DOI: 10.7860/JCDR/2016/15206.7054

Original Article

Pharmacology Section

Effectiveness of Revised Pharmacology Record Books as a Teaching-Learning Method for Second Year Medical Students

DHANYA SASIDHARAN PALAPPALLIL[1], RENEEGA GANGADHAR[2]

ABSTRACT

Introduction: The goal of teaching medical undergraduates Pharmacology is to form a sound foundation of therapeutics. The pharmacology record books are maintained as a part of the curriculum. The purpose of this study was to obtain feedback of the medical students about the new record adopted in the institution after major revision

Materials and Methods: This was a questionnaire based study done in a Government Medical College of Kerala in February 2013. The data was analysed using SPSS. The feedback on clinical pharmacology exercises was given positive and negative scores.

Results: Majority (64.5%) opined that the content in pharmacology record was good. A total of 78.1% completed the record during discussions in practical classes. Majority wrote the records for understanding pharmacology. For 79.8% General Pharmacology exercises were most relevant, 33.8% considered Clinical Pharmacology exercises to be the most thought provoking. Drug use in special groups received the maximum positive score.

Conclusion: The new improved pharmacology record is an effective teaching-learning method. Inclusion of more clinically oriented exercises has increased the interest of the students in the subject.

Keywords: Clinical pharmacology, Medical education, Qualitative research, Undergraduate

INTRODUCTION

In India, pharmacology is taught in the third, fourth and fifth semesters of MBBS (Bachelor of Medicine and Bachelor of Surgery) course. Inculcating rational and scientific basis of therapeutics enable the students to prescribe drugs safely and maintain this competency in professional life [1]. The traditional systems of teaching pharmacology exercises lacked to instill enthusiasm in young doctors [2]. Pharmacy exercises and animal experiments have been the cornerstones of pharmacology practical exercises till 2007 [3]. There was a constant plea from the subject experts to do away with animal experiments and dispensing pharmacy [4-6]. Several institutions including ours have incorporated more exercises in Clinical Pharmacology keeping the aroma of the old ones over the last 8 years [7-9]. The Medical Council of India mandates that the students maintain a proper record of the works done which should be accessible at the time of inspection [10]. It also forms a part of the student's internal assessment.

Informal discussions with the teaching faculty revealed that the old records were bulky, the main contents being Pharmacy and Experimental pharmacology. There was lack of uniformity in the content of the records with minimal printed questions. One faculty stated that "the correction of older records was boring and more mistakes were identifiable as the students mostly copied". Another pointed out that "The records were lazily written, a ritual and probably locked in the cupboards only to be taken on the eve before examination".

The new records are compact and elicit positive reinforcements of practical applications of portions covered in theory. The main concepts are explained in an introductory note and charts and questions are printed. This minimizes the mistakes that creep in during dictation or copying and provides the student an opportunity to prepare for the practicals. The teacher-teacher variability in discussions and corrections are minimized, providing a uniform, effective and acceptable method for teaching and learning.

The main sections in the revised record were General, Quantitative, Experimental and Clinical Pharmacology. The sub-section on routes of administration was drastically modified with clinically oriented questions and detailed explanation of procedures. Some important pharmacy practicals were retained. Experimental pharmacology was taught using Computer Assisted Learning (CAL) where computer based packages focused on interactive instructions instead of sacrificing animals [4]. The new additions were exercises on adverse drug reactions (ADR), Criticism and rewriting Informed consent form, critical appraisal of advertisements, Effective-doctor patient communication with role play, Clinical problem solving exercises, Preparation of essential medicines list (EML), Fixed dose combinations (FDC), Toxicology, Drug use in special groups and conditions and Interpretation of laboratory data. Review of literature showed paucity of data describing the usefulness of record as a teaching-learning method in pharmacology. Hence the study was undertaken to assess the feedback on the new record.

MATERIALS AND METHODS

This was a qualitative questionnaire based cross-sectional study conducted in the Department of Pharmacology, Government Medical College in Kerala. Ethics committee approval was not sought as this study was an educational feedback with no intervention. The study period was for two weeks. The fifth semester students of a regular batch (after the completion of final practical sessionals, n=128) who used the revised pharmacology records formed the sample population. The identities of the students were kept anonymous giving them chance of free communication. The response were collected from all those who were willing to participate using a semi structured questionnaire [Appendix 1] prepared by the investigators. The questionnaire was validated in terms of time requirement, appropriateness, clarity of instructions and questions by testing among the teaching faculty (n=8). Answers to each question were reviewed by the investigators and requisite modifications were done. The questionnaire reflected on the usefulness of pharmacology records. They were asked to select the appropriate responses and some students chose more than one response. They offered suggestions for improving the record. Feedback on clinical

pharmacology was scored, with +1 for positive and -1 for negative reply. The data were entered in the excel sheet and analysed using SPSS software version 16.

