

# Development of a Pharmacotherapy Workup Module

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# Concept of Pharmaceutical Care

- Patient-centered care
- Aims to optimize benefits and minimize harms with drug therapy in the patient

# Steps in Practice

1. Pharmacotherapy  
work up

Any potential or  
actual drug-related  
Problem (DRP)?

3. Evaluate the  
outcomes

2. Formulate a  
Care plan

- Prevent or resolve DRP
- Patient education
- Monitor efficacy + safety

# Pharmacy curriculum for Year 3 students

Fall  
term

- Track-specific preparatory course

Spring  
term

- Weekly clerkship for 3 weeks
  - Clinical + community + industry
- All students to perform drug therapy workup

Spring  
term

- 9 week clerkship – in one selected setting
- Clinical / Community / Industry / Research

# Pharmacotherapy workup module

## Objectives

- To help students develop the clinical thought process
- To prepare students for the clinical clerkship

# Development of the module

- ◉ Developer: Two Year 3 clinical students
- ◉ Time spent: 2 academic terms
- ◉ Platform used: Moodle

# Module content

Course: PHAR3611X1 (10-11) - CLINICAL PHARMACY CLERKSHIP (PHARMACOTHERAPY WORKUP LEARNING MODUL - Windows Internet Explorer

http://moodle.cuhk.edu.hk/course/view.php?id=2466

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Course: PHAR3611X1 (10-11) - CLINICAL PHARMACY...

Grades  
Groups  
Backup  
Restore  
Import  
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Reports  
Questions  
Files  
Unenrol me from PHAR3611X1 (10-11)  
Profile

Online Users  
(last 5 minutes)  
AU YEUNG YEE MAN

**1 Introduction to Drug Therapy Assessment**  
Overview  
Overview (pdf version)  
Thinking Tips

**2 Case Example 1**  
Case Example 1

**3 Case Example 2**  
Case Example 2

**4 Case Exercise 1**  
Pre-requisite Knowledge to Work up Case Exercise 1  
Case Exercise 1  
Summary of Assessment Findings and Plans of Case Exercise 1

**5 Survey, in the form of questionnaire, was conducted in the class on 5th Feb, 2010.**

**6 Case Exercise 2**  
Pre-requisite Knowledge to Work up Case Exercise 2  
Case Exercise 2  
Summary of Assessment Findings and Plans of Case Exercise 2

**7 Case Exercise 3**  
Pre-requisite Knowledge to Work up Case Exercise 3  
Case Exercise 3  
Summary of Assessment Findings and Plans of Case Exercise 3

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Events Key  
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Group User

Recent Activity  
Activity since Wednesday, 22 September 2010, 10:03 AM  
Full report of recent activity...  
Nothing new since your last login

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# Lesson menu

PHAR3611X1 (10-11): Case Example 2 - Windows Internet Explorer

http://moodle.cuhk.edu.hk/mod/lesson/view.php?id=75250&pageid=840

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PHAR3611X1 (10-11): Case Example 2

Case Example 2 ?

Preview Edit Reports Grade Essays

**Lesson menu**

- CASE DESCRIPTION
- Match drugs to their indications
- Match drugs to their indications (Answers)
- DRP 1: Unnecessary drug therapy
- Match indications to their drugs
- Match indications to their drugs (Answers)
- DRP 2: Need for additional drug therapy
- DRP 3: Ineffective drug therapy
- DRP 4: ADR
- DRP 5: Inappropriate dosage regimen
- DRP 6: Drug

**CASE DESCRIPTION**

**DD:** LSM is a 88 y/o Chinese female admitted to PWH on 9/11/2008.  
**CC:** Symptoms of upper respiratory tract infection. Productive cough.  
**HPI:** Coughed for 5 days with whitish sputum. Had difficulty to cough out the sputum. Had SOB, runny nose, and fever for 2 days; but these symptoms subsided before admission. No sore throat. Had ankle edema over the past 3 months. Had occasional orthopnea. No chest pain.  
**PMH:** Asthma.  
**SH:** Non-smoker. Non-drinker.  
**FH:** Not remarkable.  
**Lifestyle:** Lives with family members. Walks with stick.  
**ALL:** No Known Drug Allergy.  
**MPTA:** Refer to the table below.

