European
PRESCRIBING EXAM

An Erasmus+ project

International objectives on medication safety

Based on the translation of the National objectives on medication safety of the Dutch National Pharmacotherapy Test on medication safety by Cees Kramers, Jelle Tichelaar and Ben Janssen

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World Health Organization

Co-funded by the Erasmus+ Programme of the European Union

EACPT

Nederlandse Vereniging voor KLINISCHE FARMACOLOGIE en Biofarmacie

Content

Learning outcomes

The learning outcomes and the druglist of the European Prescribing Exam are based on the following literature:

- Brinkman et al. *Key Learning Outcomes for Clinical Pharmacology and Therapeutics Education in Europe: A Modified Delphi Study,* CP&T 2018.
- Jansen et al. *Essential diseases in prescribing: A national Delphi study towards a core curriculum in pharmacotherapy education,* Br J Clin Pharmacol. 2018
- Orme et al. *Towards a core curriculum in clinical pharmacology for undergraduate medical students in Europe,* Eur J Clin Pharmacol 2002

The druglist can be found in a separate document.

1. Knowledge

1.1. List medicines that are commonly implicated in allergic reactions
1.2. List common medicines to which elderly patients are especially likely to respond differently
1.3. List common medicines that are especially likely to cause harm to patients with impaired liver function
1.4. List common medicines that are especially likely to cause harm to patients with impaired renal function
1.5. List common medicines to which pregnant women are especially likely to respond differently
1.6. List common medicines that are especially likely to cause harm to the newborn as a result of transmission via breast milk
1.7. List common medicines to which children are especially likely to respond differently
1.8. Identify factors that may necessitate amendments of standard doses
1.9. List drugs and toxins to which effective antidotes are available
1.10. List drugs that are commonly misused (e.g. alcohol, opiates, cocaine) and some of their important pharmacodynamics effects
1.11. Describe common complementary and alternative medicines which interact with prescription drugs (e.g. St. John's wort)
1.12. Understand the principles of rational empiric antibiotic therapy
1.13. Describe common and severe or potentially lethal side effects of commonly used drugs
1.14. Describe common and severe or potentially lethal side effects of high risk medicines
1.15. Describe the appropriate routes of administration of commonly used drugs
1.16. Describe the appropriate routes of administration of high risk medicines

2. Skills

2.1. Identify common potentially important drug contraindications and interactions
2.2. Define patient's problem(s) to be treated
2.3. Define the therapeutic objective(s) for new therapy
2.4. Develop a list of possible treatments (i.e. standard treatment or P-drugs) for a diagnosis
2.5. Consider risks and benefits of specific drug therapies
2.6. Follow clinical guidelines, protocols and formularies where appropriate
2.7. Check the drug suitability for a patient by considering possible contraindications, interactions, previous adverse drug reactions, any special circumstances, age and gender, and diseases
2.8. Prescribe drugs with a narrow therapeutic index or high potential for serious adverse effects/interactions, and take appropriate precautions when prescribing them
2.9. Prescribe drugs for patients with special requirements (i.e. elderly, children, pregnancy and breast-feeding, renal and liver failure)
2.10. Choose the appropriate formulation, dose, route, frequency and duration of a drug
2.11. Interpret data that is relevant to prescribing decisions (e.g. renal function, drug concentrations)
2.12. Calculate appropriate doses for individual patients by weight and body surface area, and based on a normogram
2.13. Calculate the strength of an infusion based on the required rate of drug administration
2.14. Convert doses between common units and convert between concentrations expressed as percentage and mass
2.15. Write an unambiguous, legible, complete and legal prescription, including approved drug name, form, route, dose, instructions, patient details, date, prescriber's name and signature
2.16. Avoid abbreviations and other ambiguities when writing/typing a prescription
2.17. Cancel prescriptions appropriately
2.18. Review current lists of prescribed medicines on indication, contraindications, interactions, suitability and costs
2.19. Identify and manage inappropriate prescribing
2.20. Recognize the potential for medication errors and take steps to reduce the risks
2.21. Assess and manage common adverse drug reactions and interactions in the context of current clinical situation
2.22. Recognize and treat presentations of drug allergies and acute anaphylaxis
2.23. Manage overdose with commonly used medicines (e.g. paracetamol/acetaminophen, antidepressants, benzodiazepines)
2.24. Find and interpret relevant drug information from the paper and online national formularies and protocols
2.25. Establish parameters with which to monitor therapeutic effect (e.g. clinical outcomes, laboratory tests)
2.26. Request measurements of drug concentrations at optimal times for appropriate indications
2.27. Interpret the therapeutic effect based on clinical assessment and investigations (e.g. laboratory tests) and adjust the drug regimen if necessary

