Drug information and poison information center

Medicine information services (also known as drug information service) is a specialized service that is provided by pharmacists or clinical pharmacists to enhance knowledge of medicines allowing rational prescribing and minimizing medication errors.

A Drug information center is an area where pharmacists (or other health care professionals) specialize in providing information to health professionals or public. Pharmacists provide information across the spectrum of clinical practice. Providing concise information to patients during patient counselling is an important aspect of pharmaceutical care. pharmacists often provide drug information to other health professionals in the course of their clinical activities.

Drug Information Center (DIC) provides authentic, individualized, accurate, relevant, unbiased and well-referenced medication information including their indications, adverse effects, and drug safety aspects to the healthcare professionals and patients/ consumers. Impartiality and objectivity of medicine information is very important. Medicine information services have an important role to improve patient outcomes, diminish adverse drug reactions (ADRs) and reduce medication errors.

DIC provides accurate, validated, authentic, unbiased, up to date information on medicines to healthcare professionals and patients/ consumers. With the main objective of promoting the rational use of medications, DIC resolves the medication-related queries with evidence-based answers resulting in the safe and effective use of drugs in patients. Additionally, DIC contributes to reducing medication errors by promoting medication education. Furthermore, DIC has an important role in ensuring the appropriate use of antimicrobials

DIC plays a crucial role in providing pharmaceutical care services effectively and efficiently. It is accessible to any health care professional for pharmacotherapy related information and doubts and provides objective and unbiased information ensuring the safe use of medications. By aiding clinicians in safer use of medications and promoting ADR reporting, DIC can play a vital role in improving drug safety. The DIC should be well equipped with all the necessary resources for providing detailed, recent and up to date information on medication queries. To fulfill the common aim of better patient care and rational use of drugs, the ADR reporting system, and DICs should work together.

A drug information Centre can also contribute to pharmacovigilance (adverse drug reaction reporting), drug use reviews, health education programmes and clinical research.

History of drug information center in Nepal

In 1994, DIC at Tribhuvan University Teaching Hospital (TUTH) was established to aid the practicing clinicians with information on medications and their appropriate use in different clinical situations. DIC was involved in publishing a bimonthly newsletter highlighting reviews on drug and therapeutics. The center has been engaged in creating public awareness about proper drug use by developing and distributing research-based printed materials like information leaflets, pamphlets, and booklets to the general public.

In 1996, Drug Information Network of Nepal (DINoN) was established with the objective of providing high-quality DI and given responsibility for developing and disseminating unambiguous medication information on appropriate use, contraindications, possible ADRs, drug standards, efficacy, and toxicity. Earlier, DINoN was actively involved in the dissemination of drug information, however later on due to lack of donor funds the operation of the network had diminished.

Since its establishment in 2003, DIC at MTH, Pokhara, a tertiary care teaching hospital of Manipal College of Medical Science (MCOMS) had been engaged in different activities associated with DI services, medication counseling services, publication of drug information bulletin, pharmacovigilance activities, contributing to drugs and therapeutic committee (DTC) and continuing pharmacy education (CPE) programs.

The Department of Drug Administration (DDA) has been publishing and distributing drug bulletin to health institutions, industries, medical doctors, health personnel, pharmacists and institutions quarterly with updates on medications, registration of new molecules with DDA, therapeutic details of medications and regulatory notices.

Objective

- To provide an organized database of specialized information on medicines and therapeutics to meet the drug information needs of practitioners.
- To educate pharmacy students to serve as effective providers of medicines information.
- To provide accurate and unbiased medicines information service to the pharmacists, physicians and other health care professionals in the hospital and community.
- To promote patient care through rational use of medicines

Why drug information needed in Nepal?

- Increasing tendency of irrational drug use.
- Increasing tendency of drug induced illnesses.
- Lack of unbiased drug information.
- Lack of evidence based drug therapy.
- Vast and complex drug literatures.
- Drug literatures is growing and becoming complex.

Drug information to whom?

- Patients
- Pharmacist

- Nurses
- Prescribers
- Regulatory authorities

a. Drug information to patients

- Dosage form, regimen, duration.
- Special directions if any (Before / after food).
- Common side effect.
- Technique for self-monitoring.
- Storage of medicine.
- Refill information.
- Missed dose.

b. Information to clinicians

- Dose
- Comparative efficacy of newer medicine
- Dosage adjustment in special population
- Drug – drug interactions
- Drug- food interaction

c. Information to nurses

- Dose
- Infusion rates
- Dose calculations for special populations
- Storage of medicine

d. Information to pharmacist

- Dispensing information (Before food / after food, dose calculations, missed dose)
- Dosage related information
- Storage of medicine

Source of DI

A drug information Centre must has a good collection of source materials in orders to answers the questions whenever they arise. This should be continuously updated and maintained.