MEDICATIONS	Medication prior to admission?	START AND STOP DATE
Salbutamol sulphate MDI (100 mcg/puff) 4 puffs q4h	Y Previously on 2 puffs qid prn	8 puffs stat x 1 at 7:30 a.m. on 9/11. Then switched to current regimen.
Ipratropium bromide MDI (20 mcg/puff) 4 puffs q4h	N	4 puffs stat x 1 stat at 7:30 a.m. on 9/11. Then switched to current regimen.
Amoxicillin-clavulanate 1 g PO bd	N	Started at 9:00 a.m. on 9/11. Discontinued on 11/11.
Furosemide 40 mg PO qd	N	Started at 9:00 a.m. on 9/11. Discontinued on 11/11.

Done

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# Case content

PHAR3611X1 (10-11): Case Example 2 - Windows Internet Explorer

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PHAR3611X1 (10-11): Case Example 2

**PE:**  
 Gen: Alert and oriented. Height: 5' (152 cm). Weight: 49 kg.  
 VS: Temp: 37.4°C (tympenic). BP: 134/90 mmHg. Pulse: 96/min. RR: 20/min.  
 Neck: (-) JVD (Jugular Venous Distention).  
 Ext: Bilateral ankle edema.  
 Chest: (+) bilateral crepitations. (+) occasional wheeze. (-) heart murmur.  
 CXR: Infiltrate in right upper zone. Cardiomegaly observed.  
 ECG: SR. No definite ST changes.  
 FEV<sub>1</sub> and FVC: N/A.

**LAB:**  
 Sputum culture: Mucoid, few WBCs, heavy growth of oral commensals. (sampled on 9/11)  
 Sputum AFB smear: -VE. (sampled on 9/11)  
 NPA (Nasopharyngeal aspirate): -VE viral growth. (sampled on 9/11)  
 Culture of mid-stream urine: Mixed bacterial growth. No WBC and RBC. (sampled on 9/11)  
 Urinalysis: Normal findings, except protein in urine. (sampled on 9/11)

**Laboratory Reports:**

	9/11	11/11	Reference range		9/11	11/11	Reference range
<b>ELECTROLYTES</b>				<b>CBC</b>			
Na	139	136	134-145 mmol/L	Hgb	11.9	12.5	11.5-14.3 g/dL
K	<b>3.3 (L)</b>	3.9	3.5-5.1 mmol/L	Hct	0.358	0.375	0.32-0.43 L/L
<b>MINERALS</b>				RBC	4.05	4.15	3.7-4.9 x 10 <sup>12</sup> /L
Adjusted Ca	2.3	N/A	2.15-2.55 mmol/L	MCV	90.7	90.3	81.0-97.0 fL
Phosphate	0.86	N/A	0.82-1.4 mmol/L	MCH	30.6	30.1	27.0-32.0 pg
<b>RFT</b>				Platelet	285	347	140-380 x 10 <sup>3</sup> /L
sCr	61	<b>81 (H)</b>	44-80 µmol/L	WBC	8.6	<b>10.9 (H)</b>	4.0-10.8 x 10 <sup>3</sup> /L
BUN	5.5	8.5	3.4-8.9 mmol/L	<b>WBC DIFFERENTIAL</b>			
<b>LFT</b>				NEU%	<b>86 (H)</b>	<b>93 (H)</b>	41-73
ALT/SGPT	28	30	<58 IU/L	LYM%	<b>6 (L)</b>	<b>3 (L)</b>	19-17
Total ALP	<b>151 (H)</b>	<b>154 (H)</b>	45-145 IU/L	MON%	7	4	4-10
Total protein	70	<b>87 (H)</b>	66-81 g/L	EOS%	1	<b>0 (L)</b>	1-6

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# Case content

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PHAR3611X1 (10-11): Case Example 2

