CHAPTER 5
Chapter 5  Discussion, Conclusions, Implication, Limitation and Recommendation

DISCUSSION

Outcome or effectiveness of the two teaching learning approaches

This chapter presents interpretation of the study findings, discussion and conclusion. The chapter concludes with implications of the study to nursing education, administration, research and nursing practice. It also includes with the limitations of the study and its recommendations.

Medication administration is an important aspect of patient care in the healthcare institution. The part in which the nurses are actively involved in medication management is the medication administration to patients. The commonest procedure a student nurse generally carry out in the patient’s unit is the oral medication administration, nebulization and MDI to relieve the respiratory congestion, and practice of peak flow meter for lung capacity and also to understand patient’s compliance of therapy, or to make necessary modifications to treatment based on severity or to follow up for asthma treatment with their doctors. Although these procedures are frequently done in the patients’ units yet errors in medication are not very uncommon. Medication errors are frequent, occurring at a rate of one of every five doses in the hospital and skilled nursing facility. The commonest factors associated with medication errors are lack of knowledge or application of knowledge, use of wrong drug name, dosage form, or abbreviations, incorrect calculations or unit expressions.
In order to minimize medication errors committed by nursing students, it is important to establish learning materials and protocols in the laboratory setting as well as in the patient units under supervision to evaluate their competency. Students’ competency can only be assured if there is direct supervision with multiple learning methods and materials to feed their intellect and practice in daily nursing exercise. One of the seven rights of patient is right to information. Patient has every right to know what he or she is being prescribed with, how to take and with what as well as its timing. The nurse patient ratio as well as attitude in patient education matter in terms of patients’ compliance to therapy. Once the patient feels slightly relieved of its symptoms, there is tendency that he or she discontinues the drug. But it is important to focus on strict regimen of the prescription when it comes to chronic respiratory condition such as asthma and also for an infectious disease such as tuberculosis which tends to turn to resistance when drug is not taken as expected. Hence it is important to encourage nursing students to understand pharmacology and apply in clinical practice with ease and perfection. On the other hand student nurses should be taught the accountability or reporting errors as they may not due to fear of disciplinary action. Therefore students should be given adequate training in all areas of medication administration with constant support by the clinical supervisors with multiple teaching learning methods to enhance their clinical skills.

Teaching profession like nursing encompasses both cognitive aspects and artistic aspects. Teachers will admit that teaching skills and technical competence in teaching make a difference in student learning. Learning can be stimulated and guided by many different ways for different ends. But whatever is the subject,
teaching is essentially for helping the student to acquire knowledge and understanding to develop skills, attitude and values in them and to help them grow as individuals.\textsuperscript{69}

Computer assisted teaching as a teaching method has been used many years ago. It provides a non-stressful and interactive environment in which the students learn at their own pace and in their own time. Hall Worth and Brebner\textsuperscript{70} reported that students show a positive attitude towards the learning aspects of computer assisted learning and have a long motivation and sustained attention span in that kind of an environment.\textsuperscript{70}

Study conducted by Smith et al on instructional multimedia to facilitate students psychomotor skills among 45 physical therapy students of two institutions randomly assigned as experimental and control showed no difference in their attitude towards instruction but the experimental students showed greater psychomotor skills after being exposed to multimedia form of learning when compared to students who were exposed to traditional form of demonstration.\textsuperscript{71} The present study also revealed that the experimental students who were exposed to video form of learning drug administration procedure had better psychomotor skills and better interaction. Therefore multimedia provides an efficient way to teach psychomotor skills to students. Response of the students in the present study revealed more efficiency, autonomy and detail of instruction compared to demonstration.\textsuperscript{71}
Oshikoya et al interviewed 48 MBBS students on their attitude towards methods of learning pharmacology in Nigeria. The study revealed that 41.02% of the students wanted audiovisual aides teaching and inclusion of clinically oriented pharmacology lectures. Another 35.89% of the students sought seminars and group discussion while learning the subject and 58.97% desired to have case studies being included to learn the subject pharmacology. Students also opined that special topics in clinical pharmacology to be taught as lectures as well as in practical form. Hence learning pharmacology needs multiple teaching learning aides and methods to increase their comprehension and psychomotor skills among the student nurses.