RESULTS

Out of the 128 responders 124 completed the questionnaire (response rate =96.88%). Four were omitted because they were incompletely filled. The participants were of 18-22 years age, 40 being males and 84 females. Of the 124, 50.8% responded to open-ended question eliciting suggestions for improving the record.

Feedback on Revised Practical Record

Majority of students (64.5%) considered the record content to be good when compared to other second year MBBS subjects. It was thought to be excellent by 20.2%, satisfactory by 14.5% but of poor quality by one. Majority of the students (86.3%) preferred to complete the record during the discussions in practical classes, 6.5% preferred completion after referring text books and two percent preferred both methods. A total of 78.1% completed record writing during the interactive practical discussions and 12.9% completed it after referring textbooks, but 11 copied from their classmates. About 65.3% opined that they wrote records for understanding pharmacology, 20.2% for securing internal marks and eight for both. However, seven did it for fear of disciplinary actions. When 62.8% believed that the revised record helped to understand the concepts of pharmacology, 1.6% thought it was not helpful. While 34.7% came prepared for the practical classes, 65.3% came without prior preparation or referencing. The reasons for coming without preparation were lack of knowledge about the next topic (12), shortage of time (10), lack of interest (8) and no compulsion to prepare (3). Out of 81 students who came unprepared, 48 did not give any reason.

Amongst all the sections of the record, as shown in [Table/Fig-1], majority of students considered exercises on General Pharmacology to be most relevant. Clinical pharmacology exercises were the most thought-provoking (33.8%). A vast majority (90.3%) opined that CAL was beneficial in learning experimental pharmacology, eight had no opinion and four did not consider it beneficial.

Feedback on Clinical Pharmacology Exercises

In Clinical Pharmacology, there were many new additions. The feedback on these exercises was scored as shown in [Table/Fig-2]. The maximum score allowable for each exercise was 124 (one positive score by each student). Since there were 13 exercises the total score attainable was 124x13=1612. The overall total score attained was 1344. The students gave maximum score for exercise related to drug use in pregnancy, children and elderly. The exercise which scored the least was Critical Appraisal of Medical Literature. For sessions on effective doctor-patient communications, 56.5 % wanted inclusion of role plays; while 21.8 % each wanted its exclusion or didn't opine about it.

Suggestions to Improve the Record and Practical Sessions

The suggestions for improvement of record were to avoid spelling mistakes and printing errors, increase the font size, include more space for answering, include more charts with explanation, include puzzles, cartoons and colorful diagrams, explain the basic principle for each exercise, highlight important theory points and include reference after each exercise, more exercises on ADR, Patient oriented Problem Solving exercises, addition of list of emergency medicines as appendix and avoid "irrelevant exercises".

The suggestions for improvement of practical sessions were to club the practicals with corresponding theory, inclusion of more clinical case presentations, group discussions and home works to enhance student participation, inclusion of role plays and competitive exercises to make each session more interesting and use of dummies to demonstrate medical procedure.

Session (n=124(%))	R (%)	IN (%)	TP (%)	R+IN/ R+TP/ IN+TP	IR/NI/ NTP
General Pharmacology	99 (79.8)	16 (12.9)	5 (4)	0	4(3.2)
Quantitative Pharmacology	56 (45.2)	38 (30.6)	11(8.9)	3 (2.4)	16 (12.9)
Experimental Pharmacology	56 (45.2)	26 (21)	34 (27.4)	5 (4)	3 (2.4)
Clinical Pharmacology	47 (37.9)	34 (27.4)	3 8(30.6)	5 (4)	0

[Table/Fig-1]: Feedback on Practical sessions.
R-relevant; IN-Interesting; TP-Thought Provoking; IR-Irrelevant; NI-Not Interesting; NTP-Not Thought Provoking