Page Tools

### Other Monitoring Parameters:

	9/11	11/11	13/11	Reference range
Temperature (tympenic) (in °C)	37.3	36.2	36.2	35.8-38.0
BP (in mmHg)	134/90	130/75	119/75	Not applicable
Pulse (in /min)	96	85	75	60-80/min for healthy adults. Generally lower for elderly.
SaO <sub>2</sub>	92% (on room air) at 7:30 a.m.	95% (on 1L O <sub>2</sub> )	95% (on 1L O <sub>2</sub> )	>95% (on room air)
PEFR (in L/min)	<60	N/A	<60	Not applicable
Fluid output (in mL)	700 + 3 x wet napkins	750	N/A	Not applicable
Fluid input (in mL)	500	600	N/A	Not applicable

### Summary of Hospital stay:

LSM was admitted to PWH at 7:30 a.m. on 9/11 complaining of symptoms of URTI and cough. She was diagnosed as community-acquired pneumonia and acute exacerbation of asthma. She was immediately given inhaled salbutamol, ipratropium and 1L/min oxygen. She was also treated for her ankle edema. She was observed and monitored. She was sent to the general medical ward at 9:00 a.m. and she was given other medications. The laboratory results show mild hypokalemia and she was immediately given KCl. She still had wheezing but no SOB.

On 10/11, no ankle edema and elevation of jugular venous pressure was noticed, but crepitations were heard occasionally. She did not have wheezing any more.

On 11/11, her WBC count was elevated. She also complained of sputum retention. Amoxycillin-clavulanate was then switched to cefotaxime. Subsequent repeated chest X-rays in the following days showed gradual decrease in infiltrate in the right upper zone. However, she still had cough with sputum.

Today (13/11), you are the final year pharmacy student responsible for reviewing LSM's medical charts. You are asked to assess her therapy and to identify any drug-related problems before and throughout the hospital stay.

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# Assessment questions

PHAR3611X1 (10-11): Case Example 2 - Windows Internet Explorer

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PHAR3611X1 (10-11): Case Example 2

Case Example 2 ?

Preview Edit Reports Grade Essays

**Lesson menu**

- Pre-requisite Knowledge to Work up Case Example 2
- CASE DESCRIPTION
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- DRP 2: Need for additional drug therapy
- DRP 3: Ineffective drug therapy
- DRP 4: ADR
- DRP 5: Inappropriate dosage regimen**
- DRP 6: Drug interaction
- DRP 7: Non-compliance

**DRP 5: Inappropriate dosage regimen**

**What you should consider for this category of drug-related problem:**

- 5.1. Is the dosage inappropriate?
- 5.2. Is the route of administration inappropriate?
- 5.3. Is the dosage form inappropriate?
- 5.4. Is the dosing frequency inappropriate?
- 5.5. Is the time of administration inappropriate?
- 5.6. Is the rate of administration inappropriate?
- 5.7. Is the duration of therapy inappropriate?

5.1. Inappropriate dosage      5.2. Inappropriate route of administration

5.3. Inappropriate dosage form      5.4. Inappropriate dosing frequency

5.5. Inappropriate time of administration      5.6. Inappropriate rate of administration

5.7. Inappropriate duration of therapy

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# Assessment questions

PHAR3611X1 (10-11): Case Example 2 - Windows Internet Explorer

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PHAR3611X1 (10-11): Case Example 2

Lesson menu

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- DRP 6: Drug interaction
- DRP 7: Non-compliance

## 5.1. Inappropriate dosage

### 5.1. Is the dosage inappropriate?

**Tips:**

1. Is dosage adjustment required due to renal/hepatic functions or underlying diseases in the patient? If yes, which of the drugs require dosage adjustment?
2. Compare the dosage of drugs used with the recommended dosage (after dosage adjustment) specific to the indications. Is the dosage appropriate?

Drugs	Dosage regimen	Recommended dosage regimen (after adjustment if required)	Appropriate dosage?
Salbutamol MDI (MPTA)	2 puffs qid prn		
Salbutamol MDI (during hospital stay)	8 puffs stat; then 4 puffs q4h		
Ipratropium MDI	4 puffs stat; then 4 puffs q4h		
Amoxycillin-clavulanate PO	1 g bd		
Furosemide PO	40 mg qd		
Prednisolone PO	30 mg qd		
Ammonia and ipecacuanha mixture PO	10 mL tid		
KCl PO	2 g stat x 1 (equivalent to 27 mEq K)		
Cefotaxime IV	1 g q12h		

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# Answer to question

PHAR3611X1 (10-11): Case Example 2 - Windows Internet Explorer

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PHAR3611X1 (10-11): Case Example 2

2. Compare the dosage of drugs used with the recommended dosage (after dosage adjustment) specific to the indications. Is the dosage appropriate?