Study conducted by Ravi among medical students of western Nepal regarding their attitude towards pharmacology using didactic lectures as well as Self-Directed Learning (SDL) proved that male students had more affinity towards SDL and expressed to emphasize Objective Structured Practical Examination (OSPE) form of learning in order to retain their transferable skills in pharmacology. Traditional pharmacology teaching in medical schools is discipline based and teacher - centered with a heavy emphasis on acquiring factual knowledge about drugs and does not train the students adequately for therapeutics.

Michel et al compared the effectiveness of problem-based learning (PBL) and classical lecture-based learning (LBL) in conveying medical facts in a general pharmacology class of third year medical students (n=107). Three groups with a total of 31 students were randomly assigned to PBL. The PBL groups (9-12 students each) received ten 2-h sessions in which a clinical case was discussed and ten 2-h
sessions in which areas of pharmacology not covered by the case discussions were presented in an LBL format (one group with all 31 students). The other students were assigned to groups of 14-15 students and received 20 2-h sessions in an LBL format. At the end of the semester all students received a questionnaire and participated in the same 30-question multiple-choice exam. The mean number of false answers was 7.6+/−4.0 and 9.7+/−4.7 in the PBL and LBL groups, respectively (P<0.05 in a two-tailed t-test), and the percentage of failing students (>10 false answers) was 27% and 38%, respectively. Both groups were asked to rate their pharmacology class on a scale of 1 (lowest) to 10 (highest). In this questionnaire, PBL students by average rated generated interest in pharmacology, conveyed knowledge in pharmacology and understanding of medical questions approximately 1 point higher than LBL students.75

Hwang et al compared the effects of problem-based learning (PBL) method with traditional lecture method on learning in the cardiorespiratory nursing section of the Adult Health Nursing course among 71 second year nursing students in Korea. A total of 35 students participated in the PBL and 36 students attended the traditional lecture sessions and the findings of the study revealed that students who attended PBL scored higher in their post test score (t=2.007, p=.045) as well as in their learning motivation (t=2.608, p=.012).76

The findings of the present study shows that active lecture cum Video demonstration was effective in improving students competency in drug administration as well in Mini Peak flow meter practice to assess for patients compliance to therapy and follow up.
Knowledge of pharmacology and drug administration

- Post-test knowledge score was significantly higher for the group which was exposed to video form of learning (ALV) compared to live demonstration (ALLD). The difference in the mean between the two groups was 5 percentage points.

- Post-test score was significantly higher for experimental group in oral drug administration checklist. The difference in the mean was 20 percentage points. It is observed that 13.8% of experimental students and 87.5% of control students failed to explain the action mechanism of the drugs. Most, 66.2% control students and 17.2% experimental students failed to explain the indication and interaction of the drug to the patient and 98.8% of control students and 14.9% of experimental students forgot to explain the possible side effects of the drug. Majority, 91.2% of control students and 17.2% of experimental students failed to convey specific instructions to the patient when they are on their prescribed drug. These findings indicate the items in which ALV group performed better in oral drug administration. It is also observed that 20% control students failed to safely put the patient in comfortable position when compared to 21.8% experimental students who failed to do so. This implicates that the video as well as live demonstration needs improvement.

- Significant increase in the post-test score was observed on nebulization procedure with ALV group when compared to ALLD. The difference in the mean was 7 percentage points. Thirty percent of control students and 4.6% of experimental group students failed to explain the purpose of the procedure to
the patient. Another 4.6% and 8.8% of experimental and control group students failed to identify and explain to the patient in regard to the type of medication they receive. Fifteen percent of the experimental and 21.2% of the control group nursing students overlooked to auscultate the lungs for adventitious breath sounds even after having been exposed to respective teaching learning approaches. Interestingly 49.4 % of control group students failed to instruct patient to remain in bed after procedure for at least 10 min. These are the areas which contributed to higher Post-test score of the experimental students on nebulization procedures.

- Significant increase in the post-test score on MDI was observed with ALV when compared to ALLD. The difference in the in mean was 27 percentage points. It is observed that 9.2% of experimental students and 31.2% control students failed to explain the purpose of bronchodilators that it help relaxes the smooth muscles and increases the diameter of the nasal passages making breathing easier and also improves the respiratory functions. Another 12.6% experimental and 35% control students forgot to record the number of puffs the patient has taken. It is also observed that 7.5% of control students failed to explain the procedure and 2.5% failed to shake the inhaler before use.

