CHAPTER 2

Review of Literature
Introduction

Reviewing the existing literature related to the study is a critical step in the research process. A literature review is an organized written presentation of what has been published on a topic by scholars. Researchers undertake a literature review to familiarize themselves with existing knowledge base. Also, the purpose of the review is to convey to the reader what is currently known regarding the topic of interest. It is observed that, approaches to teaching learning adopted by teachers in the classroom have a significant impact on the students’ quality clinical performance and also their academic performance. How a student learns depends partly on his or her personal characteristics and partly on his perceptions of the teaching learning process, environment, content and their learning tasks. Taking these aspects into consideration, researcher has made consistent efforts to study the effects of active lecture cum live demonstration and active lecture cum video demonstration in regard to competency in drug administration as a product of classroom teaching learning of pharmacology. The review of literature for the present study was done from published research and non research journal articles, text books and websites. The review related literature for the present study has been organized under the following headings.

- Literatures related to Knowledge and skills of nurses regarding drug administration
- Review of literature related to medication errors
- Literature related to competency in drug administration
- Literature related to teaching learning approaches in pharmacology
• Literature related to chronic respiratory health problems and patients compliance

• Literature related to innovative teaching learning approaches

• Conclusions from review of literature

**Knowledge and skills of nurses regarding drug administration**

King RL’s qualitative study in Australia explored the role of nursing in pharmacology knowledge and nurses’ perception of related education needed to prepare for them to practice.\(^\text{23}\) Data were collected from 10 nurses who were working in the emergency unit using a semi structured interview schedule. The findings showed that nurses have very limited understanding of pharmacology, and are dissatisfied with the pre-registration teaching of the subject, but recognize the need for pharmacology knowledge in practice. The researcher suggests that the improved pharmacology teaching may increase nurse’s confidence in performing drug administration, patient education, and nurse prescribing and decreasing anxieties, although the study findings do not indicate whether an increase in pharmacology knowledge would result in an increased quality of patient care and decrease in drug errors.\(^\text{23}\)

Bullock’s qualitative study on the educational preparation of undergraduate nursing students in pharmacology in Australia had its data derived from 6 focus groups consisting of four to twelve nurses in each group, including nurse managers, clinical nurse consultants, bedside nurses and recently employed graduates.\(^\text{24}\) Interview technique was utilized for data collection and lasted for 60-90 minutes and
were transcribed into verbatim. The four themes emerged from the interviews were knowledge base of the graduate nurses, continuing education needs of the graduate nurses in pharmacology knowledge, aspects of pharmacology knowledge that are perceived important for nursing practice and improvements required of undergraduate pharmacology education. The participants verbalized that the graduate nurses' knowledge in the areas like medication family groups, ability to read medication charts, understanding pharmacology terminologies, theoretical principles of pharmacology and clinical principles were poor. The participants suggested that continuing education through structured nurse education programme can enhance the knowledge and clinical educators and preceptors must supervise, support the graduates in the clinical settings and also the clinical component of undergraduate programme to organize in a more structured manner. \(^{24}\)

A descriptive study conducted by Bird Wallis on nursing knowledge and assessment skills in the management of patients receiving analgesia via epidural infusion in Australia among 180 nurses working in the surgical and obstetrical clinical area. \(^{25}\) The data were collected in two phases using Clinical Skill Assessment Tool (CSAT). The first phase was direct observation of nurses in mock clinical environment to assess the clinical skills. After 4-6 weeks of survey, 158 nurses (88%) responded to the survey and 80% of these completed the observation exercise. The mean knowledge score was 28.5(66.3%). Twenty one percent of the samples achieved a score over 75%. The mean observation exercise score for the total sample was 32.5 (75.6%). The study showed that the nurse had good knowledge base for the performance of sensory blockade assessment. In the clinical skill
assessment, nurses scored very well in the sections relating to infection control, privacy, patient education and identification of pain intensity but the nurse performed very poorly in the assessment of pharmacological side-effects. Nurses who had clinical experience and completed a self learning package and who worked in the surgical areas scored higher than other nurses. There was a weak correlation between knowledge and skill performance ($r=0.329$; $p= 0.004$). The findings in this study indicate that the nurses’ knowledge outweighed their clinical skill performance and decision making.\textsuperscript{25}

An evaluative study was conducted by Niemi on nurses and nursing students to investigate on self rated and actual pharmacological skills of registered nurses and graduate nursing students in Finland.\textsuperscript{26} A total of 364 registered nurses and 282 graduating nursing students from seven hospitals and five polytechnics were selected for the study. The medication calculation skill test was used which included background factors and self rated pharmacological and mathematical skills. The response rate for the questionnaire was 68\% for nurses and 70\% for students. The subjects expressed pharmacokinetics and pharmacodynamics as the most difficult and dosage forms, routes of administration and medicine package information as most familiar. Regarding medication calculation skill test the mean score for the nurses scored 18.6\%(77.5\%) and for students 16.3\%(67.9\%). In basic level skills nurses scored 8.9\%(74.2\%) and students 7.4\%(61.7\%), while in higher level skills nurses scored 9.7\%(80.8\%) and students 9\%(75\%). The study concludes that the nurses had better pharmacological skills than students.\textsuperscript{26}
Another descriptive study conducted by Niemi to assess the medication calculation skills of nurses and self evaluation of the same nurses in Finland. A total of 546 nurses were selected for the data collection using questionnaire, statements and a medication calculation test. It was observed that 70% of the nurses evaluated their own calculation skills as sufficient and 95% of the nurses felt that they mastered addition, subtraction, division and multiplication skills. The nurses responded that they have sufficient knowledge on conversions (79%), solution calculation (50%), tablet calculation (95%), weight calculation (77%), and infusion rate calculation (73%). The results on calculation skills showed that out of 17 calculation problems, 16 answers were correct. Sixty nine percent of the nurses had answered correctly the conversions, 85% answered dosage calculations and only 56 % answered correctly solution calculations. The analysis revealed that the youngest nurses (20-29 years) felt that the calculations were easy and considered that they have adequate skills, whereas the oldest (50-59 years) felt it was difficult. Sixteen percent of the nurses expressed that pharmacodynamics was easy and 20% of them felt that they were familiar with effect of medications and 85% of nurses felt that they were more familiar with the routes of medication administration. The results showed that pharmacological skills of the nurses seemed to be inadequate.

The above studies reveals that nurses have deficient knowledge in regard to pharmacology and dosage calculation skills and majority of the authors emphasized the need for continued education in pharmacology and supervision in the clinical area.
Medication errors

Carvalho VT, and Cassiani conducted an exploratory study on medication errors and consequences for nursing professionals and clients in Sao Paulo State, Brazil in 1999, which aimed to analyze the consequences of medication errors for patients and nursing professionals based on error reports. They adopted the Critical Incident Technique with modifications as a theoretical framework. Data were collected through interviews with 7 nurses, 4 nursing technicians and 23 nursing auxiliaries. The analysis enabled the identification of consequences for patients and for the nursing professionals involved. It was concluded that medication errors must be reported so that their causes, rates and consequences in hospitals can be observed, considering that medication error rates are the sources for various studies as well as indicators for the improvement of the hospital system and care quality.