Subjects

A. Analgesics
B. Anticoagulants
C. Cardiovascular drugs
D. Psychotropics
E. Antimicrobials
F. Pulmonary drugs
G. Emergency medicines
H. Other

Categories per subject

1. Medications
2. Indications
3. Side effects
4. Patients at risk / contraindications
5. Interactions
6. Measures to prevent problems
7. Measure to take if a problem arises

The drug list can be found in a separate document.

Subject A. Analgesics

1. Medications

1.1. Paracetamol (acetaminophen)

1.2. NSAIDs

1.3. Opiate (μ) agonists

2. Indications

2.1. Pain ladder, nociceptive pain

3. Side effects

3.1. Paracetamol

3.1.1. Liver damage (> 150mg/kg)

3.2. NSAIDs

3.2.1. Peptic ulcer

3.2.2. Renal failure

3.2.3. Thrombocytopathy

3.2.4. Progressive heart failure

3.3. Opiates

3.3.1. Constipation

3.3.2. Respiratory depression

3.3.3. Dependence

3.3.4. Tolerence

4. Patients at risk / contraindications

4.1. Paracetamol:

4.1.1. Pre-existing liver damage, alcoholism

4.2. NSAIDs

4.2.1. (Peptic) Ulcer in medical history, age, rheumatoid arthritis, heart failure, diabetes

4.2.2. Renal failure: Pre-existing renal failure, heart failure, dehydration, sepsis

4.2.3. Heart failure: Pre-existing heart failure

4.3. Opiates

4.3.1. Constipation: Immobility, low food intake, limited fluid intake

4.3.2. Respiratory depression: Severe COPD

4.3.3. Traffic participation

5. Interactions

5.1. –

5.2. NSAIDs

5.2.1. Coumarins, steroids, antiplatelet agents, SSRIs (Ulcer)

5.2.2. RAAS inhibitors, diuretics (Renal failure)

5.3. Opiates

5.3.1. Anticholinergics, antidepressants, diuretics (Constipation)

5.3.2. Benzodiazepines (Respiratory depression)

6. Measures to prevent problems

6.1. Paracetamol

6.1.1. Lower dosage of paracetamol with alcoholism or liver cirrhosis

6.2. NSAIDs

6.2.1. PPI

6.3. Opiates

6.3.1. Laxatives (Constipation)

7. Measure to take if a problem arises

7.1. Overdose of paracetamol: Administer N-acetylcystein

7.2. –

7.3. Opiates

7.3.1. Laxatives, enema (Constipation)

7.3.2. Naloxone (Respiratory depression)

Subject B. Anticoagulants

1. Medications

1.1. Antiplatelet drugs (acetylsalicylic acid (ASA), etc.)
1.2. Vitamin K antagonists
1.3. Heparins
1.4. LMWH = low molecular weight heparins
1.5. Direct Oral Anti Coagulants (DOACs)

2. Indications

2.1. Antiplatelet drugs (acetylsalicylic acid (ASA), etc.)
2.1.1. Known arterial disease, such as post-infarction, angina, post TIA or stroke, post-CABG surgery, peripheral arterial disease, after stent placement
2.2. Vitamin K antagonists
2.2.1. Atrial fibrillation, mechanical valve prosthesis, pulmonary embolism, deep vein thrombosis
2.3. Heparin
2.3.1. Thromboprophylaxis, bridging start / interruption coumarin
2.4. LMWH = low molecular heparin
2.4.1. Thromboprophylaxis, bridging start / interruption coumarin
2.5. Direct Oral Anti Coagulants (DOACs)
2.5.1. Atrial fibrillation, pulmonary embolism, deep vein thrombosis

