Clinical Pharmacology and Prescribing

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Department of Pharmacology

Objectives

• Recognise the importance of clinical pharmacology as the scientific discipline that underpins a rational approach to prescribing medicines

• Understand the knowledge and skills required to:
  - Take a medication history
  - Prescribe drugs safely, effectively and economically
  - Write prescriptions that take into account the needs of individual patients

• Describe the factors that influence the choice of medicine and dose

• Explain the importance of monitoring the impact of drug therapy and describe the ways in which therapy can be monitored

Why learn about “Clinical Pharmacology” and “Therapeutics”?

• Pharmacological knowledge is essential to appropriate prescribing, and has been identified by junior doctors as an area to be strengthened in their training.

• Safe prescribing is not just about writing a prescription, but involves many cognitive and decision-making steps.
Prescribing

Is something you will do every day

- As newly qualified doctors you will be called upon to prescribe drugs many times every day.
- You need to be able to do it safely and effectively.

What is rational prescribing?

“selection of the most appropriate therapeutic regimen for a specific patient”


Multiple steps are involved in rational prescribing
Prior to writing a prescription

Make a diagnosis

Prior to writing a prescription

Make a diagnosis
Make a therapeutic decision

Patients come with symptoms not diagnoses

“Please give me stronger pain relief for a severe headache.”
- Migraine
- Medications
- Sinusitis
- Stroke
- Giant cell arteritis
- Brain tumour
- Meningitis

“I have a cough that won’t go away.”
- Postnasal drip
- Asthma
- Reflux
- Post-infectious cough
- Lung cancer
- Tuberculosis
- Psychogenic

“I am constipated. Can you prescribe something.”
- Medicine induced
- Hypothyroidism
- Hypercalcaemia
- Colon cancer
- Parkinson’s disease
- Diabetes

Prior to writing a prescription

Make a diagnosis

Prior to writing a prescription

Make a diagnosis
What your treatment goals are

- Identify key management issues with the patient
  - e.g. diagnosis, symptom control, disease modification (long-term consequences)

- Are current symptoms modifiable by symptomatic treatment or disease modifying treatment

In order to make a treatment decision you need to know…

Prior to writing a prescription

- Make a diagnosis
- Make a therapeutic decision
- Choose a medicine

In order to choose a medicine you need to know…

Efficacy

Safety

Appropriateness
**Efficacy of a medicine**

- How effective are the treatment alternatives?
  - What is the evidence to support these treatment alternatives?

- There may be patient-related factors that affect efficacy
  - Age
  - Disease states
  - Pregnancy
  - Genetics
  - Other medicines
  - Other substances
  - Compliance

**Sources of information include**

- Colleagues
- Conferences
- Review articles
- Guidelines

**Safety of a medicine**

- What are contraindications for using this drug in general and specifically in this patient?
  - Allergies
  - Concomitant disease including major organ failure

- What are common and potentially serious adverse effects that can occur with this drug?
  - Will these side effects affect my choice for this patient?

- What drug interactions need to be considered?
  - Drug-drug, drug-food, drug-disease

- Is the patient pregnant or lactating?

**Determine the risks and benefits of each treatment**

[YouTube Link](https://www.youtube.com/watch?v=F94QUszmwV4)
### Slide 16

**Appropriateness of a medicine**

- Can the patient afford it?
- Are there any considerations that need to be made for compliance?
  - More than once a day
  - Empty stomach
  - Needs blood tests and dose adjustments

### Slide 17

**Prior to writing a prescription**

1. Make a diagnosis
2. Make a therapeutic decision
3. Choose a medicine
4. Choose a dosing regimen

### Slide 18

**Choose a “route of delivery”**

- **IV injection**
  - High concentrations in the blood rapidly
  - Instant and complete absorption
  - Potentially more dangerous

- **Depot preparations**
  - Release contents slowly over hours - months
  - May improve compliance
  - Require a deep injection

- **Skin patches and gels**
  - Lower peak concentration and extended duration of effect
  - Can bypass first pass metabolism
  - Skin reaction is potential adverse effect