An exploratory study conducted by Pape to investigate the factors contributing to the medication administration errors in Texas showed that most occurring factors related to drug administration are lack of knowledge of application, use of wrong drug names, dosage form or abbreviation; incorrect calculations or unit expressions. Other causes of medication errors were illegible handwriting and use of improper abbreviations and verbal orders. The investigator also highlighted the issue that lack of institutional policies regarding medication errors can cause confusion among nurses, pharmacists. Few of the environmental factors includes crowded spaces, high noise level, excessive workload and distractions, interruption while preparing the medication were the route cause for failure to follow the protocols and procedures. The investigators summarizes some of the possible solutions such as medication
education at all levels, ordering and dispensing the normal doses, control over time and avoid transcriptions, avoid verbal orders, re-education about the importance of documentation to the nurses and developing effective tracking system to evaluate the system errors and reduce medication errors.²⁹

Another exploratory study conducted by Gladstone to identify the factors underlying the occurrence and reporting of drug errors in England among 141 nurses in 12 district hospitals over 12 months from different sources such as drug incidental forms, informal interview from 14 nurses who were willing to talk to the investigators about the errors committed by them, and self administered questionnaire from 102 nurses who carry out drug administration daily and 17 nurse managers handles nurses who committed errors in drug administration showed 79 drug incidental reports.³⁰ Among the errors reported, over 50% were dose related, the most common being an incorrect infusion (17.7%) and the least common being incorrect route (1.3%). Analysis of the questionnaire revealed that 64% of the nurses were not sure of what drug errors constitutes and when errors occur it should be reported and 18.5% of the nurses in the study did not posses any form of mathematical qualification. Most nurses believe that the errors occurred when the nurses fail to check the patient’s name band with the prescription chart. Seventy four percent considered that some errors were not reported due to nurses’ fear of management reaction. The comments from the nurse managers reflected the lack of uniform approach in solving problem of drug errors. The interview with nurses commented workload as the first contributing factor and the least was poor communication with other staff. The study implicate that a definition of medication errors should be
available to the nurses, and they should be made competent to recognize and monitor them. The nurses should be encouraged to report errors and fear of disciplinary action should be removed, they should be supported and adequate training should be given to them in all areas of medication administration.\textsuperscript{30}

A prospective cohort study was conducted by Leape to assess the incidents and prevention of Adverse Drug Event (ADEs) in United Kingdom among 4031 adult patients admitted in medical, surgical and Intensive care units of two tertiary hospitals for six months.\textsuperscript{31} The incidents were detected by self-report from nurses and pharmacists and by daily review of all charts by nurse investigators. The incidents were classified by two independent reviewers as to whether they represented ADEs or potential ADEs so as to severity preventability. The study revealed that out of 2407 ADEs of which 700(28%), out of 194 potential ADEs 83(43%) was preventable. The rate of ADEs was highest in the medical ICU (19.4/1000 patients). Three patients suffered fatal ADE during the study period and were not preventable. Among the 264 preventable ADEs and potential ADEs, 49% of the primary error occurred in the ordering stage, 11% occurred in transcription, 14% during dispensing stage and 26% occurred in administration stage. Among the ordering errors, wrong dose was most common followed by wrong choice, wrong frequency and drug interaction and among the administration errors wrong dose, wrong technique, wrong drug, missed dose and wrong time were most frequent. The investigators recommended that in the system by which drugs are ordered and administered could prevent many of these events and reduce the cost.\textsuperscript{31}
A literature review was conducted in UK by Anderson on a system approach to reduce medication errors in an attempt to demonstrate the value of non-punitive, anonymous incident reporting. The reviewer focused on the systems problem for medication errors and introduces that systems are made of many parts such as design, equipment, procedure, operators, supplies and environment (DEPPOSE). Single cause or person centered explanations of incidents are therefore incomplete and also the potential for recurrence of the incidents remained high. The effective approaches to reduce errors are the implementation of successful incident reporting system and change of attitude towards the errors and prompt response to the reported incidents. Most successful reporting scheme was found to be anonymous reporting and system based incident reporting that includes near misses and system problems, as they have the potentials to identify and correct before an incident occurs. The reviewer concluded that the workplace education on the need for anonymous, complete and honest reporting of near misses and errors, recognition of the counter-productive nature of blame, redesigning of the work environment based on incident data are essential to the effective application of the system approach in error reduction.

A qualitative study was conducted by Arndt M, to find out the nurses’ experience with medication errors in United Kingdom. A total of 32 nurses were selected for the study using interviews, group discussions and self report. Two group discussions, one with eight nurses in Germany and another with six nurses in Scotland were held. Twelve unstructured interviews were conducted with the nurses and collected six written self-reports. The theme derived from the study through
discourse analysis were the procedure of sealing with medication errors, the role of the medical staff, the image of the nurses and nursing, the situation of the student nurse and support in the situation of medication errors. The results of the study showed that the traumatic experience of having been involved with the medication error was counteracted by support given by colleagues and sharing the experience with other nurses, who had lived through similar situation. This helped the nurses to regain professional confidence and a personal sense of value. The researcher concludes that the decision made in situations of medication error has moral implications at personal, institutional and professional levels and the attention should be shifted from the person involved onto the situation, which led to such occurrence.33

A multi-professional project was carried out in United Kingdom by Guy in February to July 2001 in order to identify the interventions (i.e. the process of querying a prescription with a prescriber) that the nurses and pharmacists make in relation to drug administration. A multi-professional team was formed consisting of a pharmacist, a nurse, two members of clinical effectiveness team, and two doctors to collect the data.34 A two week collation of interventions were undertaken in sixteen wards, of which nine were specialized areas (One ICU) and general wards. Two weeks prior to the study's commencement, the nursing and pharmacy leaders promoted the project through professional forums, team meetings and poster advertisements. Instructions were also given on how to complete the data collection forms. A total of 194 interventions were detected in February and 169 in July. During the study medical staff accepted approximately 80% of the pharmacists' interventions
and 50% of those initiated by the nurses and doctors were able to justify the prescribed treatment where interventions were not accepted. Data on risk assessment demonstrated that the majority of the interventions were in minor importance and only 0.5% of the interventions were categorized as potentially life threatening. The follow-up study was conducted in July to establish whether there was a reduction in the number of interventions after the senior house officers had been in post for five months. There was a modest reduction of 25(12.8%) in the number of interventions reported in July. The study reveals that there is a need for adequate training for nursing and medical staff, along with system changes, which will help to minimize the risk for medication errors.34