3. Side effects

3.1. All drugs can cause bleeding
3.2. Heparin (also LMWH) induced thrombocytopenia

4. Patients at risk / contraindications

4.1. Antiplatelet drugs
4.1.1. Elderly
4.2. Vitamin K antagonists
4.2.1. Individuals with noncompliance, irregular alcohol intake, febrile illness or decreased food intake
4.3. –
4.4. LMWH
4.4.1. Individuals with renal failure
4.5. DOACs
4.5.1. Renal failure has a major impact on the clearance of dabigatran

5. Interactions

5.1. Antiplatelet drugs
5.1.1. Corticosteroids or NSAIDs, SSRIs (ulcer)
5.1.2. Clopidogrel with omeprazole (clopidogrel less effective)
5.2. Vitamin K antagonists
5.2.1. Acenocoumarol: corticosteroids, NSAIDs, Co-trimoxazole, (stop certain anticonvulsants e.g. carbamazepine)

5.3. Heparin
5.3.1. NSAIDs, corticosteroids
5.4. LMWH
5.4.1. NSAIDs, corticosteroids
5.5. DOACs
5.5.1. Dabigatran: all drugs that cause renal insufficiency

6. Measures to prevent problems

6.1. Antiplatelet drugs
6.1.1. PPI (ulcer)
6.2. Vitamin K antagonists
6.2.1. Frequent INR monitoring
6.3. Heparin
6.3.1.-
6.4. LMWH
6.4.1. Dosage adjustment in case of reduced kidney function
6.5. DOACs
6.5.1. Dosage adjustment or switch to vitamin K antagonists

7. Measure to take if a problem arises

7.1. Antiplatelet drugs
7.1.1. Bleeding complications: platelet transfusion
7.2. Vitamin K antagonists
7.2.1. Asymptomatically raised INR: Vitamin K
7.2.2. Bleeding complications: Prothrombin complex concentrate (PCC)
7.3. Heparin:
7.3.1. Bleeding complications: Protamine
7.4. LMWH:
7.4.1. Bleeding complications: Protamine (limited effect)
7.5. DOACs
7.5.1.

Subject: C. Cardiovascular drugs

1. Medications

1.1. Diuretics
- 1.1.1. Thiazides
- 1.1.2. Loop diuretic
- 1.1.3. K^+-sparing

1.2. Beta blockers

1.3. Calcium channel blockers
- 1.3.1. Calcium antagonists (dihydropyridines)
- 1.3.2. Calcium channel blockers (other)

1.4. ACE inhibitors

1.5. ATII antagonists

1.6. Digoxin

1.7. Nitrates

1.8. Biguanides

1.9. SU derivatives

1.10. DPP4-inhibitors

1.11. GLP-1 agonists

1.12. SGLT2-inhibitors

1.13. Insulin

1.14. Statins

2. Indications

2.1. Diuretics
- 2.1.1. Thiazides: hypertension, mild heart failure
- 2.1.2. Loop diuretics: heart failure
- 2.1.3. K+-sparing diuretics, K+ depletion occurs when using a loop diuretic and/or thiazide. Spironolactone: preferred in case of NYHA III heart failure, prevents K+ depletion when used in combination with loop diuretic and/or thiazide

2.2. Beta blockers:
- 2.2.1. Atrial fibrillation, hypertension, heart failure, secondary prevention after myocardial infarction

2.3. Calcium channel blockers
- 2.3.1. Calcium antagonists (dihydropyridines): hypertension
- 2.3.2. Calcium channel blockers (other): atrial fibrillation, hypertension

2.4. ACE inhibitors:
- 2.4.1. Hypertension, heart failure, diabetic proteinuria

2.5. ATII antagonists:
- 2.5.1. Hypertension, diabetic proteinuria, heart failure

2.6. Digoxin:
- 2.6.1. Heart failure, atrial fibrillation with a rapid ventricular response

2.7. Nitrates:
- 2.7.1. Angina pectoris, pulmonary oedema / cardiac asthma

2.8. Biguanides
- 2.8.1. Diabetes type 2

2.9. SU derivatives

2.9.1. Diabetes type 2
2.10. DPP4-inhibitors
2.10.1. Diabetes type 2
2.11. GLP-1 agonists
2.11.1. Diabetes type 2
2.11.2. Diabetes type 2 with obesity
2.12. SGLT2-inhibitors
2.12.1. Diabetes type 1 and 2
2.13. Insulin
2.13.1. Diabetes type 1 and 2
2.14. Statins
2.14.1. Hypercholesterolemia

