

Clinical implementation of medication review - screening to supervise effectiveness, appropriateness, and cost-efficiency

- **Drug-related problems (DRPs) according to Hepler CD, et al. definition (1990)**

Hepler CD, Strand LM. Opportunities and responsibilities in pharmaceutical care. Am J Hosp Pharm. 1990 Mar;47(3):533-43.

- 1) Untreated indications (under-prescriptions)
- 2) Drug use without indication (over-prescriptions)
- 3) Improper Drug Selection (mis-prescriptions)
- 4) Subtherapeutic Dosage
- 5) Overdosage
- 6) Adverse drug reactions
- 7) Drug interactions
- 8) Failure to receive drugs

- **Medication Appropriateness Index (MAI)**

Hanlon JT, et al. A Method for assessing drug therapy appropriateness. J Clin Epidemiol 1992;45(10):1045-51.

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

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

†Don't know.

- **Some sources to detect Drug – Drug Interactions: Sources**

- Softwares and Apps:
Lexi-Interact (Lexi Comp's): www.lexi.com
Epocrates: www.epocrates.com
Micromedex Drugs interactions: www.micromedexsolutions.com
- Tables:
Cytochrome Tables: 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
HCV: www.hep-druginteractions.org
Opioids DDIs: www.opioiddruginteractions.com

- **Some sources to determine adequate doses**

- Softwares and Apps:
Lexi-Interact (Lexi Comp's): www.lexi.com
Drugdex: www.micromedexsolutions.com
European Medicines Agency: www.ema.europa.eu
U.S. Food and Drug Administration: www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm
National drug databases
SmPCs
- Guidelines:
National and international scientific societies and regulatory agencies (some examples)
European Society of Cardiology: www.escardio.org
European League Against Rheumatism: www.eular.org
Global Initiative for Chronic Obstructive Lung Disease: goldcopd.org/global-strategy-diagnosis-management-prevention-copd-2016
European Association of Neurology: www.ean.org
European Association for the Study of Diabetes: www.easd.org
- Specific tools:
Renal failure ICAR: www.sitegpr.com
The renal drug database: renaldrugdatabase.com

Pediatrics: Pediatric & Neonatal dosage handbook (Lexicomp): www.lexi.com

- **Some sources to determine how to administer drugs properly**

- Softwares and Apps:
Previous drug databases
- 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
Handbook of Drug Administration via Enteral Feeding Tubes:
www.pharmacy.cmu.ac.th/unit/unit_files/files_download/2012-03-26HandbkOfDrugAdminiViaEnteralFeedingTubes%201stEd_WhiteAndBradn.pdf

- **Some sources to detect IV drug compatibility**

- Softwares and Apps:
King Guide : www.kingguide.com
Micromedex IV Compatibility: 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
HUG table: pharmacie.hug-ge.ch/infomedic/utilismedic/HUG_CompAdm_DCI.pdf

- **Some sources to detect adverse drug reactions**

- Softwares and Apps:
Lexi Comp's: www.lexi.com
Drugdex: www.micromedexsolutions.com
European Medicines Agency: www.ema.europa.eu
U.S. Food and Drug Administration: www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm
National drug databases, SmPCs
- Specific tools:
Hepatic disorders: Livertox: livertox.nlm.nih.gov
G6PD deficiency: G6PD Deficiency favism association:
www.g6pd.org/en/G6PDDeficiency/SafeUnsafe/DaEvitare_ISS-it
QT prolongation: CredibleMeds: crediblemeds.org

- **Some sources to detect inappropriate prescribing**

- Software and Apps:

Uptodate: 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

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