A literature review was carried out in Dublin by O’shea on factors contributing to medication errors.35 Some of the factors noted were poor mathematical skills of nurses, lack of knowledge of nurses regarding medications, length of nursing experience, length of nursing shifts, workload and staffing levels, nursing care and medication delivery system, single nurse drug administration, weak policy and procedures, distractions and interruptions and quality of prescriptions. The reviewer concludes that errors are due to personnel, systems and managerial problems. Assessment of workload, nursing care delivery systems and staffing levels on different shifts are the factors to be considered by the nurse managers. It is important that the nurse educators provide in-service education to nurses relating to medications.35
A prospective cohort was conducted by Baker in US to identify the prevalence of medication errors. A stratified random sampling technique was carried out to select 36 hospitals for the study. Two registered nurses, two licensed practical nurses and two pharmacy technicians were selected to train for data collection, except for adverse drug events. The health care providers were given training in the observation technique for 20 hours, including classroom lectures, interactive videotape programme, practice observation in the nursing unit and two examinations. Adverse drug events were analyzed by a three physician panel. The trained health care providers directly observed the medication administration procedures and noted the details for each event. After the medication pass, the observer and the researcher made copies of the original medication orders for patients involved in the observation. The mean drug error rate was 19% (605 of 3216 doses). The most frequent errors by category were wrong time (43%), omission (30%), wrong dose (17%) and unauthorized drugs (4%). Seven percent of the errors were judged as potential adverse drug events. The study reveals that medication errors were frequent, occurring at a rate of one of every five doses in the hospital and skilled nursing facility. The percentage of the error rated potentially harmful was 7%. The researcher concludes that the medication delivery and administration system of the hospitals and skilled nursing facilities have major system problems, which contribute to many medication errors.

According to Masters (2005), amongst all hospital errors, medication errors have been identified to have the highest frequency of occurrence. A big percentage of these errors are in fact caused by the incompetence on the part of nursing
students. It is clear that the incompetence of nursing students has some kind of a ripple effect when it comes to the delivery of healthcare. It should not be lost on this that the blame at times tends to fall squarely on educators who according to Aspden (2007) fail to prepare students well for the many tasks going forward.\(^3\)

Naylor (2002) also notes that educators have a very big role to play when it comes to enhancing the competence of nursing students so as to avert any instances of medication calculation and other drug administration errors.\(^4\) While it is true error is to human, and that sometimes some errors lead to negligible effects on patients, some errors have the potential of bringing about disastrous effects upon the patient. These medication calculation and other drug administration errors are the ones that are commonly referred to as potential ADEs or serious medication errors. A good example of such an error which can be attributed to incompetence on the part of nurses is an amoxicillin order for a patient having a previous penicillin anaphylaxis.\(^3\)

To further underscore the role of competency of nursing students plays as far as drug administration errors are concerned, Aspden (2007) notes that there have been instances where nurses have not observed the five medical administration rights. This rights which relate to the administration of medications include the right patient, the right administration when it comes to frequency as well as timing, the correct dose, the right administration route and lastly the correct drug. Failure by nurses to follow these simple rights actually has a domino effect as far as drug administration and medication errors are concerned.\(^3\)
The above studies clearly indicate that errors occur in medication administration whether major or minor in nature.

**Competency in drug administration**

An evaluative study was conducted by Lucy to determine the efficacy of a staff training programme in improving skills and knowledge of psychiatric nurses in London. A total of 29 nurses working with 'difficult to place' patients were selected and questionnaire using MCQs on management of schizophrenic and other mental illnesses, communication skills, problem solving skills, negative symptoms, delusion and hallucinations, irritability leading to violence and staff coping strategies were included. Twenty hours training was conducted for two hours per week over a period of ten weeks. Various methods of teaching used were formal teaching, role play and exercises, in pairs or groups. The comparison of pre-test and post-test training programme increased the nurses' knowledge on schizophrenia and their use of strategies involving change increased. The use of structured programmes for patients had increased significantly, which indicated that the nurses were able to assimilate knowledge about specific skills.

An evaluative study was conducted Davids et al, to assess the effectiveness of implementation of specialist educational interventions for acute inpatient mental health nursing staff and its impact on nursing care quality in United Kingdom. The sample for the study was the whole nursing staff i.e., qualifies nurses and nursing assistants, from the three acute mental health wards. The quality of nursing was measured by documentary evidence of individualized, user centered care and
opinions of the service users. The investigators collected data concerning clinical profile, documentary evidence of nursing quality which included care planning quality, quality of initial assessment, therapeutic activities, risk assessment procedures, side effect monitoring and external agency involvement and 25 service users’ views by interview before the intervention, for a month. Educational programme especially developed to meet the educational needs of acute inpatient mental health care nursing staff was carried out as a 3 days module. The course was divided into six 3 day module. After completion of the programme the investigators collected the follow up data from the records as well as from the interview of 26 service users. The record samples comprised of all the service users who were resident of the three wards and who had records available for inspection during designated data collection period. The result revealed that there was improvement in the documentation of initial assessment, the individualized care and provision of relevant therapeutic care. However the service users did not identify differences in their care such as named nurse system, level of involvement, experience of medication management and participation in therapeutic care.\textsuperscript{41}

Louise conducted a study to develop and implement a competency programme on chemotherapy with the aim of providing a unified set of skills about chemotherapy to nurses in the United States.\textsuperscript{42} Nurses working in the oncology unit were selected for the study. The programme content was based on identified specific skills and knowledge required for chemotherapy and learning needs of the nurses. The programme included three self directed learning packages on knowledge components such as information about specific drug actions., verification of drug
dosages, immediate and potential adverse effects and their management, recognition and treating the extravasations, patients’ education and safe handling of drugs. The technical competencies included were the venipuncture and proficiency in managing the intravenous lines, central venous catheters and infusion devices. At the end of the programme, the nurses were required to answer 20 item written tests, a short answer, a clinical scenario. Clinical scenario included realistic patient care information. Nurses were required to assess the laboratory values, calculate drug dosage, specify actions and classifications of chemotherapeutic agents and describe patient education. When the nurses finish answering the questions, they were reviewed for immediate feedback. Continuing nurse educators reviewed the case scenario to evaluate the individual nurses’ knowledge. The programme was evaluated by obtaining a written evaluation and verbal feedback from the staff and the managers immediately following the educational session. The evaluation of the programme showed that the nurses valued the competency programme and recognized it as an opportunity to identify their learning needs and skills deficits.\

A randomized single-blind controlled trial was conducted by Richard in London on Community Mental Health Nurses (CHMN) to assess the effectiveness of medication management training package in improving compliance and clinical outcomes in patients with schizophrenia. Sixty CHMNs were randomly assigned and clustered into 12 clusters. Six clusters were in the medication management package training and six clusters in the treatment as usual. Medication management package training consisted of 80 hours of training on the basis of eight hours per week for 10 weeks. Each CHMN identified two patients and assessed at baseline and
again after six months. The primary outcome measure was psychopathology, measured using the Positive and Negative Syndrome Scale (PANSS). The secondary outcome measure was self reported compliance; observer’s rating of compliance and self report measure of the side effects. Self report of the compliance was measured using Hogan Drug Attitude Inventory and self report measure of the side effects measured by Liverpool University Neuroleptic Side effect rating scale. The study revealed that nurses who had received medication management training produced a significant greater reduction in patient’s overall psychopathology, improved attitudes towards antipsychotic medication and compliance compared with the treatment as usual at the end of six months study period. Hence the study proves that medication management training for CHMN is effective in improving the clinical outcomes in patients with schizophrenia.43