3. Side effects

3.1. Diuretics
3.1.1. Thiazides:
3.1.1.1. Dehydration
3.1.1.2. Hypokalaemia (arrhythmias, muscle weakness)
3.1.1.3. Hypotension (tendency to fall, vertigo)
3.1.1.4. Hyponatremia (nausea, confusion, tendency to fall)
3.1.2. Loop diuretics:
3.1.2.1. Dehydration
3.1.2.2. Hypokalaemia (arrhythmias, muscle weakness)
3.1.2.3. Hypotension (tendency to fall, vertigo)
3.1.3. K^+-sparing:
3.1.3.1. Hyperkalaemia
3.2. Beta blockers
3.2.1. Hypotension
3.2.2. Bradycardia
3.2.3. Tendency to fall.
3.2.4. Sotalol: arrhythmias
3.3. Calcium channel blockers
3.3.1. Calcium antagonists (dihydropyridines)
3.3.1.1. Hypotension
3.3.1.2. Tendency to fall
3.3.1.3. Reflex tachycardia
3.3.2. Calcium channel blockers (other)
3.3.2.1. Bradycardia
3.4. ACE inhibitors:
3.4.1. Hyperkalaemia
3.4.2. Renal failure
3.4.3. (First dose) hypotension
3.4.4. Tendency to fall
3.4.5. Angioedema

3.5. ATII antagonists:
- 3.5.1. Hyperkalaemia
- 3.5.2. Renal failure
- 3.5.3. (First dose) hypotension
- 3.5.4. Tendency to fall
- 3.5.5.Angioedema

3.6. Digoxin
- 3.6.1. Arrhythmias

3.7. Nitrates
- 3.7.1. Collapse (so-called nitrate collapse), especially with fast-acting preparations

3.8. Biguanide
- 3.8.1. Lactate acidosis
- 3.8.2. Nausea/diarrhoea

3.9. SU derivatives
- 3.9.1. Hypoglycaemia

3.10. DPP4-inhibitors
- 3.10.1. Hypoglycaemia

3.11. GLP-1 agonists
- 3.11.1. Less frequently hypoglycaemia unless combined with SU derivatives or insulin
- 3.11.2. Weight loss
- 3.11.3. Nausea

3.12. SGLT2-inhibitors
- 3.12.1. Genital infections
- 3.12.2. Polyuria

3.13. Insulin
- 3.13.1. Hypoglycaemia (+ symptoms)

3.14. Statins
- 3.14.1. Muscle cramps
- 3.14.2. Rhabdomyolysis

4. Patients at risk / contraindications

4.1. Diuretics:
- 4.1.1. Elderly
- 4.1.2. Electrolyte disturbances

4.2. Beta blockers:
- 4.2.1. (Orthostatic) hypotension
- 4.2.2. Bradycardia
- 4.2.3. Severe asthma

4.3. Calcium channel blockers
- 4.3.1. –

4.4. ACE inhibitors:
- 4.4.1. Individuals with dehydration, diarrhoea, fever, vomiting, anorexia
- 4.4.2. Hereditary or idiopathic angioedema

4.5. ATII antagonists:

4.5.1. Individuals with dehydration, diarrhoea, fever, vomiting, anorexia
4.5.2. Hereditary or idiopathic angioedema
4.6. Digoxin
4.6.1. Individuals with hypokalaemia, renal dysfunction
4.7. Nitrates
4.7.1. Nitrate collapse: especially when blood volume is low
4.8. Biguanides
4.8.1. Metformin: kidney failure, heart failure, sepsis
4.9. SU derivatives
4.9.1. Poor/irregular food intake or during physical exercise
4.10. DPP4-inhibitors
4.10.1. -
4.11. GLP-1 agonists
4.11.1. -
4.12. SGLT2-inhibitors
4.12.1. Kidney failure
4.13. Insulin
4.13.1. Poor/irregular food intake or during physical exercise
4.14. Statins

