Clinical orientation of undergraduate pharmacology practicals: An intervention study

The conventional undergraduate pharmacology practicals (UGPP) curriculum, i.e., the preparation of mixtures, lotions and animal experiments, is often criticised and the introduction of clinically useful procedures in its place has been emphasised in recent issues of the Indian Journal of Pharmacology (IJP).\[1,2\] and by the Medical Council of India. But no systematically designed study has been conducted regarding the inclusion of specific practical procedures in the UGPP curriculum. Hence, an extensive, learner-oriented study was conducted, during 2002-2004, on doctors and fourth semester medical students. The objective was to obtain their written suggestions about the existing UGPP curriculum and its improvement; and to evaluate the benefits accrued to the students by the inclusion of one such suggested clinical procedure, in the curriculum, using different teaching methods.

The opinions of doctors regarding the utility of practicals, their suggestions for improvement, and their observations on including 5 important therapeutic procedures (i.e., setting up of i.V. drip for the infusion of quinine, dopamine, oxytocin, aminophylline, and the nebulization procedure in bronchial asthma) in the UGPP curriculum, were obtained. Based on their remarks, one clinical procedure, i.e., setting up of intravenous quinine infusion for complicated falciparum malaria was incorporated into the UGPP curriculum, in collaboration with a faculty member from the Department of Medicine, on a trial basis, to quantitatively assess the confidence of individual students of Group A and Group B was sought in a written proforma and their confidence levels (i.e. (i) Entirely confident (ii) Partially confident (iii) Not confident at all) were compared.

**Step III:** Group A students, who had not been shown the practical procedure earlier, were subsequently shown the procedure and encouraged to participate in the demonstration, after which they were reassessed.

**Step IV:** Fifty doctors, who had completed their MBBS in the last 10 years, were also assessed on the same SAQ and PBQ. The OSCE assessment could not be done for them as they did not have the time to visit the department for the quinine infusion demonstration. As the doctors had field exposure, their performance was compared with that of Group B students. All the assessments and scorings were by blind observers.

Finally, the opinion of the students regarding the inclusion of such procedures in the UGPP curriculum and the examination was sought.

Suggestions were collected from 100 doctors, who graduated between 1970-2003, from 15 medical colleges in 8 states (Orissa, West Bengal, Maharashtra, Madhya Pradesh, Karnataka, Tamil Nadu, Andhra Pradesh and Kerala), of which the UGPP curriculum had been revised in only two colleges. A majority of the doctors (77.14%) stated that whatever they had been taught in UGPP was not useful in their career. Some also remarked that valuable time had been wasted in performing unnecessary procedures with outdated instruments. All of them (100%) opted for the inclusion of the above-mentioned 5 therapeutic procedures in the UGPP curriculum, while 74% opted for the inclusion of these procedures in the examination also. They also suggested changes such as the demonstration of common drug formulations, managing life-threatening side effects, teaching clinical pharmacology in hospital wards, and so on.

The scores obtained by students assessed using SAQ, PBQ and OSCE and the scores obtained by the doctors assessed using SAQ and PBQ only, on the use of the quinine infusion in treating falciparum malaria, in different steps of this study, are shown in Table 1. The statistical analysis was done by applying the ‘Z-Test of Proportion’\[7\] (where Z value >1.96 indicates statistically significant difference) and the comparison is mainly done between Step IIA and Step IB.

As evident from Table1, after the theory class (Step I), only 4% students could score more than 60% in SAQ, and none in PBQ and OSCE (clinical skill). Though the verbal explanation of the procedure in the practical class without demonstration (Step IIA) improved the performance of students in SAQ and PBQ (with 61.12% vs. 4% and 40% vs. 0% scoring above 60%), it could not improve their practical or clinical skill. However,
a practical demonstration of the procedure with active participation by the students in Step IIB, dramatically improved performance in all categories of evaluation, in comparison with Step IIA. Although the difference in scores in SAQ, between the teaching methods in Step IIA and Step IIB, was not statistically significant \((Z=1.89)\), a significantly higher percentage (68.9% and 71.4%) of students, after Step II B, scored more than 60% in PBQ and OSCE, respectively in comparison to (40% and 0%) students after Step IIA. \((Z=3.12 \text{ and } 11.53 \text{ for } \text{PBQ and OSCE}, \text{respectively})\) The performance of students after Step IIB was at par with that of the doctors with regard to SAQ and PBQ \((Z=1.2)\).

A total of 95.74% of Group B students were confident of administering the I.V. quinine infusion independently, in a hospital as against 34.37% of Group A students. Group A students showed a remarkable improvement in practical skill (from 0% to 100%), after the demonstration (Step III). More than 97% students of both the groups wanted the inclusion of clinical procedures in the curriculum and the examination.

Teaching methods in pharmacology have not changed much despite the dramatic explosion of knowledge in medical science. To update the curriculum, inputs from three sources are necessary, i.e., doctors who face therapeutic challenges; experienced pharmacologists; and MBBS students. In recent issues of the LJF\(^{11,12}\), opinions of students and teachers have been analysed, but suggestions from doctors are missing. Hence, we have obtained suggestions from doctors of different states to help improve the UGPP curriculum uniformly in all medical colleges. This study highlights the fact that the existing UGPP curriculum has not been very useful to doctors, and both doctors and students desire clinically relevant practicals to be incorporated into the curriculum and the examination.