A randomized controlled equivalence / non – inferiority trial was conducted to determine the preoperative assessments carried out by appropriately trained nurses which were similar in quality to those carried out by pre registration house officers in the United Kingdom.44 Randomly selected 1874 patient admitted in the four National Health Services hospitals and 3 nurses and several pre registration house officers were selected for the study. The research compared the competence of appropriately trained nurses and pre registration officers in history taking, physical examination and ordering of tests of patients undergoing assessment before general anesthesia for general, vascular, urological or breast surgery. The nurses undertook training in anatomy, physical examination and modules taught in master’s courses in advanced practice and were supervised by a mentor for a month where as the pre-registration
house officers received no training other than medical school education. A specialist registrar in anesthesia examined each patient to confirm the assessment findings of the nurse or pre registration house officers. Measures evaluated by them were placed into four categories: correct, over-assessment, under-assessment not affecting management and under assessment possibly affecting the management. Nine hundred and twenty six patients were assessed by the house officers and 948 by nurses. Thirteen percent of assessment carried out by the nurses was possibly to have affected management compared with fifteen percent of those performed by house officer. The house officers ordered considerably more unnecessary test (24%) than the nurses (14%). The study concluded that nurses were judged to be non-inferior to house officers in assessment. There is no reason to inhibit the development of nurse led the pre-operative assessment provided that the nurses involved receive adequate training.\(^4^4\)

A descriptive study was conducted to find the effect of a research method course on nurses’ research activity in Denmark.\(^4^5\) The sample consisted of 79 registered nurses, divided into 2 groups. Sample 1 was the study group and consisted of 37 nurses who attended the research courses and sample 2 was the reference group which consisted of 42 nurses who did not attend the research course. The comprehensive research course consisted of 8 hours duration daily and was held on one day every week. Total 19 sessions were conducted with 120 hours of lecture. The main topics covered were literature review, basic statistics, research process, research ethics and publishing researches. The course winded with the verbal and written project proposal presentation of the participants. Data collection
was done by interviewing. A semi structured interview which, consisted of 55 questions were used. The interview took place with the study group members during the course day two weeks prior to finishing the course by a research assistant. Interview with the reference group members were carried out by telephone. The results showed statistically significant difference in several variables between two groups. Eighty nine percent of the study group also showed a higher level of interest and commitment to research results of others. A total of 13.9% of the study group expressed their inability to find time during working hours to participate in the research projects, while this was 50% in the reference group. The study concluded that the course reinforced nurses’ self confidence in research and research based practice.\textsuperscript{45}

An evaluative study was conducted by Narayan et al, to determine the effectiveness of training on neonatal resuscitation programme (NRP) in India.\textsuperscript{46} The sample comprised of 35 medical personnel which included post graduate trainee doctors, general duty medical officers, pediatricians, nursing officers and probationary nurses.\textsuperscript{46} The research design was a one group pre-test –post-test design. None of the participants had any formal exposure to the NRP guidelines. All the participants were administered a pre- workshop test. The workshop consisted of multi-media lecture and workstation where the participants demonstrated the skills on mannequins and post test was conducted. In the pre-test the highest score was 16 (80%) out of 20 and the lowest score was 3 (15%) out of 20 and in the post test score the highest score was 20 (100%) and the lowest was 11 (55%). The sub group analysis revealed that nursing officers and probationary nurses have shown highly
significant improvement and doctor trainee, general duty medical officers, and pediatricians showed statistically significant improvement in the post workshop scores. The study concludes that the medical workshop is an effective means of imparting the knowledge to a mixed group of medical personnel and more useful for small hospitals, where mixed group of medical personnel are responsible for the care. Hence, special educational programmes needs to be carried out for nursing students and staff from time to time in order to improve their competency in drug administration.\textsuperscript{46}

\textbf{Teaching learning approaches in pharmacology}

One of the major concepts to merge from research into teaching and learning since the early 1980s has been the idea that the students can be strategic in their approaches to learning. Research also shows that there is a huge qualitative difference in the learning achieved when deep, rather than shallow approach is chosen. However, deep or shallow approaches are not usually stable traits in individuals. The way the curriculum is designed, delivered and most importantly, assessed has a profound effect on the way students choose to learn. It is also well established that when students engage actively with the material to be learnt, the learning will be deeper and more permanent than when they are merely passive recipients of information.

Technology mediated learning requires adjustments in the teaching/learning process for both instructors and students. Teaching learning cannot be successful unless the roles of both teacher and students are well defined and followed. The
students need to be prepared, knows teaching learning material, studious, does their work and keep up with the work, being on time, listens and pays attention, being alert, participates, communicates, and asks questions relating to the subject on current issue to seek more information. Whereas the teacher need to teach the students to understand, share current issues, explain clearly, answers questions, give insight, highly prepared, helpful, supportive, Challenge/stretch students’ minds, fair/courteous, and pays attention within the classroom teaching learning and also supervises the students while in clinical to note write doings and preventing wrong doings that could harm the therapy receivers.

Likewise, in the world of learning and practice in drug therapy, success depends on the mutual contributions of all teachers, students and clinical supervisors to the medical professionals’ goals and objectives. Students must want to learn just as teachers want them to know and grow. Growth of knowledge and practice of medication administration must be modeled up to meet the current and future challenges in academic and as well as in comprehensive patient care.

Today, in the field of pharmacology teaching learning, there are increasing number of drugs, their changes in the knowledge on general principles of mechanism, its action and properties of drugs which poses each one of us to use innovative approaches to learning in undergraduate education. In this regard, Manias and Bullock explored the perceptions and experiences of lecturers and undergraduate nursing students relating to teaching and learning issues in pharmacology in the University of Melbourne. A total of 14 focus group interviews
were conducted at 10 university settings, which involved seven academic staff and seven student interviews. The focus group interviewing method was used because it enabled all participants to have 'a say', facilitated the expression of diverse views, and allowed participants to express themselves without fear that their views would be openly criticized. Student participants comprised second and third year undergraduate nurses while lecturer participants involved course coordinators, subject coordinators, and bioscience and nursing lecturers. The 'framework' method was used for data analysis, which involved the following stages: familiarization, identifying a thematic framework, indexing, charting, and finally, mapping and interpretation. Four major themes emerged from discussions with lecturers and students: teaching considerations, learning considerations, the relationship between pharmacology knowledge and clinical practice, and the features of an 'ideal' programme in pharmacology. The findings highlighted that potential conflicts existed among academic staff relating to the balance of pharmacology and nursing content in curricula, which often led to over-laden curricula. Potential conflicts also existed between lecturers and students about the value placed on a separate pharmacology subject as opposed to an integrated pharmacology programme. Hence there is still much scope for educational initiatives to improve students’ knowledge of pharmacology and medication management.\(^{47}\)