5. Interactions

5.1. Diuretics
5.1.1. Thiazides:
5.1.1.1. Starting ACEi (first dose hypotension)
5.1.1.2. SSRI (hyponatraemia),
5.1.2. Loop diuretics
5.1.2.1. Starting ACEi (first dose hypotension)
5.1.3. –
5.2. Beta blockers:
5.2.1. Digoxin, verapamil (bradycardia)
5.3. Calcium channel blockers
5.3.1. –
5.3.2. Beta blockers, digoxin (bradycardia)
5.4. ACE inhibitors
5.4.1. NSAIDs (renal failure)
5.5. ATII antagonists
5.5.1. NSAIDs (renal failure)
5.6. Digoxin
5.6.1. Beta blockers, verapamil (bradycardia)
5.7. Nitrates
5.7.1.-
Extra: All drugs can interact with benzodiazepines and opioids (tendency to fall)

5.8. Biguanides

5.8.1.-

5.9. SU derivatives

5.9.1. Beta blocker, in particular, non-selective ((masking) hypoglycaemia)

5.10. DPP4-inhibitors

5.11. GLP-1 agonists

5.12. SGLT2-inhibitors

5.13. Insulin

5.13.1. Beta blockers, in particular, non-selective ((masking) hypoglycaemia)

5.14. Statins

5.14.1. Strong inhibitors of CYP3A4.

6. Measures to prevent problems

6.1. Electrolyte disturbances / renal failure: monitoring K^+, Na^+, creatinine

6.2. Hypokalaemia: add K^+-sparing diuretic to thiazide diuretic or loop diuretic

6.3. (First dose) Hypotension: low starting dose, take in the evening (Ace-inhibitor), temporary cessation of diuretic

6.4. Do not administer nitrates in standing position

6.5. Dosage adjustment in case of reduced kidney function (e.g. metformin)

6.6. For SU derivatives and insulin: promote adherence + self-monitoring

7. Measure to take if a problem arises

7.1. Hypokalaemia: K^+ supplementation, add K^+-sparing diuretic to loop or thiazide diuretic

7.2. Hyperkalaemia: sodium polystyrene sulfonate

7.3. Hypoglycaemia: food (carbohydrates) intake or glucose administration, glucagon

Subject D. Psychotropics

1. Medications

1.1. SSRI
1.2. TCA
1.3. Benzodiazepine
1.4. Antipsychotics
  1.4.1. Typical
  1.4.2. Atypical
1.5. Antiepileptic's
1.6. Lithium

2. Indications

2.1. SSRI
  2.1.1. Depression (moderate), anxiety
2.2. TCA
  2.2.1. Depression (severe), neuropathic pain
2.3. Benzodiazepine
  2.3.1. Sleeping disorders, anxiety, febrile seizures / epilepsy, agitation
2.4. Antipsychotics
  2.4.1. Schizophrenia, delirium
2.5. Antiepileptic's
  2.5.1. Epilepsy
2.6. Lithium
  2.6.1. Bipolar disorder

3. Side effects

3.1. SSRI
  3.1.1. Hyponatraemia (occurring from ±1 week after start onwards)
  3.1.2. Bleeding
3.2. TCA
  3.2.1. Orthostatic hypotension (falling)
  3.2.2. Arrhythmias (overdose)
3.3. Benzodiazepine
  3.3.1. Weakness (tendency to fall),
  3.3.2. Anterograde amnesia
  3.3.3. Drowsiness
  3.3.4. Decreased alertness (driving)
  3.3.5. Tolerance effect dependence
  3.3.6. Rebound phenomena in abstinence (anxiety, difficult sleeping)
  3.3.7. Paradoxical reaction (agitation, excitement)
  3.3.8. Respiratory depression
3.4. Antipsychotics
  3.4.1. Typical: Extrapyramidal effects
  3.4.2. Atypical: Less extrapyramidal effects, metabolic syndrome
3.5. Antiepileptic's
  3.5.1. -
3.6. Lithium
  3.6.1. Hypothyroidism
  3.6.2. Renal failure