Drug Information Resources

- Tertiary Resources
- Secondary Resources
- Primary Resources

Primary source of information

Original work (published or unpublished) that introduce new knowledge or enhance existing knowledge on a subject. Primary literature is the foundation of both secondary and tertiary literature.

It also includes the researchers and manufactures materials such as patents and data submitted to the medicine commission.

Present information in its original forms, neither interpreted nor condensed nor evaluated by others writers. Example of primary sources are:

- Experimental or observational studies
- RCT
- Meta-analysis
- Case reports/case series
- Research abstracts
- Conference/clinical meetings
- Personal interviews
- Article published in journals

Advantage

- Information is current, original.
- Detailed information.
- Personally assess the utility and validity.

Disadvantage

- No guarantee of accuracy (Readers need to have good skills in medical literature evaluations).
- Time needed to evaluates large volume of literatures.
- Expensive.

Secondary resources

They do not contain original reports. The original sources have been selected, rearranged, condensed or commented upon by a person others than the publishers. They are usually abstracting or indexing services which summarize the information appearing in primary sources.

secondary sources consist of reviews of primary reports. These provide a personal perspective of the literature and can include comments on how the author might apply the information in practice.

Example of secondary resources are:

- PubMed
- International Pharmaceutical Abstracts
- Chemical Abstracts
- Martindale

Advantage

- Provides quick access to the primary literatures.
- Provides concise information on specific topics.
- The information is usually current.

Disadvantage

- The numbers of journals indexed by each system depends upon the scope of the database.
- The time periods between publications and lag time into secondary sources can vary for each database, from days to weeks.

Tertiary Resources

Tertiary resources are summaries of the primary and secondary published literature. Printed textbooks are the main example and these are characterized by a slow rate of revision compared to secondary sources. Tertiary sources can be very helpful in provide a quick overview of information.

Example of tertiary sources are:

- Textbooks
- Compendia
- Review articles
- Other general information such as may be found on the internet

Advantages

- Convenience
- Ease of use
- Complete information
- Familiar to most practitioners

Disadvantage

- Lag time (less current information)
- Incomplete information due to space restrictions and incomplete literature search by the author
- Possible errors in transcription, human bias, incorrect interpretation of information or lack of expertise by author

Poison information service

Poison information is a specialized area of drug information which includes information about the toxic effects of chemicals and pesticides, hazardous material, household products, overdose of therapeutic medicines including mushrooms, animal toxins from bites of snakes, spiders and other venomous creature and stings.

Poisoning is a significant global public health problem. Every year, approximately half a million people die world-wide due to poisoning. Since the middle of the 20th century, an ever increasing number of chemicals have been used for improving agricultural output and the manufacture of pharmaceutical and household products. The availability of these products has no doubt improved the quality of life but has also led to unintentional occupational and environmental exposures.

A poison Centre is a specialized unit that advises on and assists in the prevention, diagnosis and management of poisoning. Its primary role is clinical: advising on and, in some cases, providing treatment for poisoning cases. The structure and function of poison centers varies around the world; however, at a minimum, a poison Centre is an information service. Poison center's may also include a clinical treatment unit and/or a laboratory that can provide toxicological analyses.

A poisons information Centre is a specialized unit for answering enquiries, usually by telephone, about exposure to chemical agents, including products, pharmaceuticals, substances of abuse, natural toxins, pesticides and industrial chemicals.

ADVERSE DRUG REACTION

Adverse effect is defined as any undesirable or unwanted effect due to drug administration. The WHO suggested definition of ADR and AE are as follow:

- **Adverse drug Reaction (ADR):** Any response which is noxious, unintended and which occurs of doses normally used in human for prophylaxis, diagnosis, therapy of disease, or for modification of physiological function.
- **Adverse event (AE):** Any untoward medical occurrence that may present during treatment with a pharmaceutical product but which does not necessarily have causal relationship with the treatment.
- **Side Effect:** It is 'any unintended effect of pharmaceutical product occurring at doses normally used by a patient that is related to pharmacological properties of the drug'. This definition was formulated to include side effects that, although are not the main aim of the therapy, may be beneficial rather than harmful e.g. a β-blocker agent used to treat hypertension may, by β-blockade, also relieve the patient's angina.
- **Medication Error:** It is 'any preventable event that may cause inappropriate medication use or patient harm while the medication is under control of health care professional or patient'. It may be related to the professional practice, health care procedures such as prescribing, communication order, product labeling and packaging; also compounding, labeling, dispensing, distribution, administration, monitoring and use of medicine.