Exercise	R	IN	TP	R+IN/ R+TP/ IN+TP/ R+IN+TP	IR/ NI/ NTP	Total Score (out of 124)
Adverse Drug Reactions	57	37	20	2	-08	108
Informed Consent	68	35	7	1	-13	98
Critical Appraisal of Medical Literature	43	24	4	1	-52	20
Patient Oriented Problem Solving	42	37	34	3	-08	108
Essential Medicines List	72	18	10	1	-23	78
Fixed Dose combinations	92	18	11	1	-02	120
Prescription writing	74	33	10	4	-03	118
Drug Interactions	70	28	20	3	-03	118
Toxicology	73	25	17	3	-06	112
Drug use in Renal and Liver Disease	85	20	14	2	-03	118
Drug Use in Pregnancy, Elderly, Children	80	23	15	5	-01	122
Antimicrobial use	81	27	10	2	-04	116
Interpretation of Lab data	67	29	17	3	-08	108
Total	904	354	189	31	-134	1344
	1478				-134	1344

[Table/Fig-2]: Feedback Scores of Clinical Pharmacology Exercises.
R-relevant; IN-Interesting; TP-Thought Provoking; IR-Irrelevant; NI-Not Interesting; NTP-Not Thought Provoking
Scoring-R=IN=TP= R+IN=R+TP=TP+IN+ R+IN+TP= 1; IR=NI=NTP= -1

DISCUSSION

This study elicited the feedback on pharmacology record after the curriculum revisions adopted by our institution in the academic year 2012-2013. Vyas R et al., assessed the effectiveness of physiology record book as a learning tool and stated that 88% students wrote the responses to questions from each other and from the senior's record [11]. In this study 78.1% wrote the responses during the interactive practical sessions and only 11 students copied from their classmates. This can be owed to the fact that the topics were mostly new and the new records were student friendly and problem oriented.

The key motivating factor for submission of records in study done elsewhere was for obtaining grades (76%) and 83% students maintained the record as an unthinking routine, without comprehension. They opined that if written properly it could be used as an effective teaching/ learning tool for student assessment and curriculum evaluation [11]. In this study 65.3% wrote the records with an urge to know the subject while 20.2% wrote for grades and 8 for both reasons. In all 62.8% opined that the revised pharmacology record helped them to understand concepts much better. The record forms a part of formative assessment, the maximum marks attainable being ten [4]. Vyas R et al., stated that 76% submitted the record just before the submission deadline and thus did not have time to refer to better resources [11]. In this study 65.3% came for practicals without prior preparation attributing their reasons to

lack of knowledge on next topic, shortage of time, lack of interest and lack of compulsion to prepare. The topics of practicals are displayed in advance in the notice board so that the students come prepared. The faculty members should foster the culture of interactive practical sessions rather than spoon feeding. This will motivate the students to become active learners in the form of assessment driven learning [12].

Studies done elsewhere states that the 36.85% participants found theory related to general pharmacology interesting [13]. Another study states that only 13 out of 100 participants found general pharmacology theory to be useful and 14 felt it was interesting [2]. However, in this study a vast majority of the students thought that general pharmacology was the most relevant section. Application of theoretical knowledge during the practical sessions enhances interest and thus helps students to identify the relevance of learning general pharmacology.

Quantitative pharmacology consists of the exercises related to dose calculations. Rate calculation requires special arrangement in laboratory and procurement of material [5]. The dose calculation exercises included calculations on percentage solutions as well as the dosage requirement of various drugs like antibiotics or heparin infusion which a basic doctor should know in a competent set up.

Experimental pharmacology constitutes the charts and CAL based discussions. In previous studies, very few participants found it to be interesting or relevant in patient care [2,14]. However, in this study it was rated relevant by 46.8%, thought provoking by 31.4%. Majority opined that CAL was beneficial in learning experimental pharmacology. CAL is interesting and useful educational tool which helps in avoiding sacrifice of innocent animals [15]. It meets the learning objectives addressed by the cognitive and psychomotor domains and drug effects are well visualized [16]. However, requirement of special and expensive arrangement in lab, decreased feasibility in CAL based evaluation, responses at prefixed dosing and technical problems related to computers are certain disadvantages [5,15,16].

The clinical pharmacology exercises are aimed at generating clinical orientation pertaining to the treatment of disease in correlation with the pharmacological concepts [16]. Enhanced education of clinical pharmacology ensures effective and safe drug therapy [17].

The clinical pharmacology exercises were rated as the most thought provoking. Drug use in special groups and conditions, FDC, Prescription writing and Drug Interactions were the favourites in terms of interest, ability to think and write as well as future relevance in management of patients. This is in concurrence with other studies where the students favoured these exercises in terms of more relevance, interest and devotion of more teaching hours [2,13,18,19]. We should ensure the quality of therapeutic reasoning and prescribing skills by integrated teaching.