3.6.3. Diabetes insipidus

4. Patients at risk / contraindications

4.1. SSRI
4.1.1. -
4.2. TCA
4.2.1. Individuals of old age and individuals with dehydration, fever, diarrhoea, vomiting, anorexia (orthostatic hypotension)
4.2.2. Individuals with recent myocardial infarction (arrhythmias)
4.2.3. Elderly (confusion)
4.2.4. Traffic participation
4.3. Benzodiazepine
4.3.1. Elderly and children
4.3.2. Individuals with prolonged usage or a history of drug abuse
4.3.3. Individuals with severe COPD / breathing problems
4.3.4. Traffic participation
4.4. Antipsychotics
4.4.1. Parkinson's disease
4.5. Antiepileptic's
4.5.1. Pregancy (valproic acid)
4.6. Lithium
4.6.1. Renal impairment
4.6.2. Dehydration

5. Interactions

5.1. SSRI
5.1.1. Thiazides (hyponatraemia)
5.1.2. NSAIDs (bleeding tendency)
5.1.3. Tramadol (serotonin syndrome)
5.2. TCA
5.2.1. Antihypertensives, diuretics (orthostatic hypotension)
5.3. Benzodiazepine
5.3.1. Usage of alcohol, opiates, and other psychotropic substances increases the risk of the problems and side effects mentioned in point 3
5.4. Antipsychotics
5.4.1. Medicines that contribute to QT prolongation
5.5. Antiepileptic's
5.5.1. -
5.6. Lithium
5.6.1. Medication which influence the kidney function (NSAIDs, diuretics, RAS-inhibitors)

6. Measures to prevent problems

6.1. Hyponatraemia: monitoring electrolytes
6.2. Benzodiazepines tolerance, dependence: Tolerance, dependence: write prescriptions only for short periods of time.
6.3. Regular laboratory check-up to detect early side effect of lithium (eGFR and TSH)

7. Measure to take if a problem arises

7.1. Hyponatremia: fluid restriction

7.2. Bleeding: platelet transfusion (if bleeding is severe)
7.3. Orthostatic hypotension: lower dose
7.4. Arrhythmia: symptomatic treatment
7.5. Benzodiazepines dependence: switch to long-acting BZ and slowly reduce benzodiazepine usage
7.6. Benzodiazepines overdose: systemic administration of flumazenil may be of value

Subject E. Antimicrobials

1. Medications

1.1. β-lactam antibiotics
1.2. Aminoglycosides
1.3. Quinolones
1.4. Macrolides
1.5. Tetracyclines
1.6. Trimethoprim / Sulfamethoxazole
1.7. Nitrofurantoin
1.8. Metronidazole
1.9. Antifungal

2. Indications

These do not need to be addressed for this exam

3. Side effects

3.1. β-lactam antibiotics
  3.1.1. Toxicoderma (7-8% for amoxicillin)
  3.1.2. Hypersensitivity (1%)
  3.1.3. Anaphylactic shock (0.01 to 0.04%)
  3.1.4. Cephalosporin: cross-sensitivity with penicillin's
3.2. Aminoglycosides
  3.2.1. Ototoxic (irreversible)
  3.2.2. Nephrotoxic (reversible)
  3.2.3. Neurotoxic
3.3. Quinolones
  3.3.1. Tendonitis
3.4. Macrolides
  3.4.1. Prolonged QT-interval
3.5. Tetracyclines
  3.5.1. Photosensitivity
  3.5.2. Calcium binding: teeth (discoloration, hypoplasia) + bones,
3.6. Trimethoprim / Sulfamethoxazole
  3.6.1. -
3.7. Nitrofurantoin
  3.7.1. –
3.8. Metronidazole
  3.8.1.
3.9. Antifungal
  3.9.1. –

All antibiotics: Gastro-intestinal complaints

4. Patients at risk / contraindications

4.1 Some antibiotics should not be administered to pregnant woman (e.g. Quinolones, trimethoprim / Sulfamethoxazole and doxycycline (also contraindicated for children under 8 years (teeth and bones))