- Significant increase in the post-test score on Mini Peak Flow Meter practice was observed with ALV when compared to ALLD. A difference in mean score of about 20 percentage points was observed between the two groups. Students in the control group (28.8%) forgot to repeat steps 2-5 in order to
obtain the three readings to select the best reading and also failed to record the recorded readings onto the Mini Peak Flow Meter diary.

- Communication with patient in regard to teaching patients about their medication: Significantly higher score was observed with experimental group exposed to ALV when compared to control group who were exposed to ALLD. A difference of 13 percentage points in the mean score was observed between the two groups. The items in the checklist that contributed to this effect were mainly:
  - Patient identification and counter checking.
  - Checking and counter checking medications.
  - How the medication is to be administered.
  - Enquiring for allergies.
  - Explanation in regard to the type of medication with name and dosage to the patient.
  - How the medication works for the patient’s health problems.
  - Possible side effects of the medication.
  - How to reduce the adverse effect of the medications by ways of diet, medicine supplementation and observing the signs and symptoms that are possible due to drug effect.
  - Not to stop steroid therapy abruptly.
  - Completing full course of antibiotics.
  - Regular follow up.
Opinion regarding ALV from control and experimental group

Opinion collected using rating scale regarding ALV from control and experimental group were almost similar (Table 14).

Subjective feedback about video CD from control as well as experimental group identified some of the advantages and limitation of video demonstration as below:

Advantages

- Video demonstration can save lot of time for the teachers
- Students can view the video time and again in their own pace
- It induces independent form of learning
- Video can be standardized using expert teachers
- Number of teachers required for live demonstration can be reduced using video demonstration

Limitation:

- Student teacher interaction is minimized in video form of learning
- Monitoring students to how often they view the video is limited
- Facilities such as computer/laptop, LCD are required to view the video. In colleges where these facilities are not available to the students may pose a disadvantage.
- Video form of learning may help students repeatedly view and memorize but when it comes to real patient scenario, they need live demonstration to help
communicate to live patients. Therefore video alone will not be able to give 100% skills to students.

Study conducted by Elizabeth Manias and Shane Bullock among 38 nurses regarding their preparational level in pharmacology and also their perception and experiences about their medication administration at Metropolitan and regional hospitals at Victoria, Australia using 6 focus groups showed that nurses lack in-depth knowledge about pharmacology. The study also revealed that educational preparation of graduate nurses is inadequate and lacks proper structured continuing education program to enhance their pharmacology knowledge. Although the nurses perceived theoretical and clinical principles important in their practice, they need to show more accountability and responsibility towards drug administration. Monitoring with structured learning experiences during their undergraduate level can help optimize proper medication use by patients and also to enhance better teaching learning approaches to train the undergraduate nurses.  

Study conducted by Miriam McMullan among student nurses and registered nurses exploring their numeracy skills when performing drug calculation in a non-medical programme showed that 55% of students and 45% of registered nurses failed the numeracy test, while 92% and 89% respectively failed the drug test.  

Registered nurses were better off in their calculations than the students which is a sign that more clinical practice makes nurses more competent. Hence to maintain patient safety, nurses need to practice more and also refresh all kinds of calculation methods to ensure correct administration of drug dosage to patients. Educational
curricula needs to focus on how each student nurse can be prepared to learn numeracy skills and followed up for its practice in the clinical areas through supportive supervision to make safe nursing practice and reduce errors in medication.\(^7^8\)

Perception of 48 students who were appearing for the 2\(^{nd}\) professional MBBS degree examinations at Lagos state University College Medicine in Nigeria on teaching learning approaches used for pharmacology expressed the need for audio visual aids (41.02%), clinical oriented pharmacology lectures (92.86%), seminars and group discussion (35.89%), case studies and treatment as regular form of learning (58.97%) and 51.28% of the students felt that special topics in pharmacology to be taught in both lecture and practical form.\(^7^9\)

In today’s teaching learning system, 45 hours of pharmacology in nursing seems insufficient for the teachers to have multiple teaching learning strategies as they need to cover the entire syllabus. On the other hand the teacher uses lecture method as an easy way of completing the teaching hours without much effort to ensure how much the students have understood.

