Indian J Physiol Pharmacol 1999; 43 (2) : 242–246

OBJECTIVE STRUCTURED PRACTICAL EXAMINATION IN PHARMACOLOGY FOR MEDICAL LABORATORY TECHNICIANS

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(Received on March 27, 1997)

Abstract : The objective structured practical examination (OSPE) is a useful evaluation method for testing psychomotor skills. Students for the degree in medical laboratory technology require to learn certain skills which will make them useful in any research or teaching laboratory in experimental pharmacology. We outline an OSPE which can be used for evaluating students in experimental pharmacology.

Key words : OSPE evaluation methods

INTRODUCTION

The degree course for medical laboratory technicians [B.Sc (MLT)] requires that students attain a certain degree of proficiency in psychomotor skills such as handling animals, putting up isolated tissues, administering drugs to animals by the various routes independently and making necessary arrangements for the conduct of practical classes or experiments. Skills such as handling of animals and mounting of tissues are very relevant (1) to the tasks expected of these trainees in their career and hence assume great importance. A great deal of curricular time and effort is spent on these areas.

At the present time evaluation during the practical examination has been by a seat viva at the end of the practical. It is a form of global assessment at the end of the practical task. Since the process is not evaluated, this method lacks content validity (2). In order to overcome this problem we decided to identify certain important psychomotor skills related to experimental pharmacology (Table I) which could be tested in an objective manner and convert the examination pattern to objective structured practical examination (OSPE).

METHODS

A station is the place designated for testing a particular skill. Stations testing psychomotor and communication skills are called procedural stations (3) and those testing cognitive skills such as interpretation, analysis, synthesis and problem solving skills are known as response stations. Approximately two thirds

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TABLE I : Some important skills in experimental pharmacology for medical laboratory technicians.

1.	Correct use of the physical balance to weigh a substance.
2.	Loading the exact volume of a drug into a hypodermic syringe from a vial.
3.	Injecting subcutaneously
4.	Handling of mice and injecting a given drug through the intraperitoneal route single handedly
5.	Mounting the isolated rat ileum preparation
6.	Obtaining a response with Frog rectus isolated muscle preparation
7.	Smoking a kymograph drum
8.	Attaching the isolated frog heart to the lever and recording a reponse with a drug
9.	Handling a frog and counting respiratory movements in frog
10.	Measuring tail–flick response of rat using the analgesiometer

of the stations are procedural stations and the remaining one third are response stations. This can vary according to the content area being evaluated. The exact number of stations can be decided based on the infrastructure, time and manpower available for conducting the examination. The test is conducted with ten minutes being allotted to each station.

Each procedural station is manned by one observer who may be a faculty member or a technician or a resident while the response stations are unmanned. Each of the observers is given prevalidated checklists which are used to rate the performance of the students. At the end of the exam the scores of individual students are tabulated. We describe below two examples each of the procedural and response stations.

Procedural station 1 :

Skill to be tested : Injecting subcutaneously.

TASK : Inject 0.1 ml of saline subcutaneously and dispose the needle.

Materials to be provided : Hypodermic syringe of 1 ml capacity, hypodermic needles (with caps) of 18 to 24 gauge, an orange with a site marked on it, saline solution, spirit, cotton, sharps disposal container.

Check–list

1. Wipes area with spirit from centre to periphery.
2. Waits for the spirit to dry.
3. Positions needle with bevel facing upwards.
4. Holds syringe in correct manner (without touching needle).
5. Inserts needle at 45° degree angle.
6. Withdraws to check that the needle is not in a vein.
7. Pushes plunger smoothly and completely.
8. Withdraws and wipes area with cotton.
9. Disposes needle (without recapping) and syringe.

Procedural station 2 :

Skill to be tested : Using the physical balance for weighing a substance.

TASK : Weigh 1.029 g of sodium chloride using the physical balance. The sensitivity of the balance is 1 mg.

Materials to be provided : Physical balance, weights, butter paper, sodium chloride.

Check–list

1. Follows counterpoising procedure.
2. Places paper of same size in both pans.
3. Places weights in left pan.
4. Does not spill outside the pan.
5. Releases the lever before removing/ adding salt.
6. Removes weights and returns them to the box.
7. Cleans up.

