

Paper:

**PHARMACOTHERAPEUTICS SKILLS TRAINING DESIGN:
A CASE STUDY OF MEDICAL FACULTY
–ANDALAS UNIVERSITY –
INDONESIA**

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I. INTRODUCTION

Having done a curriculum analysis at Medical Faculty of Andalas University, apparently there are at least three weaknesses identified, that is: a lack of integration, a lack of evaluation and a lack of organization. Regarding a lack of integration, we can see not only in the acquisition of knowledge but also in the accomplishment of clinical skills. Skills training are concentrated at one block and weak of supporting of procedural knowledge. In my opinion, spiral curriculum is the answer for the disintegration of the existing curriculum. Such curriculum should take place for longer-term period or longitudinal.

By referring to educational research, longitudinal skill training has benefits for student's performance. For example, students who took this training are more qualified at clerkship program than students who did not. And it affects at learning abilities during clerkship (Remmen, 2001). In addition, longitudinal skill training is better than concentrated training (van Dalen, 2001). Meanwhile, Ormrod (2007) pointed out that there are at least three advantages of reviewing and practicing what we have learnt over a period time. First, such process leads us to elaborate at new ways and understand more deeply. Second, the same information reviewed repeatedly will be built more and stronger association, consequently it is ready to recall at future time when needed. And next, this process generates automaticity.

Based on the explanation above and the analysis of our existing curriculum, I design a spiral curriculum for clinical skill training and take one sample i.e. Drug Prescription Skill at Faculty of Medicine Andalas University. This paper will explain some justification of such design and describe briefly Drug Prescription Skill design.

II. THEORETICAL BACKGROUND

A spiral curriculum, which introduced firstly by Jerome Bruner in 1960, has some following features: firstly, students return to the same topics many times; the level increases gradually; there is connection between new learning and previous one as well as increasing of students' competence (Harden & Stamper, 1999). They also explained some benefits of spiral curriculum. They are:

a. *reinforcement*, this condition comes up if a subject is looked back many times. In spiral curriculum students revisit previous subject while they learn new subject; b. *stir from simple to complex*, introducing a controlled way so students attain the subject not to be overwhelmed and they construct new learning on existing one; c. *integration*, by comparing traditional method in which students are taught different subjects by different teachers and different times, in spiral curriculum students learn some subjects at the same time integrally and continuing to next stage integral vertically; d. *logical sequence*, "the spiral curriculum can help to bring some order to the increasingly complex nature of medicine and medical education"(p.142); e. *higher level objectives*, by encouraging students beyond factual recall to knowledge and skill application; f. *flexibility*, this curriculum is flexible in which students allowed to transfer directly to the second spiral of medical course of student if they have accomplished the first level in science-based course. Such curriculum moves longitudinally from the first year until the last year of study program.

Thus, constructing skills training program in the longitudinal/spiral curriculum means to construct simple skills to complex ones. This begins to separate skills to integrated skills, from trouble-free context to problematical context, from having sufficient time to working under pressure/time limits, and start from continue direction to almost undirected.

Nowadays, Pharmacotherapeutics problem increases through developing new product included new medicine. Patient as a consumer gets a problem as well; they are challenged with long stay hospital, ineffective drug and side effect that lead to other diseases. For example, first, as I saw at surgery ward of M. Djamil Hospital of Padang that there is an increasing numbers of gaster perforation patient. I have never seen this case when I was a medical student ten years ago. Such sample regarding how the patient use the uncontrolled rheumatics drug and herbal medicine as well as minus advice from doctors. Second, there are complaints from clinical teacher concerning a lack of prescribing writing students' skill. Such condition are challenging for our faculty as doctor producing institution, and because the reason above, I think it is important to design Pharmacotherapeutics skill for our medical students as described below.

1. WHAT

Based on the literature (Maxwell & Walley, nd) I propose several skills under Pharmacotherapeutics as a core skill, including:

1. Taking a drug history:

- taking precise information as regards to drug used with prescription or not.
- recording history of adverse drug reactions.

