ▶ Y-site compatibility ?
- ▶ Switch IV – PO
- ▶ Oral and enteral route
  - ▶ Scored/unscored tablets
  - ▶ Crush/chew tablets/ Open capsules ?
  - ▶ Oral suspension available
  - ▶ Administration through Naso/gastric tube

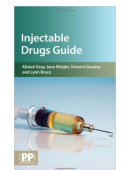
# Drug administration: some sources

- ▶ **Software and Apps**
- ▶ Previous drug databases
  - ▶ Lexi Comp's: [www.lexi.com](http://www.lexi.com)
  - ▶ Micromedex: [www.micromedexsolutions.com](http://www.micromedexsolutions.com)

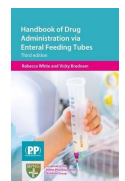
- ▶ **Books**



- ▶ Injectable Medicines administration guide



- ▶ Injectable Drugs Guide  
[ssu.ac.ir/cms/fileadmin/user\\_upload/bimarestanha/shahid\\_sadooghi/paraclinic/daokhane/file/Injectable\\_Drugs\\_Guide.pdf](http://ssu.ac.ir/cms/fileadmin/user_upload/bimarestanha/shahid_sadooghi/paraclinic/daokhane/file/Injectable_Drugs_Guide.pdf)



- ▶ Handbook of Drug Administration via Enteral Feeding Tubes  
[www.pharmacy.cmu.ac.th/unit/unit\\_files/files\\_download/2012-03-26HandbkOfDrugAdminiViaEnteralFeedingTubes%201stEd\\_WhiteAndBradn.pdf](http://www.pharmacy.cmu.ac.th/unit/unit_files/files_download/2012-03-26HandbkOfDrugAdminiViaEnteralFeedingTubes%201stEd_WhiteAndBradn.pdf)

# Drug administration?

## ▶ Medication history

- Aspirin 100 mg QD
- Hydrochlorothiazide 25 mg QD
- Omeprazole 20 mg QD
- Acenocoumarol QD dose-adjusted according to INR
- Diltiazem extended-release 90 mg BID
- Fluoxetine 20 mg QD
- Furosemide 40 mg QD
- Oxazepam 15 mg QD
- OTC : paracetamol

## ▶ Added at admission

- KCl 40 mmol TID IV 1h-infusion (solvent: NaCl 0.9% 250 ml)
- Magnesium sulfate 2 g IV continuous infusion (solvent: NaCl 0.9% 250 ml)
- Ceftriaxone 2 g IV infusion over 30 min (solvent: NaCl 0.9% 100 ml)
- Buprenorphine 0.2 mg TID + 0.1 mg TID if needed

# Parenteral administration: Injectable Drugs Guide

## Potassium chloride

### The UK NPSA Patient Safety Alert (Oct 2002)

Potassium chloride concentrate solution can be fatal if given inappropriately, therefore:

- Commercially prepared ready to use dilute solutions containing potassium chloride should be used wherever possible.
- If a suitable solution is not available commercially, dilutions should be made in the hospital pharmacy wherever possible.
- Storage of concentrated potassium chloride solutions should be restricted to pharmacy departments and to those critical care areas where concentrated solutions are needed for urgent use.
- Receipt and use of these solutions should be recorded in a similar way to Controlled Drugs and stocks should be kept in a separate locked cupboard away from commonly used diluting solutions.
- Potassium chloride concentrate solution should not be transferred between clinical areas.

### Dose

**Treatment of hypokalaemia:** the dose is dependent upon the biochemistry and clinical condition of the patient.

**Mild to moderate ↓K (K > 2.5 mmol/L):** oral KCl supplements are usually adequate. If the oral route is temporarily unavailable, a single dose of 20–40 mmol by IV infusion over 6–8 hours may be sufficient to treat acute deficiency.

**Severe ↓K (K < 2.5 mmol/L):** 20–40 mmol (as a 40 mmol/L solution) by IV infusion at a maximum rate of 20 mmol/hour (10 mmol/hour is the usual maximum in a general ward area) governed by the clinical status and hydration of the patient. Repeat as necessary according to biochemistry results.