In a normal classroom, adjustment between the teacher and the students makes a big difference in the learning and liking towards the subject. When the subject is well described by the teacher with adequate involvement of the students, the subject is sure to soar to higher score by the students and they start liking and linking the subject to their clinical experience. But when the student understands
inadequately a subject, there is a tendency of neglecting the difficult subject and making it up from the other combined subject to clear the examination.

When a student learns pharmacology and drug is to be administered in the clinical scenario, there is an increased demand from the student or registered nurse to understand the rational use of the drug for the particular patient. Therefore students’ problem solving and good communication skills can greatly influence the integration of pharmacology to clinical practice. Students considered pharmacology teaching they received to be mainly theoretical. Active form of learning pharmacology enhanced students motivation towards pharmacology. Hence change in the teaching learning activities place a greater responsibility in meaningful learning of pharmacology with greater emphasis on transferable skills in drug administration to enhance patients’ outcome of drug therapy and compliance. Second year of nursing plays a very important role in the life of the nursing students as basic sciences application to disease process, their interlink between pathological changes and the medication used rationalization lays a greater foundation to future nursing skills. When students are continuously supervised by the nursing experts in the clinical practice as well and patient education, the students step into confidence. Enhancing students’ transferable skills through problem based learning will be an important factor in increasing awareness on accountability towards drug administration. It’s essential for students to assess their own skills in pharmacology as self-assessment is an integral part of learning and it can enhance one’s own insight into strengths and weaknesses. On the other hand good communication skills of students can bring about changes in the patients’ perception towards compliance.
Learning difficulties and students’ examination score:

Knowledge of pharmacology and respiratory drug: The highest score obtained by the experimental group is 51/60 and control is 47/60. This indicates that students still have areas for improvement in terms of drug knowledge and administration even after the intervention. Nursing practice is totally reflective in nature depending on the dynamism that exists in the health care. A nurse need frequent question onto oneself in the following concerns

- Am I competent in the drug administration?
- Do I refer the medical order prior to my drug administration?
- Do I follow the standard protocol for my practice in the respective unit for patient care?
- Do I practice based on the acceptable standards and code of ethics?
- Do I explain or communicate the treatment regime to my patients?
- Do I follow the 7 rights of patients?
- Do I explain the mechanism of the drug, indications, side effects, contraindication and also drug interactions to the patient?

Therefore understanding the above reflections is going to help improve the practice of young nurses who are yet to license themselves and practice tomorrow.

Difficulties that they could face are:

- Remembering all the drug names.
- Multiple languages to be used in the clinical with patients.
• Lack of supportive supervision by teachers in the clinical areas to avoid errors in medication and to enhance confidence.

• Teachers teaching the subjects are not the clinical supervisor

• Less experienced teachers to teach pharmacology.

• Large number of students in a class.

The present study findings are supported by Chitra et al. They conducted a study among 127 medical students in Malaysia related to Computer Assisted Learning (CAL) pharmacology. Study proved that 75% students improved their understanding of pharmacology and also improved their knowledge in pharmacology (mean difference of pre-test and post-test was 11.05) which was statistically significant ($P=0.0145$). The present study samples also suggested for variety of learning experiences as well and teaching methods to be utilized in order to stimulate their interest and motivation towards understanding pharmacology one of the most feared subjects by all health care professional students. Hence multimedia plays an important role in enhancing students’ interest in learning pharmacology as repeated viewing helps them memorize and reason clinical skills or performance.

A study conducted by Louise tested the effectiveness of competency program on nurses’ knowledge and skills in chemotherapy administration using a self directed learning package. After three months the nurses were reassessed of the their knowledge and skills. Result showed improvement both in knowledge (pre-test and post-test knowledge scores were 74% and 90.98% respectively) and practice scores (pre-test 56.53% and post-test 91.84% respectively).
Niemi et al conducted a study on Finnish nurses’ and nursing students’ pharmacological skills, which included the calculation, knowledge about pharmacology, abbreviations, terminologies used, forms of medicines, routes of medication administration.\(^8^2\) Findings revealed that finished nurses had better knowledge than students nurses in terms of their pharmacological skills. In this study 57% of the nurses scored 79% in the written test. Therefore it is observed that with experience, students perform better in their clinical practice. Repeated viewing of CD with various procedures helped the student to learn medication procedures systematically in this study.