2. Prescription writing:

- selecting a safe and an effective drug and right dose
- writing precise, legible, and legal prescriptions including controlled drugs
- organizing precise records of prescriptions and response
- calculating drug doses based on patient weight and normogram
- prescribing oxygen (flow rate, delivery) and intravenous fluids.
- prescribing drugs at extraordinary groups: elderly, pediatrics, pregnancy and breast-feeding, renal and liver failure.

3. Acquiring informed consent to therapy:

- providing sufficient drug information in order that patient can decide informed consent for their therapy.
- discussing advantages and disadvantages as regards drug therapy with patients.
- identifying patient's perception and desire in drug therapy.

4. Acquiring objective information which underpins safe and effective prescribing:

- using Indonesian National Formulary
- accessing reliable drug information from medical journal and medical databases
- distinguishing between evidence and opinion treatment.

5. Selecting adverse drug reactions and interactions:

- assessing drugs as a possible cause of symptoms and signs
- recognizing the possibility for adverse interaction
- reporting adverse drug reactions and interactions

6. Drug Administration:

- choosing the right way of administration
- administering and preparing drugs for subcutaneous, intramuscular, and intravenous injections
- advising and demonstrating to patient about particular type of drug delivery eg. Topical, inhaled and insulin.

7. Drug allergy:

- recognizing allergic drug reactions and taking history of allergic reaction
- treating allergic reactions, emergency treatment of acute anaphylaxis.

8. Monitoring drug therapy:

- identifying which therapeutic effect must be observed
- measuring correctly plasma drug concentrations (which and when)
- do right action with the results.

9. Managing new evidence:

- performing evidence-based prescribing

- evaluating the validity of evidence presented on new drugs or therapies
- reading, assessing and criticizing clinical studies
- selecting methodological weaknesses including sources of bias

2. WHY

The main objective of Faculty of Medicine Andalas University (FoMAU) is to “produce competent graduates in primary health care as being the family physician who is able to fulfill the people’s needs. The indicator of the people’s need consists of bio-psycho-socio economy-cultural elements” (FoMAU, 2007). Whereas, at elaborated competencies by Indonesian Medical Council (2006) – known as Medical Standard Competency - a main reference for Indonesian Medical Faculties’ curriculum, doctors should attain seven competencies and five of them have relations with using of drugs as are given at table 1 below:

Table 1. Competency areas concerning the use of drugs

No.	Competency Areas
1.	Effective Communication Area <ol style="list-style-type: none"> Explain correctly, clear, complete and honesty about aim, need, benefit, procedur diagnostic risk and therapy before doing. Inform condition of patient orally, written or electronic to colleagues.
2.	Clinical Skill Area <ol style="list-style-type: none"> Select and do therapeutic skill and preventive action. Do clinical emergency procedure
3.	Medical Science background Area <ol style="list-style-type: none"> Explain aim of therapy physiologically and molecular. Explain rationally and in patient management clinically and pharmacology. Explain indication of drug and side effect Explain the pathological changing after therapy. Explain parameter and indicator of successful of therapy.
4.	Health problem Management Area <ol style="list-style-type: none"> Select the appropriate therapy based on quality, financial, benefit and patient condition as well as patient’s choosing. Provide strategic reason at patient management based on pathophysiology, pathogenesis, pharmacology, psychology, social and others. Write a rational drug prescription (right indication, drug, dose, frequency and drug administration as well as patient’ condition), clear, complete and readable. Identify some success therapy indicator, monitoring therapy, improving and change the right therapy. Predict, monitor, and know probability of drug interaction and side effect, improve or change with the right therapy.
5.	Information Management Area
6.	Self-care and self-development Area

7.	Ethics, Moral, Medicolegal, Professionalism and Patient Safety Area. <ol style="list-style-type: none"> Think about financial and treat in health service and their impact. Understand and law responsible regarding drug prescription, physic and sexual abuse.
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Source: Indonesian Medical Council, 2006

From table 1 we can realize that competency regarding the use of drugs is essential for doctors who will work at primary health care, because of five of seven competencies has to be engaged by medical students before practicing at community. Meanwhile, Indonesian Medical Council proposes level competencies based on Miller's Pyramid. Please, refer to Appendix 2 in which I rewrite clinical skill that students have to accomplish (concerning Pharmacotherapeutic skill) in relation to level of competency.