More concentrated solutions may be given in a critical care area with ECG monitoring, particularly where fluid overload is problematic.

NB: There is a high risk of asystole if the administration rate reaches 40 mmol/hour.

# Drug administration?

## ▶ Medication history

- Aspirin 100 mg QD
- Hydrochlorothiazide 25 mg QD
- Omeprazole 20 mg QD
- Acenocoumarol QD dose-adjusted according to INR
- Diltiazem extended-release 90 mg BID
- Fluoxetine 20 mg QD
- Furosemide 40 mg QD
- Oxazepam 15 mg QD
- OTC : paracetamol

## ▶ Added at admission

- KCl 40 mmol **TID once** IV **1h** infusion **over 6-8 h** (solvent: NaCl 0.9% **250 500** ml) **then 16 mmol TID PO**
- Magnesium sulfate 2 g IV-continuous infusion (solvent: NaCl 0.9% 250 ml)
- Ceftriaxone 2 g IV infusion over 30 min (solvent: NaCl 0.9% 100 ml)
- Buprenorphine 0.2 mg TID + 0.1 mg TID if needed



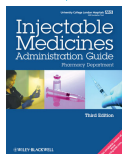
# Drug administration: some sources

- ▶ **Software and Apps**

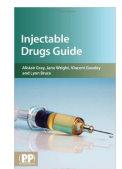
- ▶ Previous drug databases

- ▶ Lexi Comp's: [www.lexi.com](http://www.lexi.com)
- ▶ Micromedex: [www.micromedexsolutions.com](http://www.micromedexsolutions.com)

- ▶ **Books**



- ▶ Injectable Medicines administration guide



- ▶ Injectable Drugs Guide  
[ssu.ac.ir/cms/fileadmin/user\\_upload/bimarestanha/shahid\\_sadooghi/paraclinic/daokhane/file/Injectable\\_Drugs\\_Guide.pdf](http://ssu.ac.ir/cms/fileadmin/user_upload/bimarestanha/shahid_sadooghi/paraclinic/daokhane/file/Injectable_Drugs_Guide.pdf)



- ▶ Handbook of Drug Administration via Enteral Feeding Tubes  
[www.pharmacy.cmu.ac.th/unit/unit\\_files/files\\_download/2012-03-26HandbkOfDrugAdminiViaEnteralFeedingTubes%201stEd\\_WhiteAndBradn.pdf](http://www.pharmacy.cmu.ac.th/unit/unit_files/files_download/2012-03-26HandbkOfDrugAdminiViaEnteralFeedingTubes%201stEd_WhiteAndBradn.pdf)

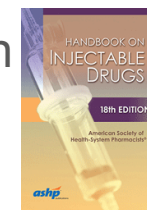
- ▶ **Compatibility**

- ▶ Software and Apps

- ▶ King Guide : [www.kingguide.com](http://www.kingguide.com)
- ▶ Micromedex IV Compatibility: [www.micromedexsolutions.com](http://www.micromedexsolutions.com)

- ▶ Books

- ▶ Trissel's Handbook on Injectable Drugs
- ▶ Neofax



- ▶ Tables

- ▶ CHUV table  
[files.chuv.ch/internet-docs/pha/medicaments/pha\\_phatab\\_compatibilitesy.pdf](http://files.chuv.ch/internet-docs/pha/medicaments/pha_phatab_compatibilitesy.pdf)
- ▶ HUG table  
[pharmacie.hug-ge.ch/infomedic/utilismedic/HUG\\_CompatAdm\\_DCI.pdf](http://pharmacie.hug-ge.ch/infomedic/utilismedic/HUG_CompatAdm_DCI.pdf)



# Compatibility: tools evaluation



- Evaluation by 2 pharmacists
- 40 pairs frequently used in pediatric intensive care units
- Trissel's handbook = gold standard