King conducted a study to assess the perception of nurses regarding their educational need for pharmacology. Study revealed that they have limited understanding of the subject and also dissatisfied with the teaching modalities.\(^8^4\) Nurses also identified their learning need areas such as drug administration, patient assessment and nurse prescribing and patient medication education. The samples in this study showed poor knowledge about the medications used in the hospital, which suggest that improved pharmacology teaching might increase nurses’ confidence in performing drug administration, patient education and nurse prescribing. The present study also supports these findings as nurses’ communication or patient education scores in both experimental and control group was only 47.57 out of 57 and 39.82 out of 57 respectively in the post-test. Hence there is a need for reinforcement of patient education/ communication in the clinical scenario on an ongoing process.\(^8^3\)
Canister nebulizers represent convenient means of administering bronchodilators aerosol, and are widely used in the treatment of reversible airway obstructions. Optimal therapeutic benefit depends upon the proper inhalation technique. Kelling et al. conducted an evaluative study to determine the need for specific physician instruction in the correct usage. Fifty-five house officers and non-pulmonary attending staff from the medicine department were interviewed using the placebo canister and asked a series of standard questions regarding the recognition, assembly and correct inhalation technique of the device. Correct assembling of the device was performed by 68% and 36% of the house officers and attending staff respectively. Only 40% of the participants correctly performed more than four of the seven steps felt to constitute a correct inhalation maneuver. In the present study, experimental group has shown reduction in some of these errors.

Ninety-seven percent of the experimental group students instructed their patients to remain in bed after the procedure for at least 10 min and once the procedure was over 32.3% of the control students and 12.5% experimental students did not record the time and duration of the medication. A nurse’s explanation about the medication and process by which it will be given to the patient with time duration will make any patient less anxious about the treatment modality. Hence educating our patients and understanding their therapy purely depends on how we prepare our young nurses in their pharmacology knowledge so as to help patient comply to treatment.

Another study by Sarvadikar et al. identified the attitude towards reporting medication errors among nurses, doctors and pharmacists in a tertiary hospital in
Scotland through a survey. Study samples consisted 43% doctors, 68% nurses and 64% pharmacists (n=57). Findings revealed that nurses and pharmacist are likely to report medication errors whether minor or major in spite of the fears related to receiving disciplinary actions when compared to doctors. It also showed that all health care professionals were more likely to report an error as the clinical scenarios had progressive worsening of the patients under their care. Hence incomplete cares given by students are likely to occur in areas of medication. Therefore close supervision and monitoring their level of understanding pharmacology and practice of medication administration becomes a crucial responsibility of the teachers.
CONCLUSIONS

The present study concludes that active lecture cum video form of learning was effective in improving students' knowledge, skills and communication in learning respiratory drugs and in turn performing procedures such as oral drug administration, nebulization, Metered Dose Inhaler and Mini Peak Flow Meter. As experimental group performed better in the Post-test on all the procedures, nursing educator should think about developing visual aids or video demonstration of various nursing medication procedures. Self learning video packages would reduce the manpower required for teaching and hence the cost of education. Effectiveness of these packages are to be assessed regularly through student feedback and performance. Packages are to be revised and improved based on student feedback and performance.

For the rising number of students and the number of procedures to be demonstrated and re-demonstrated, video form of learning could save time, learn more independently as well as same expert teacher demonstrating the procedures with ease and perfection can enhance students’ clinical competency especially in drug administration.
IMPLICATIONS