3. *HOW*

Based on SPICES learning strategy is implemented at FoMAU and theory of SPICES introduced by Harden, Sowden and Dunn (1984), predictably, this Pharmacotherapeutic skill is trained by such method as well. **Firstly**, student-centered learning, students learn procedural-knowledge from standard procedural guide provided by faculty or from prescribed learning materials by themselves. Such learning materials, please see Appendix 3. Subsequently, they try to act under supervision until they can accomplish the objectives gradually and lastly they act independently. Students are allowed to practice by themselves by appointment with teacher or technical assistant. **Secondly**, problem-based learning is more concerned with elaborating their knowledge and case will be as stimulator for their learning process. For example, teacher will ask them to write a prescription for diarrhea patient, teachers may just tell about symptoms or signs of the patient. **Thirdly**, integrated - skill training at this curriculum is integrated with Knowledge and Attitude, other subjects and other skills as well as practical of the theory, as we can see at Appendix 1. Then, horizontal and vertical integration also arises at this skill, while spiral curriculum is method for vertical integration, for instance, at year 2 they are trained how to take a drug history, then at next year they are confronted with how to communicate more complicated i.e acquiring inform consent from patient, of course they should inform properly to patient in order to patient agree with them. At year 5 to six, they will be confronted with real patient and real situation when under pressure condition is commonly at bed-side teaching. **Fourthly**, community-based learning, at this method, students will apply their skill as well as knowledge to community, specially at clerkship curriculum. **Fifthly**, early clinical exposure - from the first year students will introduced with medical science and relate with their real life condition as well as clinical condition. Such as, they learn basic pharmacology in which they explore how medicine/chemical agent acts at our body. In addition, at the second year they will be trained how to communicate concerning drug use and how to write a prescription. **Finally**, systematic - this core skill is developed systematically based on competencies that students have to be attained.

4. *WHEN*

These skills are trained with taking a drug history skill at year 2 when students have been learnt Basic Pharmacology at year 1, then, they are confronted with prescription writing skill. Next, students at 3rd year are expected to be able to acquire inform consent to therapy and objective information which underpinning safe and effective prescribing as well as selecting adverse drug reactions and interactions. Subsequently, at year 4 learners shall complete how to administer several routes of drug, care with drug allergy, how to monitor drug therapy and consider with new evidence regarding the use of drugs. As a detail description of these skill, please see at Appendix 1 in which brief description Pharmacotherapeutics skill in relation to knowledge and attitude the students should be attained, and other subjects that students have to understand, as well as related others skill and practical which they will be trained.

5. ASSESSMENT

We see firstly at a glance, there are two basic important kind of assessment i.e formative and summative assessment. Firstly, we assess in order to intrude intently to improve. Secondly, we assess to make such decision as good/bad, prepared to move forward, and do again a program. Such two processes lead to direct the instrument selection (Friedman, 2005). Whereas, by regarding purposing of assessment, Friedman stated six goals i.e.: assuring that a students meets fixed minimal prerequisite; identifying students who have accomplished a required stage promotion to the next stage or who need to redo the program; selecting the best candidates for a particular program; permitting students to monitor their self-study; providing information as regards to accomplishment of students level and producing potency and limitation of student performance. Conventionally, the first three of these goals are related with summative assessment, while the last three of them with formative assessment.

Other opinion regarding assessment comes from an educational psychologist who suggested that the following point of evaluation influence students' motivation, these are by making evaluation clear and more specific; minimalizing or reducing competition for grade; giving specific feedback and suggestion so students can improve their task (Ormrod, 2007).