Lindsay Brown from University of Queensland, Australia noted that ideally, computers in pharmacology enhance the provision of concise and precise information, allow demonstration of practical concepts without using animals and provide alternative examination procedures. Putting these ideals into practice
reviews maintaining student interest and recognising likely pitfalls. The challenge of computer-assisted teaching of large pharmacology classes should be explored through researcher.\textsuperscript{48}

Pharmacology education in nursing has become increasingly important as nurses’ roles in administering; prescribing and educating patients about their medications have grown. Some authors have expressed concern at the lack of science teaching in nurse education, and others have suggested that there is a theory-practice gap in this area of the curriculum.\textsuperscript{49} Rachel L. King, M. in 2004 studied Nurses’ perceptions of their pharmacology education by identifying nursing roles that require pharmacology knowledge, and nurses' preparation for practice from pre-registration pharmacology education.\textsuperscript{49} A qualitative approach was used to collect data from a purposive sample of 10 qualified nurses from an emergency admissions unit in a city in the north of England. Semi-structured interviews were transcribed verbatim and categorized using Burnard’s 14 stages. Findings showed a limited understanding of the subject, and dissatisfaction with the teaching of pharmacology, with resulting anxiety on qualifying. Nursing roles identified as requiring pharmacology knowledge included drug administration, patient assessment, nurse prescribing, and patient medication education. Hence the findings suggest that, although nurses have a limited understanding of pharmacology, they recognize the need for pharmacology knowledge in practice. Improved pharmacology teaching might increase nurses’ confidence in performing drug administration, patient education, and nurse prescribing, and decrease anxieties related to these roles.\textsuperscript{49}
Marcia MW, Anderson WS, James LW explains that advancing computer technology, cost-containment pressures, and desire to make innovative improvements in nursing education argue for moving learning resources to the computer.\textsuperscript{50} A reasonable target for such a strategy is the traditional clinical lecture. The purpose of the lecture, the advantages and disadvantages of “live” versus computer-based or video lectures, and demonstration and the technical options in computerizing the lecture deserve attention in developing a cost-effective, complementary learning strategy that preserves the teacher-learner relationship. We need to build on the strengths of the lecture format and discuss strategies for converting the lecture to a computer-based learning presentation in the subject pharmacology where the students find it hard to recollect and analyze the effect of the drug that keeps changing upon the type of patients’ health problems. The clinical teaching learning of the nursing students is a prime responsibility of the nurse-educators. The efficiency of presenting information by one person (the lecturer) to many persons (the audience) is undeniable. However, cost-containment pressures and anticipated reduction in funding for nursing education in the long term and also availability of re-enforcement learning materials could help them comply with the competency of drug administration and thus reduce the drug errors by student nurses. Hence, it the nursing researches are forced to seek even more efficient educational strategies.\textsuperscript{50}

With the advent of the multimedia, computer allows presentation of teaching materials in a manner that is both entertaining and informative. Continuing innovation in software and hardware has made computer-based tools more developer-
learner-friendly as well as increasingly inexpensive. Despite reservations to computer-based learning on the part of some medical educators, the evolution of technology and the pressures of cost containment encourage continuing exploration of the potential risks and benefits. Already accepted roles of the computer in enhancing the efficiency of the lecture include generating and distributing lecture handouts and slide presentations. In this research the investigator will explore the potential for transferring the actual content of the clinical pharmacology subject using nursing process learning activities to the multimedia computer, quiz forms, and video and live demonstration to enhance students competency in drug administration and patient’s compliance to drug regimen. The investigator in her quest presents the need for such innovative teaching learning through review based on drug errors made by various health care professionals and the level of harm caused to the receivers of therapy and also the various teaching methods applied to help learn pharmacology and integrate their learning and also to help patients comply better to the drug regimen they receive for their health problems.

**Chronic respiratory health problems and patients’ compliance to therapeutic regimen**

Failure to adhere to medication instruction, either willfully or inadvertently, has been termed as non compliance with medication. Instances of non compliance can include either the individual fails to take the medication, taking less or more than the dose prescribed or instructed. Major factors affecting compliance in prescribed medicine could be categorized into physiological, behavioral, treatment, health care provider/ patient instruction factors. Among the physiological factors, the major
concern could be loss of vision, loss of hearing that can impede an elderly patient’s ability to read information related to his or her medicine that has been prescribed. On the other hand mobility limits, type of disease, presence of symptoms, memory loss, depression among elderly and cognitive impairment can lead to non-compliance to one’s therapy. Behavioral factors such as social isolation, social and health beliefs, economic conditions such as fixed income for elderly may lead to inadequate purchase leading to non-compliance and complications related to incomplete treatment. Factors related to treatment such as duration and complexity of the regimen can decrease the compliance rate. Health care provider’s instruction level and patient’s interaction level such as how well the nurse instructs the patient or communicates and also the patient’s ability to ask questions related to his treatment regimen build high degree of compliance. Hence education is the key factor to improving compliance among patients with asthma as well and Tuberculosis. This compliance in the long run can be only achieved if the nursing force is taught the right understanding of pharmacology, drug administration principles and its application in the clinical scenario. Understanding patients attitude towards prevention Vs treatment, complexity or the regimen, extent of unwanted effects and also their views about their own health problems and how best it is being treated could bring down the level of non compliance of patients with long term treatment.

Shashibhushan considers bronchial asthma, a major public health problem affecting a large number of individuals of all ages. Globally, 100 to 150 million people suffer from asthma. Being a chronic medical condition, management of bronchial asthma requires, continuous medical care. Modern management of bronchial asthma
mandates prolonged medication in order to reverse and prevent symptoms and airflow limitations. Hence key issue in proper management of bronchial asthma is adherence to treatment and poor compliance to prescribed therapy increases morbidity and mortality.⁵¹

Chochrane reports that 50% of patients with a chronic disease do not use their medication at all or do not use it as prescribed.⁵² A key reason for poor compliance is that patients with a chronic disease do not have a satisfactory understanding of their condition and the reasons for using medication.⁵²

Interview conducted by Col in Massachusetts among 315 consecutive elderly patients admitted to an acute care hospital due to noncompliance with medication regimens or adverse drug reactions, their causes, consequences, and predictors revealed 89 of the elderly admissions (28.2%) were drug related, 36 due to noncompliance (11.4%), and 53 due to adverse drug reactions (16.8%).⁵³ One hundred three patients had a history of noncompliance (32.7%) and the factors statistically associated with a higher risk of hospitalization due to noncompliance were poor recall of medication regimen, seeing numerous physicians, female, medium income category, use of numerous medications, and having the opinion that medications are expensive. Hence many elderly admissions are drug related and noncompliance accounting for a substantial fraction of these.⁵³