The exercises which scored the least were Critical Appraisal of Medical Literature and preparation of EML as majority thought them to be irrelevant. This is in contrast to other studies where the participants demanded inclusion of video detailing and more materials for critical appraisal of pharmaceutical promotions and inclusion of more resources and sessions for EML [20]. Inducing students to understand and respond to the medical literature has been proven to be challenging for the medical educators of the South Asian countries [21]. It is a matter of apprehension that the EML was thought to be of no relevance. Group discussions and video sessions stressing its relevance needs to be organized. A copy of EML in India should be attached in records. The students should understand the importance of using generic names. Preparation of one's own Personal drug list would ensure the knowledge of essential drugs concept and prevent the effect of therapeutic jungle [22]. Role plays enhance the communication skills of the students.

The suggestions for improvement included corrections of technical and printing defects, inclusion of more clinically oriented exercises and integration of theory with practicals.

LIMITATIONS

Feedback of the faculty involved in the preparation, handling practicals and evaluation of records were not taken. Quantitative assessment of the record was not done.

CONCLUSION

Majority of the participants felt that the new record was a suitable teaching learning material. Inclusion of more exercises which are in consonance with patient care has increased the interest of the students. Simultaneous reforms in other subjects of medical curriculum and integration will foster the achievement of the educational goal; a competent Indian Medical Graduate.

ACKNOWLEDGEMENT

The authors thank the participating students, teaching staff and post graduate students of the Department of Pharmacology, Government T D Medical College.

REFERENCES

[1] Kerala University of Health Sciences. Available online at http://14.139.185.154/images/kerala/kuhs/Academic_Notification/medicine/mbbs_syl_rvd.pdf.page 107 [Cited on 19/01/2015].
[2] Palappallil DS. Attitude of interns and students on teaching and learning methodologies in pharmacology. *International Journal of Pharmacology and Therapeutics.* 2015;5(1):1-7.
[3] Hariharan TS. Need for changes in the practical pharmacology curriculum of medical undergraduates. *Indian J Pharmacol.* 2004;36(3):181.
[4] Gitanjali B, Shashindran CH. Curriculum in clinical pharmacology for medical undergraduates of India. *Indian J Pharmacol.* 2006;38:S108-14.
[5] Desai M. Changing face of pharmacology practicals for medical undergraduates. *Indian J Pharmacol.* 2009;41(4):151-52.
[6] Sharma V, Sharma R. Pharmacology teaching: Need for a sea change. *Indian J Pharmacol.* 2009;41(6):288.
[7] Chaurasia RC. Pharmacology exercise for undergraduate: MLNMC model. *Int J Basic Clin Pharmacol.* 2013;2(4):495-97.
[8] Joshi A, Trivedi M. Innovations in pharmacology teaching. *Int J Pharm Biomed Res.* 2010;1(2):62-64.
[9] Kaushal S, Chopra SC, Arora S. Modifications in the undergraduate MBBS pharmacology practical curriculum: The DMCH model. *Indian J Pharmacol.* 2007;39(1):57-59.
[10] MCI. General Considerations and Teaching Approach. In: Graduate Medical education regulations, 1997. Available online at http://www.mciindia.org/RulesandRegulations/GraduateMedicalEducationRegulations1997.aspx [Cited on 19/01/2015]
[11] Vyas R, Tharion E, Sathishkumar S. Improving the effectiveness of physiology record books as a learning tool for first-year medical students in India. *Adv Physiol Educ.* 2009;33(4):329-34.
[12] Abraham RR, Raghavendra R, Kamath S, Kamath A. A trial of the objective structured practical examination in physiology at Melaka Manipal medical college India. *Adv Physiol Educ.* 2009;33(1):21-23.
[13] Bhosale UA, Yegnanarayan R, Yadav GE. Attitude, perception and feedback of second year medical students on teaching-learning methodology and evaluation methods in pharmacology: A questionnaire-based study. *Niger Med J.* 2013;54(1):33-39.
[14] Vasundara K, Kanchan P, Pundarikaksha HP, Girish K, Prasanna S, Jyothi R. An imperative need to change pharmacology curriculum: A pilot survey. *Indian J Pharmacol.* 2010;42(6):420.
[15] Kuruvilla A, Ramalingam S, Bose AC, Shastri GV, Bhuvaneswari K, Amudha G. Use of computer assisted learning as an adjuvant to practical pharmacology teaching: Advantages and Limitations. *Indian J Pharmacol.* 2001;33(4):272-5.
[16] Naeem SS, Rizvi W, Kumar A. Revisiting undergraduate practical pharmacology. *J Pharmacol Pharmacother.* 2012;3(1):76-79.
[17] Badyal DK, Bala S, Kathuria P. Student evaluation of teaching and assessment methods in pharmacology. *Indian J Pharmacol.* 2010;42(2):87-9.
[18] Garg A, Rataboli PV, Munichandi K. Student's opinion on the prevailing teaching methods in pharmacology and changes recommended. *Indian J Pharmacol.* 2004;36(3):155-58.
[19] Oshikoya KA, Bello JA, Ayorinde EO. Medical student's view on the methods of teaching pharmacology at the Lagos State University College of Medicine, Nigeria. *Nig Q J Hosp Med.* 2007;17(3):101-07.
[20] Shankar PR, Jha N, Bajracharya O, Gurung SB, Singh KK. Feedback and knowledge, attitude, and skills at the end of pharmacology practical sessions. *J Educ Eval Health Prof.* 2011;8(12):12.
[21] Shankar PR, Piryani RM. Medical education and medical educators in South Asia: a set of challenges. *J Coll Physicians Surg Pak.* 2009;19(1):52-56.
[22] Mathur VS. Towards a more meaningful teaching of pharmacology. *Indian J Pharmacol.* 2004;36(4):259-61.

