
Keeping a Place for Pharmacology in the Medical Curriculum

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Pharmacology in a Systems Based Curriculum

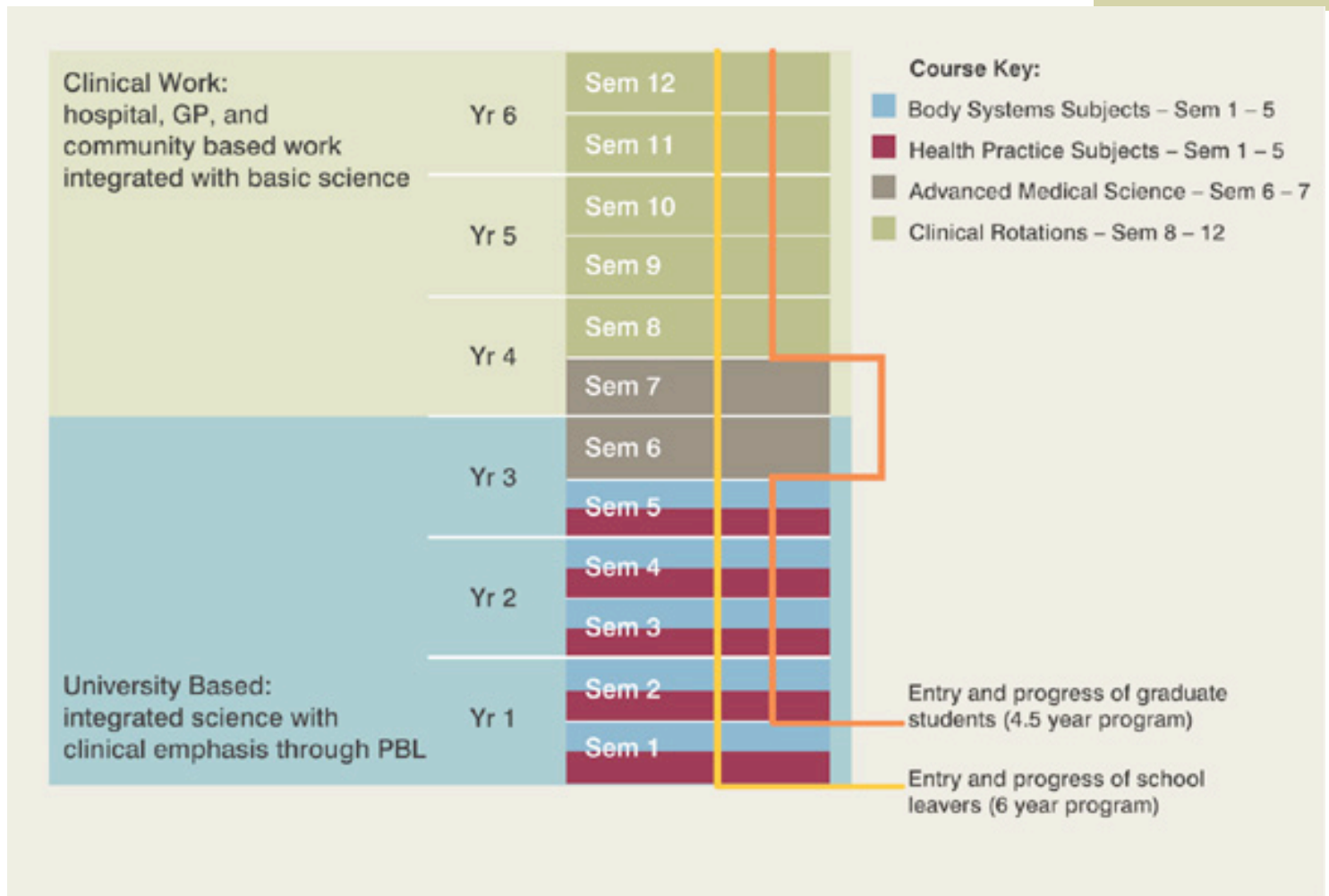
- ◆ It is relatively easy to include drug mechanisms of action and adverse effects within a systems based curriculum
- ◆ Pharmacology of therapeutic substances studied in parallel to physiology, biochemistry, pathology etc. reducing repetition
- ◆ It is more difficult to identify where and how to address general principles of pharmacokinetics and pharmacodynamics that are not body system specific