**Table 4** Tool-evaluation summary

Tool	Accuracy score <sup>a</sup>	Completeness score <sup>a</sup>	Comprehensiveness score <sup>a</sup>	Applicability score <sup>a</sup>	Global score <sup>a</sup>
Ref	250	250	250	250	1000
Thé	234	200	218	188	840
pH	175	200	134	298	807
CHUV	213	150	174	266	803
Perf	230	138	218	191	776
NeoF	190	181	116	191	678
King	192	131	108	211	642
Stab	179	144	149	112	584
KIK	105	156	157	105	523

Ref Trissel's Handbook

Thé Thériaque database, Perf Perfysi database, CHUV CHUV's cross-table King King cross-table wall chart, NeoF Neofax handbook, Stab Stabilis database, pH pH cross-table, KIK software

# Incompatibility

## Micromedex IV Compatibility

Y-Site Test Detail	Rating
Ceftriaxone sodium - Magnesium sulfate	Not Tested
Ceftriaxone sodium - Potassium chloride	Compatible
Magnesium sulfate - Potassium chloride	Compatible

### IV COMPATIBILITY DETAIL

Drug 1	Drug 2	Status	Information	Test Parameters
Ceftriaxone sodium 165mg/mL in D5W- Dextrose 5%	Potassium chloride 1mEq/mL in D5W- Dextrose 5%	Compatible	Physical Compatibility: Physically compatible. No changes in measured haze or turbidity, particulates, or color were found.  Storage: Ambient room temperature near 23 °C exposed to normal fluorescent light.	Reference: 8869  Study Period: 4 hours.  Method: Visual observation and electronic assessment.  Container: Simulated Y-site administration using glass test tubes.
Ceftriaxone sodium 165mg/mL in Normal saline- Sodium chloride 0.9%	Potassium chloride 1mEq/mL in Normal saline- Sodium chloride 0.9%	Compatible	Physical Compatibility: Physically compatible. No changes in measured haze or turbidity, particulates, or color were found.  Storage: Ambient room temperature near 23 °C exposed to normal fluorescent light.	Reference: 8869  Study Period: 4 hours.  Method: Visual observation and electronic assessment.  Container: Simulated Y-site administration using glass test tubes.

## King Guide

Search IV Drugs (up to 10):



Search for another drug to add it to the multiple drug compatibility results.

Click any drug to remove it from the results.

= Compatible = Incompatible = Conflicting Reports NA = No Data

Click any symbol to view the fluids, dosages, and details.  
Click any drug to view the complete monograph for that drug.

CEFTRIAXONE SODIUM

POTASSIUM CHLORIDE

MAGNESIUM SULFATE

Y-Site	CEFTRIAXONE SODIUM	MAGNESIUM SULFATE	POTASSIUM CHLORIDE
CEFTRIAXONE SODIUM	-		
MAGNESIUM SULFATE		-	
POTASSIUM CHLORIDE			-

Syringe	CEFTRIAXONE SODIUM	MAGNESIUM SULFATE	POTASSIUM CHLORIDE
CEFTRIAXONE SODIUM	-		
MAGNESIUM SULFATE		-	NA
POTASSIUM CHLORIDE		NA	-

Admixture	CEFTRIAXONE SODIUM	MAGNESIUM SULFATE	POTASSIUM CHLORIDE
CEFTRIAXONE SODIUM	-		
MAGNESIUM SULFATE		-	
POTASSIUM CHLORIDE			-

**Caution:** The compatibility of two or more drugs in the same IV line/container should not be inferred from information presented here, unless data on that specific combination has actually been reported within the text of the monograph.

# Drug administration?

## ▶ Medication history

- Aspirin 100 mg QD
- Hydrochlorothiazide 25 mg QD
- Omeprazole 20 mg QD
- Acenocoumarol QD dose-adjusted according to INR
- Diltiazem extended-release 90 mg BID
- Fluoxetine 20 mg QD
- Furosemide 40 mg QD
- Oxazepam 15 mg QD
- OTC : paracetamol