Presumably, based on principles above and learning outcome of Pharmacotherapeutic skill – knowledge and performance-based- I propose two types of assessments. There are formative assessment (peer and feedback assessment) and summative assessment (written test and OSCE/objective structured clinical examination).

Peer, some researchers found that peer assessment has potential to develop students' performance (Norcini, 2003; Dannefer et.al, 2005). But, sometimes peer assessment produces internal conflict among students because of inappropriate or hurtful comment, therefore, it is important to generate a conducive environment, and provide rules what items are assessed (Dannefer et.al, 2005).

Feedback, it is not easy to improve student's skill without conducive situation and feedback or input for their performance from teachers (Snadden, D., & Ker, J.S., 2005), otherwise Snadden & Ker suggested the ways in order to design an effective feedback, including: Clear, feedback is clear and not vague so students can realize which performance that they have to improve; Owned, feedback is from your own perception; Regular, it is very useful if we give feedback regularly and at that moment happen; Balance, it means balancing of weaknesses and strengths, as result students feel fairly; and Specific, point out specific thing that you thought it is needed improvement.

Written test, purpose of this assessment is to assess procedural knowledge of students. It could be MCQ (Multiple Choice Question, or essay). It takes place at the end of semester/year.

OSCE, this assessment takes place together with other subject at the end of semester/year.

III.CONCLUSION

This paper has presented the design of Pharmacotherapeutics skill based on a thorough analysis of the existing curriculum. This design is implemented in accordance to the theory of Spiral Curriculum. The skills are applied at year 2 and continue until clerkship program. The skills consist of taking a drug history, prescription writing, acquiring inform consent to therapy, acquiring objective information which underpin safe and effective prescribing, selecting adverse drug reactions and interactions, drug administration, drug allergy, monitoring drug therapy, and managing new evidence.

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Appendix 1.

Year:	Skill	Knowledge	Attitude	Practical	Relation to other Subjects	Relation to other Skill
1st		Identifying and interpreting basic pharmacology: - the mechanism of drugs action generally at a molecular, cellular, tissue and organ level. - the ways in which these actions produce therapeutic and adverse effects - the receptor as a target of drug action and related concepts such as agonism, antagonism, partial agonism and selectivity - the development of tolerance to drugs.			Chemistry, Biology, Anatomy, Biochemistry, Physiology, Biomolecular	
2nd	Taking a drug history: -taking precise information as regards drug used with prescription or not. - recording history of adverse drug reactions. Prescription writing: - selecting a safe and effective drug and right dose - writing precise, legible, and legal prescriptions including controlled drugs - organizing precise records of prescriptions and response	Clinical pharmacokinetics, analysing: - the mechanism of drug absorption, distribution, metabolism and excretion. - the underlying theory of volume of distribution, clearance and half life and their clinical relevance. - how these factors determine the optimal route, dose and frequency of drug administration. Applying prescription for patients with special condition included: - elderly patient - children - pregnant and breast-feeding women - patient with renal or liver diseases.	A rational practicing to write prescription and therapeutics: - identifying the correct clinical diagnosis - understanding the pathophysiological process involved - knowing the drugs that might beneficially influence these processes - establishing the end-point with which to monitor therapeutic response - communicating with patient in making the decision to treat. Concerning risk-benefit analysis: - recognizing and	Drug Absorption and Excretion	Anatomy-Histology, Biochemistry, Physiology, Pharmacy, Communication, Internal, Paediatrics, Obstetrics & Gynaecology	Taking patient history, ICT, Administrative skill, Physical examination,