- **Oral tablets**
  - Slower rise to a later peak concentration
  - May be less complete absorption
  - May be subject to first pass metabolism

- **Local delivery**
  - Site of action can be targeted
  - Reduces systemic effects
Choose the dose

- Population
  The same dose for everyone
- Group
  The same dose for similar group (e.g. weight, renal function)
- Individual
  The dose is determined by the individual response

- The dose response relationship
- Therapeutic index
- Disease states that influence the response
- Potential drug interactions

Diagnosis
Therapy
Medicine
Dosing regimen
Prescribe

There is certain information that is essential for a legal prescription.

- Doctor’s Name (name and initials)
- Signature
- Physical Address
- MCNZ registration number
- Contact phone number
- Patient’s Name
- Full residential address
- Age if under 13 years

It is essential that the prescription is legible.
Each prescription has three parts.

- **Amoxycillin 500mg tablet**
  - Sig: i t.d.s. p.o.
  - M: 7 days supply

<table>
<thead>
<tr>
<th>Day</th>
<th>Quantity</th>
<th>Time</th>
<th>Instruction</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>1 tablet</td>
<td>3rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>1 tablet</td>
<td>3rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>1 tablet</td>
<td>3rd</td>
<td></td>
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</tr>
<tr>
<td>4th</td>
<td>1 tablet</td>
<td>3rd</td>
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</tr>
<tr>
<td>5th</td>
<td>1 tablet</td>
<td>3rd</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```
• Name of medicine
• Formulation e.g. caps, tabs, syrup
• Strength of medicine

• For Amoxycillin this part of the prescription may read as:
  \[ R_x \text{ Amoxycillin } 500\text{mg tabs} \]

---

• These are the instructions for the patient.

• For Amoxycillin this may be written as:
  \[ \text{Sig: i t.d.s. p.o} \]

---

• These can be more detailed.

• For Warfarin this may be written as:
  \[ \text{Sig: 2mg o.d. p.o.} \]
  Take the dose prescribed by your doctor or nurse. You need regular INR tests to make sure this dose is safe for you.
Third Part – M or Mitte (translates as ‘send to a total of’)

• These are the instructions for the pharmacist.
• Specifies the quantity to be dispensed.

• For Amoxycillin may specify seven days supply:
  
  $M$: 7 days supply

• The maximum period of supply is 3 months except for oral contraceptive which is 6 months supply.

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### Commonly used abbreviations

<table>
<thead>
<tr>
<th>Administration</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>sc</td>
<td>before food</td>
</tr>
<tr>
<td>pr</td>
<td>with food</td>
</tr>
<tr>
<td>po</td>
<td>after food</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>once daily</td>
</tr>
<tr>
<td>AM</td>
<td>morning</td>
</tr>
<tr>
<td>MD</td>
<td>midday</td>
</tr>
<tr>
<td>NO</td>
<td>night</td>
</tr>
<tr>
<td>PR</td>
<td>when required (as needed)</td>
</tr>
<tr>
<td>q6h</td>
<td>every six hours</td>
</tr>
<tr>
<td>q4h</td>
<td>every four hours</td>
</tr>
<tr>
<td>q12h</td>
<td>every twelve hours</td>
</tr>
<tr>
<td>BID</td>
<td>twice a day</td>
</tr>
<tr>
<td>TDS</td>
<td>three times a day</td>
</tr>
</tbody>
</table>