**Nursing education**: The findings of the study show that varied teaching learning approaches in training students to learn pharmacology and drug administration is an effective way of increasing their knowledge and skills. The present study was done in a structured setup in the fundamentals of nursing laboratory for the second year B.Sc. nursing students who are currently studying the subject. There is scope for all batches of students, be it first year or final year to enhance their clinical skills so that errors in medication can be reduced drastically. Today, public is very much aware of their rights and consumer protection act, which the nurse is being held accountable if errors are made. Hence nurse educators can use variety of learning methods and styles to suit the nature of the students with the advancement in technology for best adaptation by the younger generation nurses. The nursing curricula should focus on clinical applied pharmacology and integrated curriculum for better understanding and reasoning capacity of the students. Hence teachers can use different teaching strategies to encourage critical thinking in students. Frequent drug calculation sessions on various drug forms and also age group can enhance calculation capacity of the students. Reporting of facts related to medication errors should be taught to the students so that complications can be reversed back without undue complications of the errors made on the client. This can only foster accountability among the nursing students. Giving medication alone does not serve the purpose of the entire treatment process. Patient education on his or her medication remains one of the most important area of concern for compliance. Hence students to be taught how to communicate about the drug that the patient receives can only happen when the
A nurse has adequate knowledge of the drug and the way it has to be taken. Therefore having knowledge, skills, and right attitude to teach can solve the unsolved mysteries of medication compliance to the large population under the nurses’ care.

**Nursing administration:** The nurse administrators must identify the weak areas of students in respect to their learning. Programmes such as training on medication, patient safety under students’ care, supervision, and patient’s rights should be introduced time and again. Every new drug that comes to the market should be learnt and taught to the students for its safety through continuing nursing education. Continuing nursing education not only for registered nurses but also for student nurses should be a must. Under the administrator’s guidance the teachers of nursing fraternity should be able to develop various learning packages to suit the changing scenario. Therefore drug administration, though taught in first year of the student’s life, yet it has to be reinforced time and again. All nurses who are registered should be certified as practitioners in medication administration. Hence training our students in clinical areas can bring about desired changes if every staff nurse is certified as practitioner. For the newly joined registered nurse, orientation programme should be made mandatory in relation to drug administration protocols of the hospital so as to avoid errors. The competency programme should be re-assessed and if the nurse does not qualify, further training can be planned. On the other hand every nurse should undergo a certification programme yearly on the practice irrespective of whether the person working in hospital or colleges of nursing, so that correct practice can be enhanced uniformly across the health care sector.
**Nursing research**: Errors in medication can be prevented by using the findings of the current research and the learning modules. Supervisors and students can carry out ongoing researches on the innovative methods of learning pharmacology and drug administration so as to enhance knowledge and skills keeping in mind acceptability, accessibility and cost effectiveness. Research can be conducted for all batches of students in different levels of learning for long term effect. Innovative models such as electronic drug folder gadgets which can be easily carried by health care professionals in the clinical can be introduced. Color coded medication containers can be designed and its usage can be tried for patients who are not so literate in terms of their therapy or who have the tendency of forgetting their medication. Research can be conducted in areas of reminder techniques for effective medication management for chronic respiratory problems to minimize complications and to reduce cost of hospitalization. Effective mobile health teaching strategies can be introduced for people living with chronic respiratory problems for effective home management and monitoring their compliance. From the other hand researches on interactive video related various procedures can be best learn to be on par with international standards in nursing practice.
LIMITATION OF THE STUDY

• Participants were not randomized to control and experimental groups to avoid contamination bias. If randomized, students of the same institute will be together for all other teaching sessions, may share the video CD given to the experimental group, thus potentially minimizing the difference in outcomes between the two groups. Pilot study with randomized design, carried out in a single institute realized contamination bias. Since pilot study proved sample contamination, the study designed was changed to quasi experimental design.

• There are threats to internal validity. During the study, the investigator had no control over the events that took place between the pre-test and the post-test and also the differences between the characteristics of both control and experimental group students.

• With respect to internal validity, this design is considered inferior to randomized experiments

• Unknown confounders and unmeasured differences between groups can bias the results.
RECOMMENDATIONS

The following recommendations are made based on the findings of the study:

- Similar study can be replicated with cluster randomized design, taking each college as cluster.
- Follow up study can be conducted to note the progress of the students in their clinical practice in terms of their knowledge, skills and attitude towards drug administration.
- Further research with multiple methods can be tried to find the best method to teach pharmacology both in class room as well as in the clinical areas.
- Nursing teachers are to be encouraged to develop video demonstration of various nursing procedures and effectiveness of this packages are to be tested regularly to improve the quality of the packages.