Drugs	Dosage regimen	Recommended dosage regimen (after adjustment if required)	Appropriate dosage?
Salbutamol MDI (MPTA)	2 puffs qid prn	2 puffs q4-6h prn	Y
Salbutamol MDI (during hospital stay)	8 puffs stat; then 4 puffs q4h	4-8 puffs q20min for up to 4 hrs, then q1-4h prn.	Y
Ipratropium MDI	4 puffs stat; then 4 puffs q4h	8 puffs q20min prn for up to 3 hrs (used with a SABA)	Y for the dose administered in AED. But there is no dosage recommendation after 3hrs.
Amoxycillin-clavulanate PO	1 g bd	250-500 mg bd	Dosage may be too high.
Furosemide PO	40 mg qd	Initial 20 mg/day, increase slowly to desired response.	Initial dosage may be too high.
Prednisolone PO	30 mg qd	40-50 mg for 5-10 days depending on severity	Dosage may be too low. However, it is reasonable because of concern of ADR.
Ammonia and ipecacuanha mixture PO	10 mL tid	10-20 mL up to qid	Y
KCl PO	2 g stat x 1 (equivalent to 27 mEq K)	40-100 mEq/day divided in 2-5 doses; limit to 20-25 mEq/dose	Y for the dose of single administration.
Cefotaxime IV	1 g q12h	1 g q8-12h	Y

Conclusion: The dosage of amoxycillin-clavulanate is too high due to LSM's poor renal function. The initial dosage of furosemide is too high for her. The dosage of prednisolone is reasonable because of concern of ADR.

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# Case exercise

PHAR3611X1 (10-11): Case Exercise 1 - Windows Internet Explorer

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PHAR3611X1 (10-11): Case Exercise 1

## CASE DESCRIPTION

**DD:** TC is an 89 y/o Chinese male admitted to the PWH on 26/8/2009.

**CC:** Increased SOB. Increased coughing.

**HPI:** Increased SOB since midnight (26/8). Increased coughing with yellow sputum. No chest pain. No fever. History of COPD. Well-controlled daily symptoms. Had pulmonary rehabilitation. Had COPD exacerbations requiring hospital admissions in February/2009, March/2008 and February/2005.

**PMH:** COPD. BPH. Chronic constipation.

**SH:** An ex-smoker for more than 10 years, but quit 20 years ago. Non-drinker.

**FH:** Not remarkable.

**Lifestyle:** Retired. Lives with a son and a maid.

**ALL:** Theophylline (results in hallucination).

**MPTA:** Refer to the table below. Received vaccines for influenza and pneumococcus in November/2008.

CURRENT MEDICATIONS	MPTA (Medication prior to admission)?	START & STOP DATE
Salbutamol sulphate MDI (100 mcg/puff) 4 puffs qid	Y Previously on 2 puffs qid.	Started at 8 puffs q4h stat at 5:35 a.m. on 26/8. Changed to current regimen at 9:20 a.m. on 26/8.
Ipratropium bromide MDI (20 mcg/puff) 4 puffs qid	N	Started at 4 puffs q4h stat at 5:35 a.m. on 26/8. Changed to current regimen at 9:20 a.m. on 26/8.
Prednisolone po 30 mg om	N	Started stat at 5:35 a.m. on 26/8.
Ammonia and ipecacuanha mixture po 10 ml tds	N	Started stat at 5:35 a.m. on 26/8.
Beclomethasone dipropionate MDI (250 mcg/puff) 2 puffs bd	N	Started at 9:20 a.m. on 26/8.
Amoxycillin-clavulanate po 1 g bd	N	Started at 9:20 a.m. on 26/8.
Oseltamivir phosphate po 75 mg qod x 5 doses	N	Started at 5:30 p.m. on 26/8.
Terazosin po 1 mg noct	Y	Continued during hospital stay.
Lactulose po 10 ml bd	Y	Continued during hospital stay.