## ▶ Added at admission

- KCl 40 mmol once IV infusion over 6-8 h (solvent: NaCl 0.9% 500 ml) then 16 mmol TID PO
- Magnesium sulfate 2 g IV-continuous infusion (solvent: NaCl 0.9% 250 ml)
- Ceftriaxone 2 g IV infusion over 30 min (solvent: NaCl 0.9% 100 ml)
- Buprenorphine 0.2 mg TID + 0.1 mg TID if needed

**2 different veins or rinse the infusion line between administration and as soon as the clinical condition allows it, switch antibiotic IV-PO**

# ADVERSE DRUG REACTIONS

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# Adverse drug reactions: some sources

## ▶ Software and Apps



- ▶ Lexi Comp's: [www.lexi.com](http://www.lexi.com)



- ▶ Micromedex (Drugdex): [www.micromedexsolutions.com](http://www.micromedexsolutions.com)



- ▶ European Medicines Agency: [www.ema.europa.eu](http://www.ema.europa.eu)



- ▶ U.S. Food and Drug Administration: [www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm](http://www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm)

- ▶ National drug databases, SmPCs

## ▶ Hepatic disorders



- ▶ Livertox: [livertox.nlm.nih.gov](http://livertox.nlm.nih.gov)

## ▶ G6PD deficiency



- ▶ G6PD Deficiency favism association: [www.g6pd.org/en/G6PDDeficiency/SafeUnsafe/DaEvitare\\_ISS-it](http://www.g6pd.org/en/G6PDDeficiency/SafeUnsafe/DaEvitare_ISS-it)

## ▶ QT prolongation



- ▶ CredibleMeds: [crediblemeds.org](http://crediblemeds.org)

## ▶ Combination of apps



- ▶ PIM-Check: [pimcheck.org](http://pimcheck.org)

# Adverse drug reactions: key symptoms

- ▶ Hepatic disorders (abnormal liver function tests)
- ▶ Hematologic disorders (Neutropenia/ Agranulocytosis, leukopenia or lymphopenia, haemolytic anaemia, thrombocytopenia)
- ▶ Haemorrhage
- ▶ Skin reactions
- ▶ Anaphylactic reactions
- ▶ Acute renal failure
- ▶ Digestive disorders (dysphagia, epigastric pain, constipation, diarrhoea)
- ▶ Cough
- ▶ Hypo/Hyperglycaemia
- ▶ Electrolyte disorders (hyponatremia, hypo/hyperkalemia, hypocalcemia ...)
- ▶ Neurologic or musculoskeletal disorders (dizziness, seizure, myalgia)
- ▶ Cardiovascular disorders (cardiac rhythm disorders, heart failure, hypo/hypertension)



# Adverse drug reactions?

## ▶ Medication history

- Aspirin 100 mg QD
- Hydrochlorothiazide 25 mg QD
- Omeprazole 20 mg QD
- Acenocoumarol QD dose-adjusted according to INR
- Diltiazem extended-release 90 mg BID
- Fluoxetine 20 mg QD
- Furosemide 40 mg QD
- Oxazepam 15 mg QD
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- Ceftriaxone 2 g IV infusion over 30 min (solvent: NaCl 0.9% 100 ml)
- Buprenorphine 0.1 mg TID + 0.1 mg BID if needed

# INAPPROPRIATE PRESCRIBING

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**Under-prescriptions**  
**Over-prescriptions**  
**Mis-prescriptions**

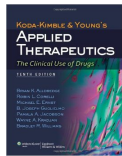
# Inappropriate prescribing: sources

## ▶ Guidelines

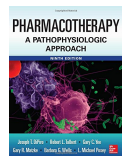


- ▶ Uptodate: [www.uptodate.com](http://www.uptodate.com)

## ▶ Books



- ▶ Koda-Kimble & Young's Applied Therapeutics: The Clinical Use of Drugs



- ▶ DiPiro Pharmacotherapy : A Pathophysiologic Approach. 2014

- ▶ National and international scientific societies and regulatory agencies

## ▶ Explicit criteria

- ▶ STOPP/START version 2:  
*Screening tool of older people's prescriptions / Screening tool to alert to right treatment*

O'Mahony D et al. STOPP/START criteria for potentially inappropriate prescribing in older people:version 2. Age Ageing. 2015;44:213-8. PMID: 25324330