Response station 1:

Skill to be tested : Calculation of the dose of a drug and the procedure for dilution to obtain the correct volume that can be accurately measured in a syringe.

TASK : The dose of drug "A" is 0.5 mg/ kg. The concentration of the solution of "A" provided is 1 percent.

(a) Calulate the volume that is required for injecting drug "A" into a mouse weighing 25 g.

(b) Write down the steps of the procedure so that the correct amount of the drug can be accurately loaded in a tuberculin syringe.

Response station 2 :

Skill to be tested : Recognition of symbols displayed on labels denoting inflammable, corrosive, radioactive and poisonous.

TASK : You are given lebels for four boxes containing the following chemicals :

1. Ether
2. Concentrated nitric acid
3. Sodium cyanide
4. RIA Kit for assay of insulin

(a) Draw the most appropriate symbol which characterises the property of each chemical against its name.

(b) Give two examples of chemicals for each symbol you have drawn.

DISCUSSION

The present practical examination system in pharmacology for the medical laboratory technicians lacks validity, objectivity and reliability. Since students are asked to carry out individual experiments, there is a lack of uniformity as some experiments are much easier to perform. Hence luck plays a major role in the outcome. There is also high inter-examiner variability. OSPE successfully reduces most of these problems.

The advantages of OSPE are that there is uniformity since all students perform all the tasks, it is very objective and a large number of students can be effectively examined in a relatively short time. The main drawback of OSPE seems to be the fact that there is an artificial compartmentalization of tasks which does not truly reflect the real life situation. The other problems are observer fatigue, which can be avoided by getting observers to change stations after some time. The advantages far out-weigh the disadvantages of this method. Prior discussion with all teachers and meticulous planning is required to conduct OSPE effectively. However, once started, its advantages become obvious to students and teachers alike.

Lack of confidentiality is probably the only reason why OSPE cannot be conducted during the university examinations. Therefore, we recommend the use of OSPE for formative examinations only (we conduct four such examinations).

The success of OSPE depends a great deal on the checklists which are used. In designing these checklists care should be taken that the task and its components are observable, measurable and can be completed comfortably within the allotted time. Discussions with the faculty and students will ensure that unrealistic and irrelevant tasks are not set. Response stations can be set to test problem solving skills which are complementary to the skills tested in the procedural stations. In the first example described in this paper the response station tests the ability of the student to calculate the dose to be injected while the procedural station tests the skill of injecting the drug.

A candidate's individual score after OSPE is indicative of the expertise gained by the student for that particular psychomotor skill whereas the group score serves as a feedback to the teacher. In the worked out example given in Table II only candidates No. 2 & 4 have received very high scores. All the students have performed

TABLE II : OSPE Code Sheet
Check List for injecting subcutaneously.

Sl.No	*Item*	*Candidate's number*						*Group*
		1	*2*	*3*	*4*	*5*	*6*	*Score*
1.	Wipes area with spirit from centre to periphery	√	√	×	√	×	√	4
2.	Waits for spirit to dry	×	√	×	√	×	√	3
3.	Positions needle with level facing upwards	√	√	×	√	×	×	3
4.	Holds syringe correctly (without touching needle)	√	√	√	√	√	√	6
5.	Inserts needle at 45° angle for 1 cm	√	√	√	√	√	√	6
6.	Withdraws to check that the needle is not in a vein	×	×	×	×	×	×	0
7.	Pushes plunger smoothly and completely	×	√	×	√	×	√	3
8.	Withdraws and wipes area with cotton	√	√	×	√	×	√	4
9.	Disposes of needle (without recapping) and syringe	×	×	×	×	×	×	0
	Individual Score	5	7	2	7	2	6	

Instructions to observer : Mark (✓), if yes/done
Mark (×), if no/not done

Name of observer : Signature

correctly at the fourth and fifth subtasks whereas none of them have got the sixth and ninth subtasks correct. When the majority of the students in a class is not able to do a task properly the teacher should take this as a feedback implying inadequate or faulty coverage during the teaching–learning session (4). This will help the teacher in devising better teaching–learning activities so that students are able to attain proficiency in the skills practised.

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