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# Case exercise - question

PHAR3611X1 (10-11): Case Exercise 1 - Windows Internet Explorer

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PHAR3611X1 (10-11): Case Exercise 1

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**DRP 5: Inappropriate dosage regimen**

**12** Does the drug-related problem of "inappropriate dosage regimen" exist?  
Marks: --/1

Choose one answer.

- ☐ a. Yes because the dosage is inappropriate.
- ☐ b. Yes because the route of administration is inappropriate.
- ☐ c. Yes because the dosage form is inappropriate.
- ☐ d. Yes because the dosing frequency is inappropriate.
- ☐ e. Yes because the time of administration is inappropriate.
- ☐ f. Yes because the rate of administration is inappropriate.
- ☐ g. Yes because the duration of the therapy is inappropriate.
- ☐ h. Drug-related problem of "inappropriate dosage regimen" does not exist.

Submit

**13** Hence, state the drug(s) involved (if any).  
Marks: --/1

Choose at least one answer.

- ☐ a. Salbutamol
- ☐ b. Ipratropium
- ☐ c. Prednisolone
- ☐ d. Ammonia and ipecacuanha mixture
- ☐ e. Beclomethasone

Done

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# Case exercise - feedback

PHAR3611X1 (10-11): Case Exercise 1 - Windows Internet Explorer

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PHAR3611X1 (10-11): Case Exercise 1

12 Does the drug-related problem of "inappropriate dosage regimen" exist?

Marks: 1/1

Choose one answer.

- ☐ a. Yes because the dosage is inappropriate.
- ☒ b. Yes because the route of administration is inappropriate. ✗

Oral and inhalation routes of administration are appropriate because TC can swallow and administer inhaler. All the drugs are administered in the appropriate route for their effects.

For bronchodilator, inhaled route is preferred over oral route. Salbutamol, ipratropium, beclomethasone are administered by inhalation for local effects at the airway walls.

Prednisolone, amoxicillin-clavulanate, oseltamivir and terazosin are administered orally for systematic effects (local osmotic effect for lactulose). Although intravenous and oral routes are available for prednisolone and amoxicillin-clavulanate, oral route is more appropriate because TC does not have significant comorbidities that require the use of iv route.
- ☐ c. Yes because the dosage form is inappropriate.
- ☐ d. Yes because the dosing frequency is inappropriate.
- ☐ e. Yes because the time of administration is inappropriate.
- ☐ f. Yes because the rate of administration is inappropriate.
- ☐ g. Yes because the duration of the therapy is inappropriate.

Done

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# Case Summary

PHAR3611X1 (10-11): Summary of Assessment Findings and Plans of Case Exercise 1 - Windows Internet Explorer

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PHAR3611X1 (10-11): Summary of Assessment Findin...

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## Summary of Assessment Findings and Plans of Case Exercise 1 ?

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### Summary of Assessment Findings and Plans of Case Exercise 1

Major assessment findings	Plans
Dosage of amoxicillin-clavulanate may be too high due to TC's poor renal function ( $\text{CrCl} < 30 \text{ mL/min}$ ).	Recommend adjusting the dosage of amoxicillin-clavulanate to 375mg bd.
Non-compliance with inhalation technique of MDI.	Recommend the use of spacer with MDI. Reassess the inhalation technique.
Potential additional drug needed for his macrocytic anemia.	Collect information about his anemia from medical history and patient interview. May consider recommending the doctor to order the laboratory tests on serum vitamin $\text{B}_{12}$ and folate levels.
Possible unnecessary use of ammonia and ipecacuanha mixture during COPD exacerbation.	Confirm with the doctor the intention of using ammonia and ipecacuanha mixture. Explain the lack of evidence of using it during COPD exacerbation.
TC has 2 consecutive days of significant net fluid loss.	Recommend adequate fluid intake.

Continue

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# Conclusion

- Students are capable of developing learning module that can benefit their peers