- ▶ PIM-Check:

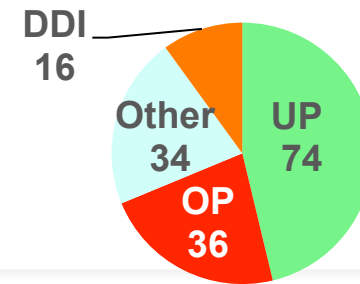
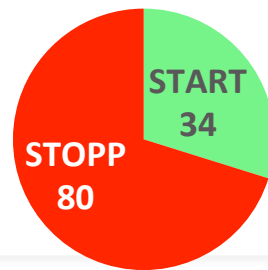
*Potentially inappropriate prescribing for patients in internal medicine checklist*

[pimcheck.org](http://pimcheck.org)

Desnoyer et al. PIM-Check: An International Prescription-Screening Checklist Designed by a Delphi Method for Adult Internal Medicine Patients. In revision

# Explicit criteria: STOPP/START vs PIM-Check

	STOPP/START version 2	PIM-Check
▶ <b>Explicit criteria validated using a 2 round web-based Delphi method involving</b>	19 experts in geriatrics from 13 european countries	39 experts in internal medicine from Be, Fr, QC, CH
▶ <b>Target</b>	Older people	Adult in internal medicine unit
▶ <b>Number of items</b>	114 items	160 items
▶ <b>Types of PIM</b>	Over- (STOPP) /under- (START) prescriptions	Over- (OP) / under- (UP) / mis-prescriptions (Other) / drug-drug interactions (DDI)



# Explicit criteria: STOPP/START vs PIM-Check

## STOPP/START version 2

## PIM-Check

### ▶ Classification

Classified according to pathophysiological systems

### ▶ Presentation

2 tables (paper)

#### Appendix 3: Screening Tool of Older Persons' Prescriptions (STOPP) version 2.

The following prescriptions are potentially inappropriate to use in patients aged 65 years and older.

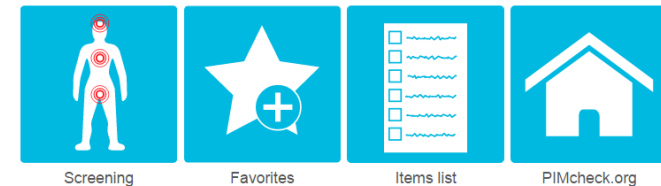
#### Section A: Indication of medication

1. Any drug prescribed without an evidence-based clinical indication.
2. Any drug prescribed beyond the recommended duration, where treatment duration is well defined.
3. Any duplicate drug class prescription e.g. two concurrent NSAIDs, SSRIs, loop diuretics, ACE inhibitors, anticoagulants (optimisation of monotherapy within a single drug class should be observed prior to considering a new agent).

#### Section B: Cardiovascular System

1. Digoxin for heart failure with normal systolic ventricular function (no clear evidence of benefit)
2. Verapamil or diltiazem with NYHA Class III or IV heart failure (may worsen heart failure).
3. Beta-blocker in combination with verapamil or diltiazem (risk of heart block).
4. Beta blocker with bradycardia (< 50/min), type II heart block or complete heart block (risk of complete heart block, asystole).
5. Amiodarone as first-line antiarrhythmic therapy in supraventricular tachyarrhythmias (higher risk of side-effects than beta-blockers, digoxin, verapamil or diltiazem)

### Website and Webmobile application



#### CARDIOLOGY

##### Heart failure

- UP Heart failure: Start ACEI or ARB
- UP Heart failure: Start beta-blocker\* treatment
- UP Heart failure: Start aldosterone antagonist when LVEF ≤ 35% despite optimal treatment
- OP Heart failure: Drugs that may exacerbate HF