5. Interactions

5.1. β-lactam antibiotics
  5.1.1. -
5.2. Aminoglycosides
  5.2.1. -
5.3. Quinolones
  5.3.1. Calcium, magnesium, zinc, iron → complexes which greatly reduce absorption
5.4. Macrolides
  5.4.1. (Strong) inhibitors of CYP450 (3A4) > i.e. with simvastatin, atorvastatin
  5.4.2. Drugs prolonging qt interval (domperidone, haloperidol)
5.5. Tetracyclines
  5.5.1. Calcium, magnesium, zinc, iron → complexes which greatly reduce absorption
5.6. Trimethoprim / Sulfamethoxazole
  5.6.1. Methotrexate (bone marrow depression)
  5.6.2. Acenocoumarol (INR changes)
5.7. Nitrofurantoin
  5.7.1. –
5.8. Metronidazole
  5.8.1. Alcohol
5.9. Antifungal
  5.9.1. Miconazole is a strong inhibitor of CYP450 (3A4, 2C9). For example interactions with (some) statins and vitamin K antagonists.

6. Other issues

6.1. Switch therapy (iv ABs are expensive!)
  6.1.1. General principles of switching therapy (when, why, etc.)
6.2. Resistance development
  6.2.1. Measures to prevent resistance
6.3. Beta-lactamase
6.4. Tissue Penetration
  6.4.1. Lipophilicity or hydrophilicity of antibiotics
6.5. Reasons for ineffectiveness of antibiotic therapy
  6.5.1. Resistance, viral infection, tumour, foreign body, empyema, abscess, sequester

Subject F. Respiratory drugs

1. Medications

1.1. Beta agonists
- 1.1.1. Short-acting
- 1.1.2. Long-acting

1.2. Parasympaticolytics
- 1.2.1.Short-acting
- 1.2.2.Long-acting

1.3. Corticosteroids

2. Indications

2.1. Beta agonists
- 2.1.1. Acute relieve of distress
- 2.1.2. Maintenance therapy

2.2. Parasympaticolytics
- 2.2.1. Acute relieve of distress
- 2.2.2. Maintenance therapy

2.3. Corticosteroids
- 2.3.1. Maintenance therapy
- 2.3.2. Exacerbation

3. Side effects

3.1. Beta agonists
- 3.1.1. Tachycardia / palpitations
- 3.1.2. Hoarseness
- 3.1.3. Tremor

3.2. Parasympaticolytics
- 3.2.1. Hoarseness

3.3. Corticosteroids
- 3.3.1. Hoarseness
- 3.3.2. Oral candidiasis
- 3.3.3. Systemic: osteoporosis, steroid-induced diabetes, Cushing's syndrome, adrenal insufficiency.

4. Patients at risk / contraindications

4.1. Beta agonists
- 4.1.1. Patients with heart diseases

4.2. Parasympaticolytics
- 4.2.1. -

4.3. Corticosteroids
- 4.3.1. COPD patients without frequent exacerbation (less than one per 2 years)

5. Interactions

5.1. Beta agonists

5.2. Parasympaticolytics

5.3. Corticosteroids
- 5.3.1. Systemic use of corticosteroids

Subject G. Emergency medicines

1. Medications

1.1. Fluids
- 1.1.1. Saline
- 1.1.2. Lactated Ringer's
- 1.1.3. Glucose
- 1.1.4. Colloids

1.2. Adrenaline

1.3. Antihistamines

1.4. Active charcoal

2. Indications

2.1. Fluids
- 2.1.1. Saline: Maintenance therapy, repletion therapy
- 2.1.2. Lactated Ringer's: repletion therapy
- 2.1.3. Glucose: To prevent hypoglycaemia, hyperkalaemia (in combination with insulin)
- 2.1.4. Colloids: Shock with hypoalbuminemia (limited support)

2.2. Adrenaline
- 2.2.1. Anaphylaxis

2.3. Antihistamines
- 2.3.1. Anaphylaxis

2.4. Active charcoal
- 2.4.1. Intoxications

3. Side effects

3.1. Fluids
- 3.1.1. Saline: Hyperchloremic acidosis
- 3.1.2. Lactated Ringer's: Hyponatraemia
- 3.1.3. Glucose: Hyperglycaemia, hypokalaemia
- 3.1.4. Colloids: Renal failure