	<ul style="list-style-type: none"> - calculating drug doses based on patient weight and normogram - prescribing oxygen (flow rate, delivery) and intravenous fluids. <p>Prescribing drugs in extraordinary groups: Elderly, pediatrics, pregnancy and breast-feeding, renal and liver failure.</p>		<p>assessing that there are risks and benefits associated with all drug treatments</p> <ul style="list-style-type: none"> - recognizing these may differ between patients depending on a variety of factors. - recognizing that doctors should monitor the impact of the drugs they prescribe 			
3 rd year	<p>Continuing skill at 2nd year.</p> <p>Acquiring inform consent to therapy:</p> <ul style="list-style-type: none"> - providing sufficient drugs information in order to patient can decide inform consent for their therapy. - discussing advantages and disadvantages as regards drug therapy with patients. - identifying patient's perceive and desire in drug therapy. <p>Acquiring objective information which underpinning safe and effective prescribing:</p> <ul style="list-style-type: none"> - using Indonesian National 	<p>Identifying frequently used drug</p> <ul style="list-style-type: none"> - the mechanism of action, the indications for use, the right route of administration, and the important contra-indication and side-effects of a selected list of frequently used drugs. <p>Interpreting ethics of prescribing</p> <ul style="list-style-type: none"> - Informed patient consent . <p>Indicating medicine management</p> <ul style="list-style-type: none"> - the role of local formularies - the role of drug & therapeutic committees - the influence that affect individual prescribing choices - the rational assessment of new drugs based on safety, efficacy and cost-effectiveness <p>Defining adverse drug reactions</p>	<p>Recognizing the responsibilities of a doctor as part of the prescribing community:</p> <ul style="list-style-type: none"> - useless prescription and over consuming of limited resources must be avoided - concerning adverse drug reporting - adhering to therapeutics guidelines and drug formularies as appropriate <p>Recognizing personal limitations in knowledge:</p> <ul style="list-style-type: none"> - recognizing the need to seek further information about drugs when faced with unfamiliar prescribing problems. 	<ul style="list-style-type: none"> - Analgesics. - Toxicology - Cardiovascular - Otonomy Drug 	<p>Anatomy,</p> <p>Biochemistry,</p> <p>Physiology,</p> <p>Pharmacy,</p> <p>Communications,</p> <p>Ethics,</p> <p>Interne,</p> <p>Health Economics,</p> <p>ICT,</p>	<p>Communication skill,</p> <p>Non-pharmacotherapeutics Skill,</p> <p>Administrative skill,</p> <p>Management skill,</p> <p>ICT,</p> <p>Attitudinal awareness,</p>

	<p>Formulary</p> <ul style="list-style-type: none"> - accessing reliable drug information from medical journal and medical databases - distinguishing between evidence and opinion treatment. <p>Selecting adverse drug reactions and interactions:</p> <ul style="list-style-type: none"> - assessing drugs as a possible cause of symptoms and signs - recognizing the possibility for adverse interaction -reporting adverse drug reactions and interactions 	<ul style="list-style-type: none"> - the frequency of adverse reactions in primary and secondary care. - recognition of the predisposing factors and how risks can be minimized - the importance of reporting adverse reaction. 				
4 th year	<p>Continuing skill at 2nd and 3rd year.</p> <p>Drug Administration:</p> <ul style="list-style-type: none"> - choosing the right way of administration - administering and preparing drugs for subcutaneous, intramuscular, and intravenous injections - advising and demonstrating to patient about particular type of drugs delivery eg. Topical, inhaled and insulin. <p>Drug allergy:</p> <ul style="list-style-type: none"> - recognizing 	<p>Identifying drug interaction:</p> <ul style="list-style-type: none"> - the potential for drugs to interact to cause positive and negative effects - the drugs interact mechanism - the ways in which interactions can be predicted and avoided. <p>Discussing therapeutic drug monitoring:</p>	<p>Responding for the future</p> <ul style="list-style-type: none"> - recognizing the need to update prescribing practices. - ensuring that patients benefit where possible from advances in medical knowledge - recognizing the need to assess the benefits and hazards of new therapies. - knowing the limitations of applying clinical trial data to individual patients. 	<p>Histamine and Anthihistamine Drug</p> <p>Demonstration : how to using measurements of plasma drug concentrations.</p>	<p>Anatomy,</p> <p>Biochemistry,</p> <p>Physiology,</p> <p>Pharmacy,</p> <p>Interne,</p> <p>Pulmonology,</p> <p>Allergics & Immunology,</p> <p>Research Methodology,</p> <p>Anaesthetics,</p> <p>Nursing Care,</p> <p>Dermatology,</p> <p>Ophthalmology,</p>	<p>Communication skill,</p> <p>Physical Examination,</p> <p>Non-pharmacotherapeutics Skill,</p> <p>Management Skill,</p> <p>Administrative Skill,</p>