The assessment of scores obtained by students (in SAQ, PBQ and OSCE), after using different teaching methods, and those obtained by doctors (in SAQ and PBQ) in this observer-blind study proves the following: Practical classes on clinical procedures involving the demonstration of the entire procedure, step by step, in small groups, with the active participation of students, are effective in improving the skill of students. This is practically possible and economically feasible. As one of the goals of undergraduate training is to train students to manage a patient, the inclusion of such procedures in the UGPP curriculum needs to be discussed in an appropriate forum to update the curriculum in Indian medical colleges.

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References


**Table 1**

Percentage of candidates securing different scores

<table>
<thead>
<tr>
<th>Category</th>
<th>% of candidates scoring less or more than 60%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SAQ</td>
</tr>
<tr>
<td></td>
<td>&lt;60%</td>
</tr>
<tr>
<td>Roll. 1-106 after theory (Step I)</td>
<td>96</td>
</tr>
<tr>
<td>Roll. 1-53 after verbal explanation (Step IIA)</td>
<td>38.8</td>
</tr>
<tr>
<td>Roll. 54-106 after active demonstration (Step IIB)</td>
<td>22.2</td>
</tr>
<tr>
<td>Roll 1-53 Demonstration (after active) (Step III)</td>
<td>0</td>
</tr>
<tr>
<td>Doctors (Step IV)</td>
<td>29.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters (score) studied</th>
<th>Steps/Groups compared</th>
<th>Z value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAQ</td>
<td>Step II A Vs. Step II B</td>
<td>1.89</td>
<td>NS</td>
</tr>
<tr>
<td>PBQ</td>
<td>Step II A Vs. Step II B</td>
<td>3.12</td>
<td>S</td>
</tr>
<tr>
<td>OSCE</td>
<td>Step II A Vs. Step II B</td>
<td>11.53</td>
<td>S</td>
</tr>
<tr>
<td>PBQ</td>
<td>Step II B Vs. Step IV</td>
<td>1.2</td>
<td>NS</td>
</tr>
</tbody>
</table>

Z>1.96 - Significant (S), Z<1.96 - Not Significant (NS)
ANNEXURE I
SHORT ANSWER QUESTIONS (SAQ)

Name & Qualification: 
Marks= 40

Designation & Experience:
1. What are the indications for quinine therapy in malaria? 3
2. What are the indications for oral quinine therapy? 3
3. What are the indications for parenteral quinine therapy? 3
4. Which quinine salt is preferred for parenteral use and why? 3
5. How to administer (route) quinine therapy in cerebral malaria? 3
6. If quinine is to be given through I.V. drip, what is the ideal fluid in which Inj. quinine is to be administered and why? 3
7. Mention the dose, frequency, rate of administration and duration of quinine therapy if through I.V. drip. 10
8. Mention the important adverse effects to be monitored during quinine therapy and how to monitor them? a) b) c) 6
9. Mention the contraindications to quinine therapy. 3
10. Mention the alternative drugs and their dosing schedule in patients with serious falciparum malaria in whom quinine is contraindicated. 3

Signature of Student/ Doctor.

ANNEXURE II
PROBLEM BASED QUESTIONS (PBQ)

Q) An adult male aged 25 years, weighing 42 kg, presented with fever and unconsciousness. His peripheral smear showed PF rings. (a) Prescribe treatment for this patient. (b) Demonstrate how will you administer the drug.

The problem solving skill expected from the student here is as follows:
1. Calculate the dose of Inj. quinine for a 42 kg adult:
   i.e., 420 mg of Inj. quinine 10 mg/kg.
2. Calculate the volume of Inj. quinine required:
   i.e., as 1 amp Inj. quinine contains 2 ml and each ml contains 300 mg of quinine.
   So, 420 mg will be present in 1.4 ml of Inj. quinine.
3. Selection of fluid, i.e., 10% dextrose solution.
4. Calculate the rate of quinine infusion:
   i.e., 1.4 ml of Inj. quinine is introduced into 500 ml of 10% dextrose solution, which is to be administered over 4 h.
   So, the desired rate of administration is calculated as follows: In 4 h, 500 ml to be given

   Hence, in 1 min, 2.08 ml or 2 ml to be given.

   In 1 min=500/240=2.08 ml
In 1 min=125/60=2.08 ml

   So, the rate of quinine administration should be 32-40 drops/min.

5. The student should demonstrate the preparation of the quinine infusion with the help of 10% dextrose solution, Inj. quinine 1 amp, syringe, needle, I.V. set, dummy and so on. While this procedure is being conducted by the student, the observer awards marks, considering the steps given in Annexure III.

ANNEXURE III (To be filled up by the observer)
OBJECTIVE STRUCTURED CLINICAL EXAMINATION (OSCE)

Name of the Student:

DID THE STUDENT:
1. Calculate the correct dose of Inj. quinine required for the particular patient? Yes No (4 marks)
2. Draw out the correct volume of Inj. quinine to be introduced into the bottle? Yes No (4 marks)
3. Follow the proper procedure in drawing the Inj. from the ampoule into the syringe? Yes No (4 marks)
4. Close the regulator of the I.V. set before introducing it into the bottle? Yes No (4 marks)
5. Introduce the I.V. set into the bottle keeping it in erect position, and then suspend the bottle in the stand? Yes No (4 marks)
6. Press the air chamber of the I.V. set after hanging the bottle so that fluid enters the air chamber? Yes No (4 marks)
7. Open the regulator and make the I.V. set air-free and then close the regulator? Yes No (4 marks)
8. Fix the drip on the dummy? Yes No (4 marks)
9. Adjust the rate of quinine drip in the desired rate (……drops/ min)? Yes No (4 marks)
10. Follow the aseptic technique throughout the procedure? Yes No (4 marks)

Signature of the Observer.