Murthy, in his address to understand the disease burden in India estimates the caseload of patients with asthma in urban and rural India age above 15 years
from 1996-2016. The prevalence of asthma among 15-59 years is 2,309 and 10,375 among 60 years and above.\textsuperscript{54}

<table>
<thead>
<tr>
<th>Year</th>
<th>Urban (cases)</th>
<th>Rural (cases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>1790</td>
<td>2784</td>
</tr>
<tr>
<td></td>
<td>8,279</td>
<td>11,272</td>
</tr>
<tr>
<td>2001</td>
<td>1811</td>
<td>2540</td>
</tr>
<tr>
<td></td>
<td>8,379</td>
<td>11,408</td>
</tr>
<tr>
<td>2006</td>
<td>1838</td>
<td>2577</td>
</tr>
<tr>
<td></td>
<td>8,503</td>
<td>11,577</td>
</tr>
<tr>
<td>2011</td>
<td>1865</td>
<td>2615</td>
</tr>
<tr>
<td></td>
<td>8,628</td>
<td>11,747</td>
</tr>
<tr>
<td>2016</td>
<td>1892</td>
<td>2653</td>
</tr>
<tr>
<td></td>
<td>8,752</td>
<td>11,917</td>
</tr>
</tbody>
</table>

The current treatment of asthma will cause every patient per year an estimate of Rs. 26,087 for a chronic moderate to severe cases and Rs. 7,053 per hospitalization episode. The treatment cost in 2016 will exceed Rs. 31,045 for chronic moderate and severe and Rs 8,394 per episode of hospitalization.\textsuperscript{50} India in 2011, the number of chronic cases of asthma estimated is approximately-

- 34.57/100,000 Urban males and 32.05/100,000 females
- 128.89 /100,000 Rural male and 251.58/ 100,000 females
- In the year 2016 the estimated asthma cases will rise from-
- 37.30/100,000 urban male and 35.97/ 100,000 females
- 139.50/100,000 rural males and 137.99/100,000 females

Asthma can cause considerable patient morbidity and low productivity and also an increase in health care utilization yet the prognosis of asthma holds good.
(60-80%). Patients live a normal live without any disruption with good therapeutic compliance and it is also observed that 10-20% of the patients continue to have severe attacks throughout their lives.\textsuperscript{54}

According to Medical Council of India (ICMR) 13 million people age above 15 are affected with asthma. Another 11 million suffers from chronic bronchitis.\textsuperscript{55} An advisory panel held at AIIMS, New Delhi lead by Dr. GC Khilnani estimates to 1.69 lakhs of individuals suffering from asthma across 12 centers in India. It was also noted that asthma was highest in the age group of 55-64 years followed by 65-74 years.\textsuperscript{55}

Tuberculosis (TB) ranks third among infectious diseases as a leading cause of death, suffering, and disability,\textsuperscript{56} and its global incidence is growing at approximately 0.4% per year, with faster increases in sub-Saharan Africa and the former Soviet Union. Every year, there are an estimated 8.2 million new TB cases worldwide (incidence rate of 136/100,000) and 1.82 million deaths from TB, of which 226,000 (12%) are attributable to HIV. The increase of multidrug-resistant TB (MDR-TB), and, more recently, the emergence of extensively drug-resistant TB (XDR-TB), poses additional challenges for global TB control. India is the highest TB burden country in the world, accounting for one fifth of the global incidence - an estimated 1.9 million cases annually. The Revised National Tuberculosis Control Programme (RNTCP) has now completed over ten years of its implementation, TB mortality in the country has reduced from an estimated 42/ lakh population in 1990 to 28/ lakh population in 2006, and the prevalence of TB in the country has reduced from 568/lakh population
in 1990 to 299/lakh population by the year 2006 as per the WHO 2008 Global TB Report. These are encouraging trends pointing that the RNTCP is on the right path and steadily working towards achieving by 2015 the United Nations’ Millennium Development Goals relating to TB that is to halt and begin reverse incidences of TB by 2015.  

One of the aims of the World Health Organization is to detect 70% cases and 85% success rate in the treatment plan. Nurses being the largest health care team member in the health care sector, yet deficient for the entire population has greater role to play in the global fight against TB. Nursing roles in the WHO DOTS (directly observed therapy short course) strategy cover the entire spectrum of activities, including advocating for political commitment, case detection, administering and monitoring drug regimens, ensuring a regular supply of medicines, and standardizing recording and reporting systems. Nurses and other professionals are challenged to deal with the burden of TB-related disease and disability, and with proper investment in their training and support can become key partners in the global fight against TB.

"Compliance" has been adopted to describe the degree to which patients follow their providers' recommendations. Compliance with a prescribe therapeutic regimen has become a prime health care issue over the past few decades and recognized to represent a complex challenge since its first mentioning by Hippocrates about 2400 years ago. It has coincided with advances in medical science resulting in increased knowledge regarding etiology, treatment and prevention of disease and other causes of impaired health. As knowledge increases regarding efficacy of treatment and prevention so does frustration and concern increases when individuals
fail to comply with the medical and nursing advice regarding the prevention and treatment. Consequences of non-compliance among patients could be traced by reported findings or observations of the therapy after having given. Numerous factors such as the duration of therapy, the complexity of the prescribed drug regimen and many psychosocial factors, alone or in combination, may contribute to compliance with drug therapy.\(^\text{58}\)

Non compliance is an old age story among patients with chronic health problems. Study conducted by Shashibhushan on factors contributing to compliance of aerosol therapy among 100 bronchial asthma patients in Belgaum, North Karnataka who were started on aerosol therapy over duration of one year show that at the end of 3 months, only 31% of the patients had regular compliance and 69 patients (69%) were non-compliant to aerosol therapy for bronchial asthma.\(^\text{51}\) Level of learning status of the individual had an important role for non-compliance, four times daily or multiple drugs, dislike of medication and distant pharmacies. Non-Drug factors include fears about side effects, anger about condition or its treatment, forgetfulness or complacency and attitudes toward ill health. Various strategies such as verbal praise, interactive communication skills tailoring the medications to the patient’s routine and answering to the family’s worry were used. Yet, after employing the various strategies of patient’s education, the compliance increased in 23 patients (34.3%) among the earlier defaulted patients, while the remaining 44 patients (65.7%) were found to be noncompliant even after various educational techniques.\(^\text{51}\)
Monica Julie Tettersel assessed patients' knowledge of asthma and treatment and compliance levels among 100 moderate to severe asthmatics recruited patients with the use of postal questionnaires and non-compliance was found to be high: 39% of patients omitted to take their asthma treatment as prescribed. The level of patient knowledge had no significant effect on compliance to drug therapy. The highest compliers were respondents who reported never receiving an explanation about the condition. The majority of patients believe they would know how to manage an attack, but when they 'scored' on their ability only 34.4% were deemed to be safe. However, the level of patient knowledge appears to influence a patient's ability to manage an asthma attack. Less than half of the patients who had asthma explained to them reported to have understood the initial explanation, and explanations made by nurses were particularly poorly understood. The study identifies reasons why patients do not comply with drug treatments. Many feel the drugs are not necessary and many forget to take them. Almost half of the cohort admits a reluctance to use their inhalers in public and a third state a preference for tablets rather than inhalers. Health professionals must look at other means of improving patient compliance rather than education in isolation. Since the general practitioner contract was introduced in April 1990, nurses working in general practice have become increasingly involved with health education as part of health promotion and chronic disease management clinics. This study highlights the need for further education in this area.