	<p>allergic drug reactions and taking history of allergic reaction</p> <ul style="list-style-type: none"> - treating allergic reactions, emergency treatment of acute anaphylaxis. <p>Monitoring drug therapy:</p> <ul style="list-style-type: none"> - identifying which therapeutics effect must be observed - measuring correctly plasma drug concentrations (which and when) - do right action with the results. <p>Managing new evidence:</p> <ul style="list-style-type: none"> - performing evidence-based prescribing - evaluating the validity of evidence presented on new drugs or therapies - reading, assessing and criticizing clinical studies - selecting methodological weaknesses including sources of bias 	<ul style="list-style-type: none"> - the importance of monitoring the impact of drug therapy. - the ways that this can be achieved (measuring plasma drug concentration or assessing pharmacodynamic responses) - the variable relationship between plasma drug concentration and drug effect. <p>Explaining development of new drugs</p> <ul style="list-style-type: none"> - drug development including clinical trials (Phase I to Phase IV) - the approval process and major regulatory authorities in Indonesia. - the requirements of good clinical trial design - consent, ethics, bias, statistics, dissemination of information. 			<p>ENT,</p> <p>Surgery,</p> <p>Obstetrics & Gynaecology.</p>	
Elective		<p>Alternatives therapies</p> <ul style="list-style-type: none"> - the motivation that lead patient to seek alternatives therapies. - some common indications and appraisal of the evidence for their efficacy 			<p>Public Health,</p> <p>Health Economics,</p> <p>Antropology and</p>	

		- how such therapies might interact with prescription drugs that patients are receiving.			Sociology, Communicati on, Phytopharmac y	
5 th year	Application SKA to real patient					
6 th year	Application SKA to real patient					

Appendix 2.

Clinical Skill Level according to Medical Standard Competency (2006):
(Concerning the use of drugs):

No.		1	2	3	4
1.	Internal Medicine: Therapeutics skill: - subcutaneous and intramuscular injection - administration of insulin - intravenous canulation			3 3	4
2.	Surgery: Accident and emergency: - first aid - fluid resuscitation Therapeutics skill: - pre-operative preparation - infiltration anaesthesia - local nerve block - administration of analgesics		2	3 3	4 4 4
3.	Gynaecology/obstetrics: Contraception/sterilization: - Advise about contraception - Insertion I.U.D Practical obstetrics: Normal delivery: - chemical induction of labour		2	3	4
4.	Ophthalmology: Therapeutics skills: - eye drops instillation - eye ointment application				4 4
5.	General practice: Skin, mucosa and subcutaneous tissue: - administration of drugs, intravenous - administration of drugs, intramuscular - administration of drugs, subcutaneous - administration of drugs, intracutaneous - application of topical anaesthetics (drops, spray) - administration of local anaesthetics - administration of nerve block		2	3 3 3	4 4 4
6.	Communication and recording: - formulating orally and in writing - educating, advising and coaching of individuals and groups - making a management plan - therapeutics consultation				4

	<ul style="list-style-type: none"> - drug prescription - Oral and written communication with colleagues and other health care professional (referral, consultation) - Reporting and making record - Information processing and applying (especially from scientific literature). 				
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Level:

1. Able to know and explain. (Passive observation- Active observation)
2. Ever seen or demonstration (Participatory observation)
3. Ever done or under supervision (Supervised practice)
4. Able do independently (Independent practice- sharing responsibility)

Appendix 3.

Learning materials:

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