APPENDIX 1

Encircle the Appropriate Responses

Gender: Male/Female **Age:** .....

1. How do you rate the overall quality of the pharmacology record book compared to Microbiology, Pathology and Forensic Medicine
   a. Bad b. Satisfactory c. Good d. Excellent
2. Which of these do you like to use for writing the responses to the questions in Pharmacology Record Book?
   a. Discussion in practical class b. Referring to text books c. Copying from the senior's records d. Copying from the classmate's record
3. Do you come prepared for the discussions on practical exercises in the record
   a. Yes b. No
   If No, give reasons
4. I think these exercises in the record are
   a. Relevant b. Irrelevant c. Interesting d. Not interesting e. Thought provoking f. Not thought provoking

A. General Pharmacology	a.	b.	c.	d.	e.	f.
B. Quantitative Pharmacology	a.	b.	c.	d.	e.	f
C. Experimental Pharmacology	a.	b.	c.	d.	e.	f
D. Clinical Pharmacology	a.	b.	c.	d.	e.	f

5. What is your opinion about the use of Computer Assisted Learning (CAL) in discussing Experimental Pharmacology?
   a. Beneficial b. Non beneficial c. I Don't know
6. The reason why I write the responses to questions in the pharmacology record book is usually for
   a. for Internal assessment
   b. for understanding the subject
   c. for the fear of disciplinary action
7. I think that the clinical pharmacology exercises in the record
   a. Relevant b. Irrelevant c. Interesting d. Not interesting e. Thought provoking f. Not thought provoking

A. Exercises on Adverse Drug Reactions	a.	b.	c.	d.	e.	f
B. Criticism and Rewriting Informed Consent	a.	b.	c.	d.	e.	f
C. Critical appraisal of drug advertisement	a.	b.	c.	d.	e.	f
E. Patient Oriented Problem Solving Exercises	a.	b.	c.	d.	e.	f
F. Exercises on Fixed Dose Combinations	a.	b.	c.	d.	e.	f
G. Prescription writing	a.	b.	c.	d.	e.	f
H. Drug Interaction	a.	b.	c.	d.	e.	f
I. Toxicology Exercises	a.	b.	c.	d.	e.	f
J. Drug use in Renal and Liver diseases	a.	b.	c.	d.	e.	f
K. Use of drugs in pregnancy, children and elderly	a.	b.	c.	d.	e.	f
M. Principles of Antimicrobial Use	a.	b.	c.	d.	e.	f
N. Interpretation of laboratory data	a.	b.	c.	d.	e.	f

8. What do you think about the incorporation of role plays in effective doctor –patient communication?
   a. Should be include b. Lectures are better c. I don't know
9. How far did the revised pharmacology record help you in understanding the concepts of Pharmacology?
   a. Not at all b. Somewhat c. Very much
10. Give some suggestions for improving the record?
    .....

PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Pharmacology, Government TD Medical College, Alappuzha, Kerala, India.
2. Professor, Department of Pharmacology, Sree Mookambika Institute of Medical Sciences, Kulashekaram, Tamilnadu, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Dhanya Sasidharan Palappallil,
Assistant Professor, Department of Pharmacology, Govt. TDMCA, Kerala-688005, India.
E-mail: drspdhanya@gmail.com

FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Jul 26, 2015**
Date of Peer Review: **Aug 26, 2015**
Date of Acceptance: **Nov 02, 2015**
Date of Publishing: **Jan 01, 2016**