##### Dyslipidaemia and hypolipidemics

- UP Dyslipidaemia and high cardiovascular risk: start statins

# Explicit criteria: STOPP/START vs PIM-Check

## STOPP/START version 2

## PIM-Check

### Medical specialties, pathologies and domains included

▶ Cardiovascular System	✓	✓
▶ Coagulation System	✓	✓
▶ CNS and Psychiatry	✓	✓
▶ Renal/ urogenital System	✓	✓
▶ Gastrointestinal System	✓	✓
▶ Respiratory System	✓	✓
▶ Musculoskeletal System	✓	✓
▶ Urogenital System	✓	✓
▶ Endocrine System	✓	✓
▶ Pain and Analgesic Drugs	✓	✓
▶ Ophthalmology	✓	✓
▶ Vaccination	✓	✓
▶ Other	<ul style="list-style-type: none"> <li>▶ Drug indication</li> <li>▶ Drugs with increased risk of falls in older people</li> <li>▶ Antimuscarinic/ anticholinergic drugs</li> </ul>	<ul style="list-style-type: none"> <li>▶ Dependencies</li> <li>▶ Infectious diseases</li> <li>▶ Obesity</li> <li>▶ Pharmacology &amp; toxicology</li> <li>▶ Transplantation</li> </ul>

# Inappropriate prescribing?

## ▶ Medication history

- Aspirin 100 mg QD
- Hydrochlorothiazide 25 mg QD
- Omeprazole 20 mg QD
- Acenocoumarol QD dose-adjusted according to INR
- Diltiazem extended-release 90 mg BID
- Fluoxetine 20 mg QD
- Furosemide 40 mg QD
- Oxazepam 15 mg QD
- OTC : paracetamol

## ▶ Added at admission

- KCl 40 mmol TID IV 1h-infusion (solvent: NaCl 0.9% 500 ml) then 16 mmol TID PO
- Magnesium sulfate 2 g IV continuous infusion (solvent: NaCl 0.9% 250 ml)
- Ceftriaxone 2 g IV infusion over 30 min (solvent: NaCl 0.9% 100 ml)
- Buprenorphine 0.1 mg TID + 0.1 mg BID if needed

# Over-prescriptions

## STOPP criteria

### Section B: Cardiovascular System criteria

2. Verapamil or diltiazem with NYHA Class III or IV heart failure (may worsen heart failure)

### Section C: Antiplatelet/Anticoagulant Drugs

5. Aspirin in combination with vitamin K antagonist, direct thrombin inhibitor or factor Xa inhibitors in patients with chronic atrial fibrillation (no added benefit from aspirin)

## PIM-Check over-prescription criteria

- OP** Heart failure: Drugs that may exacerbate HF  
triggering factors: HEART FAILURE + Diltiazem
- OP** Proper use of antibiotics: reevaluate the duration of therapy  
triggering factors: ceftriaxone
- OP** QT prolongation: drugs that prolong the QT interval  
triggering factors: STEMI, NSTEMI, Heart failure, Hypokaliémie + fluoxetine + furosemide + hydrochlorothiazide



# Under-prescriptions

## START criteria

### Section A: Cardiovascular System criteria

5. Statin therapy with a documented history of coronary, cerebral or peripheral vascular disease, unless the patient's status is end-of-life or age is > 85 years.
6. Angiotensin Converting Enzyme (ACE) inhibitor with systolic heart failure and/or documented coronary artery disease.
7. Beta-blocker with ischaemic heart disease.
8. Appropriate beta-blocker (bisoprolol, nebivolol, metoprolol or carvedilol) with stable systolic heart failure.

### Section H: Analgesics

2. Laxatives in patients receiving opioids regularly.

### Section I: Vaccines

1. Seasonal trivalent influenza vaccine annually
2. Pneumococcal vaccine at least once after age 65 according to national guidelines

## PIM-Check under-prescription criteria

- UP Heart failure: Start ACEI or ARB
- UP Heart failure: Start beta-blocker\* treatment
- UP STEMI / NSTEMI Secondary prevention: Start statins
- UP STEMI / NSTEMI Secondary prevention: Start ACEI or ARB
- UP RF: Calcium, vitamin D and/or phosphate-binding agents
- UP Opioids: start prophylactic measures\* to prevent constipation
- UP Annual influenza vaccination
- UP Pneumococcal vaccination: high-risk patients\*  
triggering factors: Heart failure, STEMI/NSTEMI, Chronic kidney disease