3.2. Adrenaline
- 3.2.1. -

3.3. Antihistamines
- 3.3.1. Sedation

3.4. Active charcoal
- 3.4.1. Obstipation

4. Other issues

4.1. Active charcoal in contra-indicated for unconscious patients (risk for aspiration)

Subject H. Other

1. Medications

1.1. Levothyroxine
1.2. Allopurinol
1.3. Ranitidine
1.4. Iron (ferrous fumarate – ferrous sulphate)
1.5. Tamsulosin
1.6. Oxybutynin
1.7. Methotrexate
1.8. Metoclopramide

2. Indications

2.1. Levothyroxine
  2.1.1. Hypothyroidism
2.2. Allopurinol
  2.2.1. Gout
  2.2.2.
2.3. Ranitidine
  2.3.1. Dyspepsia
2.4. Iron (ferrous fumarate – ferrous sulphate)
  2.4.1. Iron deficiency anaemia
2.5. Tamsulosin
  2.5.1. Benign prostate hypertrophy
  2.5.2. Kidney stones
2.6. Oxybutynin
  2.6.1. Urine incontinence
2.7. Methotrexate
  2.7.1. Rheumatoid arthritis
  2.7.2. Psoriasis
2.8. Metoclopramide
  2.8.1. Nausea

3. Side effects

3.1. Levothyroxine
  3.1.1. Symptoms of hyperthyroidism
3.2. Allopurinol
3.3. Ranitidine
  3.3.1.
3.4. Iron (ferrous fumarate – ferrous sulphate)
  3.4.1. Obstipation
  3.4.2. Black coloured faeces
3.5. Tamsulosin
  3.5.1. Orthostatic hypotension (with dizziness)
  3.5.2. Ejaculation disorders
3.6. Oxybutynin
  3.6.1. Anticholinergic side effects (obstipation, nausea, dry mouth, blurry vision)
3.7. Methotrexate
  3.7.1. Bone marrow depression
  3.7.2. Toxicity in kidney, lungs and liver

3.7.3. Mucosal eruptions
3.8. Metoclopramide

4. Patients at risk / contraindications

4.1. Levothyroxine
4.1.1. History of cardiac diseases
4.2. Allopurinol
4.2.1. -
4.3. Ranitidine
4.3.1. Kidney failure
4.4. Iron (ferrous fumarate)
4.4.1. -
4.5. Tamsulosin
4.5.1. Elderly
4.6. Oxybutynin
4.6.1. Elderly
4.6.2. Traffic participation (first days)
4.7. Methotrexate
4.7.1. Severe kidney or liver failure
4.7.2. Chronic infection (HIV, tuberculosis)
4.8. Metoclopramide
4.8.1. Dopamine antagonists are contra-indicated for patients with Parkinson's disease

5. Interactions

5.1. Levothyroxine
5.1.1. Calcium, magnesium, zinc, iron → reduced absorption
5.1.2. PPI → reduces absorption
5.2. Allopurinol
5.2.1.
5.3. Ranitidine
5.3.1. -
5.4. Iron (ferrous fumarate – ferrous sulphate)
5.4.1. Reduces absorption of quinolones, tetracycline's, levothyroxine
5.5. Tamsulosin
5.5.1. Antihypertensive drugs (hypotension, orthostatic hypotension)
5.5.2. Phosphodiesterase inhibitors (severe hypotension)
5.6. Oxybutynin
5.6.1. -
5.7. Methotrexate
5.7.1. Trimethoprim / Sulfamethoxazole (bone marrow depression)
5.7.2. NSAIDs (increase plasma concentration)
5.8. Metoclopramide
5.8.1. -

6. Measures to prevent problems

6.1. Administer folium acid once a week, with a minimum of 24 hours after ingestion of methotrexate
6.2. Before start and regularly after start methotrexate: laboratory test (complete blood count, ASAT, ALAT, bilirubin, eGFR)

7. Measure to take if a problem arises