Today, tuberculosis is an important re-emerging disease with increasing global morbidity and mortality. Tuberculosis control is hindered by patient noncompliance with treatment regimens. In this regard, Ashry Gad et al conducted a study to identify...
the compliance with antituberculosis drugs among tuberculosis patients in Alexandria, Egypt.\textsuperscript{59} A total of 172 patients diagnosed with tuberculosis during the first three months of 1995 were investigated. The patients were interviewed at their homes during July and August 1995. More than one-third (34.9\%) of the patients were not adhering to the antituberculosis drug regimen. Factors increasing drug compliance included: disease symptoms, knowledge about the disease, family history of tuberculosis and hospitalization. More information about the disease and the importance of compliance should be provided to tuberculosis patients at the time of diagnosis and initiation of therapy. Supervision of drug administration by health care personnel is stressed through this research finding.\textsuperscript{59}

Matuszewski, et al conducted a retrospective case control study to determine patients who were noncompliant with prescribed medications for chronic obstructive pulmonary disease (COPD) and who had higher rates of hospitalization.\textsuperscript{60} Study was performed in a tertiary-care university-affiliated Veterans Administration Health Care System setting. Subjects included 93 patients hospitalized for exacerbation of COPD and 93 controls with a diagnosis of COPD who did not require hospitalization. Utilizing pharmacy prescription fill records, medication noncompliance rates of patients who required hospitalization for exacerbation of COPD were compared with patients who did not require such hospitalization. It showed the mean noncompliance ratio for the hospitalized patients was lower than the ratio for the controls (0.19 vs 0.20) although the difference was not statistically significant (P = .95). There was no statistically significant difference between the demographics of the two groups. However, the patients who were hospitalized had a significantly greater number of
COPD and non COPD medications (P< .0001, P< .0001) prescribed. They also had significantly more non COPD admissions and lengths of stay (P = .02, P = .01). Hence at the levels of medication noncompliance observed in this population, there was no difference in rates of hospitalization. Hospitalization could be attributed to other causes such as severity of illness and existence of other co-morbid conditions.  

Spector has reported that compliance with medication is essential if treatment is to be effective. Underuse, overuse, and erratic use of medication forms the noncompliance. Noncompliance accounts for almost 10%-46% with asthma therapy which is a serious issue with the mainstay of asthma treatment. Ways to monitor compliance include monitoring prescriptions, counting tablets, measuring levels of medication in blood or urine, and measuring canister weight, although none are fully effective. Contributing factors to noncompliance with treatment include side effects, lifestyle, social and economic factors, method of drug delivery, and dosing. Failing to monitor the above leads to increased symptoms and asthma exacerbations, both of which can lead to increased morbidity. To improve compliance, causal factors need to be addressed; there is a need to educate patients and those who support them about the disease and the importance of following the physician's recommendations.  

Hence the above literature clearly showed great amount of non-compliance to the treatment modalities whether it be Asthma, Tuberculosis, cardiac related, neurological, Endocrine, or any system treatment. Hence the nurse educators must
modify the teaching learning and practical efforts so that patients who are under their care 24 hours could improve in their compliance while in hospital as well as when they are sent back home with various complex drugs and also to prevent from further complications.

As a result Nurse educators have a long history of using mentorship to transmit skills, knowledge, and attitudes. Assessing the skills and identifying the undergraduate nursing students’ knowledge and skill in learning the treatment aspects and management of the same holds a greater accountability to combat TB control and asthma management in our country. Observing their skills and mentoring them in developing their skills will foster professional practice standards leading to high patient compliance. Assessing continuously their clinical skills should be seen as part of the continuum of education required to create competent nurses.

**Innovative teaching learning approaches**

We find that nursing health care professional students appear less competent than they did in school or pre university level. Study and test taking strategies developed in school, such as multiple reading or rote memorization, do not facilitate long term retention and multiple teaching learning strategies are required for health sciences students to competently deal with patient care and most importantly drug administration. The examination demands the students to expand their learning beyond mere understanding and simple recall to knowledge integration and to the application of that knowledge to a problem solving situation while dealing with each individual patient under their care. Nursing curriculum spends much effort in
researching what should be studied and learned; rarely do they help students achieve the skills to manage the vast amount of materials that must be mastered. Concern for the plight of students who fail to cope with the demands of higher education is expressed in many forms. Here are some of the studies highlighting the usefulness of some training or intervention programmes.

Vana et al conducted a study on the Effectiveness of an Audience Response System in Teaching Pharmacology to Baccalaureate Nursing Students at College of Nursing & Health Innovation, Arizona State University, Phoenix. Here the students’ use an audience response system, commonly called clickers, in order to see if this method actually improves students’ grades. Two methods were used, lecture format utilizing multiple-choice PowerPoint slides and audience response system was more effective than a lecture format using only multiple-choice PowerPoint slides in the comprehension and retention of pharmacological knowledge in baccalaureate nursing students. The study also assessed the additional use of clickers positively affected students’ satisfaction with their learning. Results from 78 students who attended lecture classes with multiple-choice PowerPoint slides plus clickers were compared with those of 55 students who utilized multiple-choice PowerPoint slides only. Test scores between these two groups were not significantly different. A satisfaction questionnaire showed that 72.2% of the control students did not desire the opportunity to use clickers. Of the group utilizing the clickers, 92.3% recommend the use of this system in future courses. The use of multiple-choice PowerPoint slides and an audience response system did not seem to improve the students’
comprehension or retention of pharmacological knowledge as compared with those who used solely multiple-choice PowerPoint slides.\(^{62}\)

Patil and Ameya conducted a controlled prospective study of PBL versus Lecture Based Learning (LBL) in cardiovascular system.\(^{63}\) Sixty four students of year 2 term 1, were randomly assigned to PBL group (n = 32) and to the LBL group (n = 32). At medical students of GSL Medical college Rajahmundry, India and AIMST University, Sungai Petani, Malaysia during the period from May to July 2008. Analysis included marks secured by the students in the continuous assessment (CA) examination (consisting of multiple-choice questions, true and false questions, short answer and long answer questions) and feedback regarding teaching methodology from the students in both the groups were taken. Majority, 80% students in the PBL group secured higher marks in the CA examination as compared to LBL group. The feedback results showed that students considered PBL to be an effective and favorable learning method over the LBL. PBL is an effective way of delivering medical education in a coherent, integrated programme and offers several advantages over traditional teaching methods. PBL is a group teaching method that combines the acquisition of knowledge with the development of skills and attitudes.\(^{63}\)