### Commonly used abbreviations

<table>
<thead>
<tr>
<th>Route</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>loc</td>
<td>buccal</td>
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<tr>
<td>IM</td>
<td>intramuscular</td>
</tr>
<tr>
<td>IV</td>
<td>intravenous</td>
</tr>
<tr>
<td>nb</td>
<td>nasobiliary</td>
</tr>
<tr>
<td>mg</td>
<td>nasal/gastric</td>
</tr>
<tr>
<td>po</td>
<td>oral</td>
</tr>
<tr>
<td>pr</td>
<td>per rectum</td>
</tr>
<tr>
<td>pc</td>
<td>per vagina</td>
</tr>
<tr>
<td>nj</td>
<td>nasal/jugal</td>
</tr>
<tr>
<td>subcut</td>
<td>subcutaneous</td>
</tr>
<tr>
<td>sublingual</td>
<td></td>
</tr>
<tr>
<td>sq</td>
<td>sublingual</td>
</tr>
<tr>
<td>topical</td>
<td>topical</td>
</tr>
<tr>
<td>PRG</td>
<td>percutaneous/epidermal gastronomy</td>
</tr>
</tbody>
</table>
### Slide 31
**Abbreviations to avoid**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>mg or mcg</td>
<td>microgram (1/1000 of a milligram)</td>
<td>Write microgram.</td>
</tr>
<tr>
<td>U or IU</td>
<td>Unit of measurement</td>
<td>( \text{U} = \text{mg}) or international unit</td>
</tr>
<tr>
<td>QD or OD</td>
<td>Once a day</td>
<td>( \text{QD} = \text{QD} ) or ( \text{OD} = \text{OD} )</td>
</tr>
<tr>
<td>q.i.d.</td>
<td>Four times a day</td>
<td>Write daily or the intended time of administration (eg. morning, night)</td>
</tr>
<tr>
<td>QM</td>
<td>Subcutaneous</td>
<td>Write subcutaneous or subcutaneous.</td>
</tr>
<tr>
<td>Sr or Sr</td>
<td>Sublingual</td>
<td>Write sublingual or sublingual.</td>
</tr>
</tbody>
</table>

### Slide 32
**After writing a prescription**

- **Counsel the patient**

### Slide 33
**You are the patient’s main source of information**

- Medicine name and dose
- How and when to take it
- Reason(s) for prescribing medicine
- Benefits of treatment and when they should occur
- Possible adverse effects and how to manage them
- Possible interactions with food, drink and medicines
- Timing of follow-up

**Don’t provide too much information when patient is not able to assimilate it (e.g. when worrying about other issues)**

What else can you do?

- Provide sources of further information
- Discuss aids to adherence (e.g. medicine cards)

Counsel the patient
Monitor response

“Know the abnormality you are going to follow during treatment. Pick something you can monitor.”

What signs, symptoms and laboratory parameters should I monitor in this patient?

When and how often do I measure them?
Different monitoring strategies for different medicines

- **Clinical response**
  - If the clinical endpoint is easily measured.
  - Treatment of cancer
  - Cure of infection
  - Resolution of nausea

- **Biomarkers**
  - If biomarkers predict clinical response (cost, time, ease of measurement).
  - Prostate specific antigen
  - CD4 count
  - Full blood count

- **Drug concentration**
  - If there is no easily measured endpoint.
  - If the effects correlate better with drug conc. than dose.
  - Digoxin (arrhythmias, heart failure)
  - Phenytoin (epilepsy)
  - Lithium (mood disorders)

Indications for therapeutic drug monitoring

- An event is potentially serious but occurs infrequently.
  - Epileptic seizures, cardiac arrhythmias

- Narrow therapeutic index and a small increase in dose can lead to toxicity.
  - Phenytoin, digoxin

- Effects correlate better with blood concentrations than they do with dose.
  - Phenytoin, lithium

- Deciding whether or not a symptom is due to an adverse effect.
  - Detecting non-compliance.

After writing a prescription

1. Counsel the patient
2. Monitor response
3. Review the medicine
Efficacy and safety
• Desired effects
• Adverse effects

Appropriateness
• Clinical changes
• Changes in medicines

Patient view
• Patient knowledge, understanding and concerns
• Adherence

Review a medicine after it has been started

• Offer repeat information and review to patients, especially when treating long term conditions with multiple medicines

• Any plan should include a date for a follow up review


Steps involved in prescribing

- Diagnosis
- Therapy
- Medicine
- Dosing regimen
- Prescribe
- Communicate
- Monitor
- Review