# Other and drug interaction

## PIM-Check other criteria

**OTH** HBP: Favour ACEI or ARB in patients with diabetes/CKD/HF/STEMI/NSTEMI and HBP

**OTH** Proper use of antibiotics: reevaluate the route of administration

## PIM-Check DDI criteria

**DDI** Anticoagulation and DDI  
triggering factors: acenocoumarol + diltiazem, omeprazole, ceftriaxone, fluoxetine

**DDI** DDI: strong enzyme inducers and inhibitors\*  
triggering factors: diltiazem (inh CYP3A4, Pgp), fluoxetine (inh CYP2D6, Pgp)

**Stop : Aspirin, diltiazem, hydrochlorothiazide**

**Start: Betablocker, ACEI, Statin, Calcium, Vitamin D, Phosphate binding agent (according to phosphate plasma concentrations), Laxative**

Switch: antibiotic with good oral bioavailability (according to antibiotic resistance testing : ciprofloxacin?)

**DDI: strengthen INR and ECG monitoring**

# Inappropriate prescribing?

## ▶ Medication history

- ~~Aspirin 100 mg QD~~
- ~~Hydrochlorothiazide 25 mg QD~~
- Omeprazole 20 mg QD
- Acenocoumarol QD dose-adjusted according to INR
- ~~Diltiazem extended-release 90 mg BID~~
- Fluoxetine 20 mg QD
- Furosemide 40 mg QD
- Oxazepam 15 mg QD
- Calcium / colecalciferol 1000/800 QD
- Bisoprolol 1.25 mg QD (starting dose)
- Enalapril 2.5 mg BID (starting dose)
- Pravastatin 20 mg QD
- Macrogol 3350 QD
- OTC : paracetamol

## ▶ Added at admission

- KCl 40 mmol TID IV 1h-infusion (solvent: NaCl 0.9% 250 ml) then 16 mmol TID PO
- Magnesium sulfate 2 g IV continuous infusion (solvent: NaCl 0.9% 250 ml)
- Ceftriaxone 2 g IV infusion over 30 min (solvent: NaCl 0.9% 100 ml)
- Buprenorphine 0.1 mg TID + 0.1 mg BID if needed

# And now?

## ▶ Medication history

- Omeprazole 20 mg QD
- Acenocoumarol QD dose-adjusted according to INR
- Fluoxetine 20 mg QD
- Furosemide 40 mg QD
- Oxazepam 15 mg QD
- Calcium / colecalciferol 1000/800 QD
- Bisoprolol 1.25 mg QD (starting dose)
- Enalapril 2.5 mg BID (starting dose)
- Pravastatin 20 mg QD
- Macrogol 3350 QD
- OTC : paracetamol

## ▶ Added at admission

- KCl 40 mmol TID IV 1h-infusion (solvent: NaCl 0.9% 250 ml) then 16 mmol TID PO
- Magnesium sulfate 2 g IV continuous infusion (solvent: NaCl 0.9% 250 ml)
- Ceftriaxone 2 g IV infusion over 30 min (solvent: NaCl 0.9% 100 ml)
- Buprenorphine 0.1 mg TID + 0.1 mg BID if needed

# You need to start again the approach

- ▶ Drug – Drug Interactions
- ▶ Doses
- ▶ Drug administration
- ▶ Adverse drug reactions
- ▶ Inappropriate prescribing:
  - ▶ Under-prescriptions
  - ▶ Over-prescriptions
  - ▶ Mis-prescriptions

# Take Home Messages

- ▶ **To detect DRPs you need to have:**
  - ▶ Clinical and therapeutic knowledge (e.g.: guidelines, interaction, dose,...)
  - ▶ Some clinical experience
  
- ▶ **But most of all:**
  - ▶ To be responsive
  - ▶ To know how to use appropriate tools

# THANK YOU FOR YOUR ATTENTION

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[audedesnoyer@gmail.com](mailto:audedesnoyer@gmail.com)