Srivastava et al conducted a study to obtain students’ opinion regarding the subject pharmacology, its teaching methodology, reforms to be introduced, computer and Internet use and its application in teaching learning process.\(^{64}\) A total of 372 students of 2\(^{nd}\) professional M.B.BS of UFHT Medical College Haldwani were given a questionnaire which consisted of 2-10 options. A total of 372 students in the age
group 19-24 yr with male female ration 1:1, mostly from northern India were included in the study. Majority, 50.53% (n = 141) considered pharmacology useful and important, 35.48% (132) wanted more of clinical pharmacology and problem based learning, 21.51% (80) wanted more frequent use of audiovisual aids. Three hundred and sixty (96.77%) wanted integrated teaching curriculum. Maximum, 88.17% (328) used computer and 80.64% (300) used internet and 44.64% (192) had knowledge about computer application and telemedicine and 40.86% (152) considered student seminars as useless. Hence students appreciated the subject pharmacology and wanted more of integrated problem based learning. Therefore nursing students' curriculum can also focus on clinical oriented pharmacology learning with refresher course in computer as today’s children are well verse with technology and learning and application can become meaningful.  

Mittal R et, al. conducted a study to evaluate students learning using student centered and integrated curriculum where vertical and horizontal integrated teaching is a relative novel method of training students recommended by the medical council of India over lectures, tutorials, demonstrations etc. which involves passive learning. Three year study was conducted on the MBBS Phase -II students of 3 batches. Integrated teaching (seminar on various segments of a topic) was carried out in 3 different ways to each batch of students. Batch 1: Subject experts (faculty) delivered talk on segments of topic allotted. Batch 2 were randomly selected 7-10 students presented with the topic and was faculty guided. Third batch had pre-session test with validated MCQs. About 10 topics were covered in a year for all the batches and were announced 15 days prior to the seminar for the student to prepare.
The seminar was for 2 hrs and a post-session was conducted using pre-validated MCQs following it to assess the learning outcome. Findings clearly revealed that post-sessions scores (mean +SD) of all batches calculated and analyzed using ANOVA showed significant improvement in the performance of batch 3 as compared to other batches. And hence, pre-session tests promote students participation in teaching learning activities and also facilitates the learning process. Similarly clinical oriented pharmacology can be best utilized by orienting the students before posting to their particular specialized area using MCQs on commonly prescribed drug. This clearly enhances their clinical reasoning so as to why the drug is given for their patient. In this regard a survey was done among 112 third year B.Sc. nursing students of MCON, Manipal during 2010 academic year. The students were given system drug file as part of their practical assignment and at the end of their posting, a test of 100 MCQs was administered covering major system drugs. Majority, 65% of the students scored 60% and above in the MCQ test on clinical oriented drugs whereas only 25% of the students get 60% and above in their classroom test. This indicates that students learn better with MCQs, which makes them internalize or clinically reason.65

Christopher assessed the need for Infection Control Training among Health Care Providers using a survey questionnaire. A total of 614 nurses working in 8 selected hospitals of Udupi district and Mangalore (DK) district were selected using quota sampling method.66 Findings of the study showed 100% agreement by the respondents that infection control training is relevant, to prevent hospital associated infections. Majority of them preferred group discussion (83.38%), demonstration
(79.31%), video (79.31%), self-study (77.03%) and only 16.61% preferred the lecture as their preferred mode of teaching and learning. There were 100% agreement with the topics like infection transmission in the health care setting, misconception about disease transmission, importance of following infection control, methods of infection control, standard precautions (universal precautions), hand washing and use of gloves, disinfection, aseptic technique management of sharps sterilization and waste management.  

Opinion surveyed by the investigator among 60 B.Sc. Nursing students of MCON in 2006 regarding their experience of teaching learning for the subject pharmacology, revealed that all teachers teaching the subject uses only lecture method to convey the entire syllabus (100%). Sixty percent of the students felt that the classes were less interesting and most, 75% expressed that only young, inexperienced teachers teaches them. Majority, 64% felt that teachers need to use innovative method to make the teaching learning experience interesting. Forty five percent of the students felt that remembering the names of the drug is too difficult and hence they lose interest and therefore they pay less attention and work on pathology and genetics to make up their marks for the internal as well as University exams.

Hence, the nursing students need to be helped to make a transition from their prior conditioning as dependent learners to their new role as self-responsible learners. Intervention programme to produce change in perceptions of certain context of student learning were found useful and have shown improvement in performance.
Any programs to enhance learning skills and strategies must start with the learner’s perspectives and program for improving approaches to learning, enhancing learner’s confidence and motivation, to reduce stress and anxiety of learning pharmacology may be useful for all the students. One time teaching or demonstration to students about learning drug administration is not going to solve the problems of errors but repeated viewing of video form of required skill is a must for the nursing fraternity to bring down the rate of drug errors which puts us into legal risk. With video one can learn anytime, anywhere and also saves time. It allows students to learn lessons by watching it either with CD or online. One need not sit at one place or laboratory or classroom but can learn conveniently from anywhere. Video learning gives the student the greatest advantage that no regular classroom can give. One can fast forward, replay or pause. This makes for great note taking and brushing up on an old class taken.

Today the depth and breadth of science and arts of professional nursing is expanding and an overwhelming task for a new nursing student to learn pharmacology. As students attempt to navigate through this learning experience, many find it difficult to differentiate between what is necessary to learn and what is less important. The pharmacology subject examination is a combination of genetics and pathology. Students have fear related to learning and digesting pharmacology and when they are put in the clinical area most of them tend to avoid giving drugs to patients for fear of making a mistake. Henceforth, enquiring on the reason for not administering medication among the students, the clear cut answer given is: we can make up our pass mark from the subject genetics and pathology. Hence they neglect
pharmacology learning whereas one of most important duty of the nurse is to administer medication.

Summary

The following conclusions were drawn from the literature review:

- Nurses lack adequate knowledge regarding pharmacology and drug administration especially in areas of dosage calculation.

- Medication errors occur either major or minor in nature

- Competency based training programmes are a must for nursing students to improve their clinical competency.

- Various innovative teaching learning approaches can sensitize students to learn pharmacology, drug administration and integrate their learning into clinical application.

- Almost 50% of the patients with chronic respiratory problems still fail to comply with their regimen. Therefore Nurses are posed with challenges to educate and help them adhere to their treatment regimen to prevent from complications of incomplete treatment.

- Video form of learning drug administration can enhance students’ competence in drug administration. It is cost effective, time saving, student friendly and great amount of space is provided for repeated learning.

- There is limited research studies related to innovative teaching learning methods in pharmacology in India. Most of the studies are focused among medical students.