This Presentation

- ◆ Course structure at the University of Melbourne
- ◆ An example of a PBL case that addresses pharmacokinetic principles
- ◆ Student response to that case

MBBS-Course Structure



Body Systems Subjects

Semester 1	Principles of Biomedical Science
Semester 2	Nutrition, Digestion & Metabolism
Semester 3	Cardiorespiratory & Locomotor
Semester 4	Control Systems, Growth & Development
Semester 5	Defence Mechanisms & Their Failure

Body Systems Subject - Weekly Timetable

SEMESTER 2 2004 (Updated 6/7/04)

Week 1

	Monday 19 Jul	Tuesday 20 Jul	Wednesday 21 Jul	Thursday 22 Jul	Friday 23 Jul
9am	NDM PBL Tutorial PBL Rooms	NDM Lecture 1.2 Sunderland Theatre		NDM Lecture 1.4 Sunderland Theatre	NDM PBL Tutorial PBL Rooms
10am				Prac 5 & 6 10am-1pm Biochemistry SCRC Energy Balance	
11am					
12pm	NDM Lecture 1.1 Sunderland Theatre	NDM Lecture 1.3 Sunderland Theatre			NDM Lecture 1.5 Sunderland Theatre
1pm					
2.15pm	HP2 Introduction Sunderland Theatre	HMB Seminar Sunderland Theatre		Prac 3 & 4 2.15pm-5.15pm Biochemistry SCRC Energy Balance	Prac 1 & 2 2.15pm-5.15pm Biochemistry SCRC Energy Balance
3.15pm	H&S Lecture Sunderland Theatre				
4.15pm					

BPS-Core Curriculum for Medicine

- ◆ Surveyed frequency of drug appearance in different teaching formats over pre-clinical years
- ◆ Most areas well covered, excepting gastrointestinal system
- ◆ In PBL cases many drugs appeared during closure offering little incentive for self-directed learning

The Challenge

- ◆ How do we include basic concepts (pharmacokinetics, pharmacodynamics) in a systems based curriculum?
 - System? - Nutrition, Digestion & Metabolism
 - Early in course, semester 2 of first year
 - One week focus on pharmacology - lectures, practical class, problem based tutorial

A Pharmacokinetics Case

- ◆ Some issues we wished to address:
 - Route of administration
 - Therapeutic range
 - Metabolism, excretion
 - Drug interactions
 - Patient adherence

SEMESTER 2 2004 (Updated 6/7/04) **Week 11**

	Monday	Tuesday	Wednesday	Thursday	Friday
9am	NDM PBL Tutorial 'Out of the Blue'	NDM Lecture 11.2 Sunderland Theatre Pharmacodynamics II		NDM Lecture 11.4 Sunderland Theatre Pharmacokinetics II	NDM PBL Tutorial
10am				Prac 4 & 5 10am – 1pm Pharmacokinetics	
11am					
12pm	NDM Lecture 11.1 Pharmacodynamics	NDM Lecture 11.3 Sunderland Theatre Pharmacokinetics I			NDM Lecture 11.5 Sunderland Theatre Drug Interactions
1pm					
2:15pm				Prac 1 & 2 2:15 pm – 5:15 pm Pharmacokinetics	Prac 3 & 6 2:15 pm – 5:15 pm Pharmacokinetics
3:15 pm					
4:15 pm					

Phenytoin

- ◆ Features of the case
 - Underlying disorder (epilepsy) unrelated to systems under study
 - Disorder revealed in trigger
 - Strong indication early in the case that problem relates to poor adherence
 - Questions more directive than usual
- ◆ *Ensure focus is on the drug and not the disorder*

"Out of the Blue"



One afternoon, Tony Spiteri, a 30 year old man, is brought to the Emergency Department of a suburban Melbourne hospital by ambulance. His pregnant wife, Angela, accompanies him. She is crying. She says, "We were just watching TV and suddenly he went stiff and then his arms and legs started jerking. He went blue and froth started coming out of his mouth. I thought he was going to die. He kept shaking for about three minutes and he's been really sleepy since. He's told me that he has epilepsy and that he used to have fits, but he hasn't had one since I met him. He takes these tablets every day to stop them." She hands you a bottle of phenytoin 100 mg tablets.

Out of the Blue

- ◆ It becomes apparent that Tony is not taking his medication regularly and issues of adherence are explored
- ◆ After some time Tony is seen again displaying signs of toxicity due to an interaction with cimetidine

Tutor Notes (summary)

This case encourages discussion about drug administration, absorption, distribution, metabolism and elimination. Important concepts are therapeutic range (or index), drug toxicity, drug interactions and adherence. It provides the opportunity to reinforce the principles of first aid for the fitting patient, the *bio-psychosocial* consequences of epilepsy and long term medication, the medico-legal responsibilities of medical practitioners and issues related to self-medication.

Resources – Books

Hardman JG, Limbird LE. Goodman & Gillman's pharmacological basis for therapeutics.

Chapter 1 – Pharmacodynamics: The dynamics of drug absorption, distribution and elimination

Laurence DR, Bennett PN, Brown MJ. Clinical pharmacology. Edinburgh: Churchill–Livingston; 1997.

Chapter 7 – General pharmacology

Katzung BG. Basic and clinical pharmacology. 7th ed. London: Prentice–Hall International; 1998.

Chapter 3 – Pharmacokinetics and pharmacodynamics: dose selection and the time course of drug action

Chapter 4 – Drug biotransformation

Chapter 24 – Antiepileptic drugs

Rang HP, Dale MM, Ritter JM. Pharmacology. 4th ed. Edinburgh: Churchill Livingstone; 1999.

Chapter 3 – Method and measurement in pharmacology

Chapter 4 – Absorption and distribution of drugs

Chapter 5 – Drug elimination and pharmacokinetics

Chapter 36 Antiepileptic drugs and centrally acting muscle relaxants

You may use any of the pharmacology texts to explore routes of drug administration, drug absorption, drug distribution, drug metabolism and drug elimination.

Australian Medicines Handbook, Camden Park: Lane Print Group; 1998.

Souhami RL, Moxham J. Textbook of medicine. 3rd ed. Edinburgh: Churchill Livingstone; 1997.

Chapter 26 – Syncope and epilepsy, pp 1076–1083

Understanding epilepsy is not a major objective of this week. However, you may find it useful and interesting to do some reading about the pathophysiology, aetiology and principles of medical treatment of epilepsy.

Learning Issues

The following list contains the learning objectives for this problem as developed by the case writers. You may have had other learning issues. These are as valid and important and you need not confine yourself to this list.

- **be able to describe the principles of drug administration, absorption, distribution, metabolism and elimination.**
- be able to describe the first aid management of a person suffering a fit.
- be able to describe the potential bio-psycho-social consequences of epilepsy and long term drug therapy and its application to this clinical case.
- have been introduced to the concept of adherence and compliance and be able to describe the common forms of non-compliance, have a broad understanding of the prevalence of non-compliance/adherence and recognise the important compliance/adherence consequences of non-compliance/adherence in a patient with a chronic illness such as epilepsy.
- **be able to apply the concepts of bio-availability, half-life, therapeutic range and therapeutic index.**
- be able to describe some of the mechanisms by which drug interactions may occur.



Evaluation of Case

- ◆ Each PBL group was asked to complete an evaluation
- ◆ Groups were asked to discuss questions and submit a consensus response

Identification of Learning Issues

Learning Issue	Groups (%)
Drug absorption, distribution & elimination	100
Mechanism of action of phenytoin & diazepam	93
Determinants of drug dose	86
Reasons for monitoring plasma levels of drugs	86
Determinants of drug route of administration	71
Determinants of dose frequency	57

Student Responses

- ◆ What other issues would you like to cover?
 - 50% of groups wanted to spend more time studying epilepsy

- ◆ General comments:

“It would have been more interesting if it was more integrated with the NDM syllabus (although we recognise that with a relevant disease we wouldn’t have had the time to cover the pharmacology stuff).”

Outcome

- ◆ We were satisfied that the case:
 - Directed students to the desired learning issues
 - Deflected most students from investigating epilepsy

Conclusions

- ◆ Special effort needs to be made to accommodate general pharmacological principles in a systems based curriculum
- ◆ Dedication of time within a body systems unit helps to focus attention on pharmacological principles