Risk factor of ADRs/Predisposing Factors to Adverse Drug Reactions

The risks of developing ADRs are multi-factorial. These factors include drug related factors, patient related factors, disease related factors and social factors·

A. Drug Related Factors

a. **Drug Dose and Frequency:** Dose of medication, frequency of administration and time of the day at which the drug is administered significantly affect the occurrence of ADRs.

Administering under dose or over dose of medication, increasing or decreasing frequency of administration, changing the appropriate time of the day to administer the medication can cause patient harmful drug effects. Aspirin when taken at night yield better anti-platelets action.

b. **Polypharmacy practice:** Poly-pharmacy may cause ADRs due to the drug additive effect, synergism, duplication, drug interactions, discontinuation of treatment and physiological antagonism. Poly pharmacy practice promote medication error.

B. Patient Related Factors

a. **Age:** Age have significant effect on development of ADRs especially the extreme ages that is pediatric and geriatric patients. These categories of patients are not usually studied extensively during clinical trials. Geriatric patients with multiple disease conditions, decreased drug elimination and previous history of allergy are more prone to ADRs. However, pediatric patients have low capacity to metabolize drug hence more prone to ADRs. Furthermore, ability to excrete drugs via kidney and rate of liver metabolism also decreased in elderly.

b. **Gender:** Men differ from women in GIT motility, also have higher body weight, internal organ size and glomerular filtration but lesser body fat; these factors affect both the drug pharmacokinetics and pharmacodynamics. Research conducted in northern India reported that female patients treated with angiotensin converting enzyme inhibitor had higher incidence of cough (37.9%) compared to male patients (15. 5%).

c. **Pregnancy:** During pregnancy several physiological changes occur which may affect drug pharmacokinetics as well as pharmacodynamics; these include cardiovascular changes; increase in cardiac output (32%) due to the increase in heart rate (10-15bmp) and GIT motility, acidity and tone increase during pregnancy which leads to changes in drug absorption, excretion and metabolism. During pregnancy ADRs may affect only the mother, the fetus or both.

d. **Fetal Development:** Fetus is sensitive to drugs in maternal circulation because of its fragile nature, low metabolism and excretion capacity may cause teratogenicity. Teratogenicity and other ADRs usually occur when drug is taken at first trimester during fetal organ formation. Effect on neonate or infants usually manifest when the drug is taken at the second or third trimester leading to growth retardation, respiratory depression, infection or hemorrhage.

e. **Renal function:** Kidney disease alters rate of drug clearance and metabolism leading to drug toxicity and low therapeutic effect.

C. Disease Related Factors

Presence of multiple disease conditions at same time predisposes patient to drug-disease interaction which may eventually lead to ADRs. Drug that is useful in treatment of one disease may be harmful in others; using NSAIDS to treat pain may exacerbate peptic ulcer; also condition of patient with asthma may worsen if he is treated with propranolol for angina or hypertension. Patients with chronic diseases like diabetes, high or low blood pressure, ulcer, glaucoma, an enlarge prostate, poor bladder control should be monitored carefully, because such categories of patients are more prone to drug-disease interaction and ADRs. Drug like prednisolone can cause fluid retention and may worsen congestive heart failure.

D. Social factors

a. **Race and Ethnicity:** Occurrence of ADRs differs from one population of patients to another due to genetic differences. Study shows that patient from East-Asia have three times risk of developing cough with ACE inhibitors than white patients.

b. **Alcohol:** Alcohol affect drug metabolism and promote development of ADRs. Alcohol causes hepatitis and liver cirrhosis that significantly affect the rate of drug metabolism; liver disease is proved to increase the toxicity of β-blockers.

c. **Smoking:** Studies revealed that cigarette smoking decreases the action of β-blockers on blood pressure. Smoking also interacts with drugs like theophylline, thiothixene, insulin, oral contraceptives, and H2 blockers. Clinical investigation proves that on average, insulin dependent diabetic smoker needed 15-20% more insulin than non-smokers, and up to 30% more for heavy smoker.

Classifications of adverse drug reactions

A. Based on types of ADRs

i. Type A (Predictable reaction)

- Augmented reactions
- Dose dependent
- E.g. sedation with Benzodiazepine and bleeding with warfarin
- They include side effect, secondary effect toxic effect.

ii. Type –B (Unpredictable reactions/ bizarre reactions)

- allergic reactions and Idiosyncrasy are type B reactions.
- These are non–dose related and unpredictable reaction to drug.
- E.g. allergic reaction caused by penicillin.

iii. Type C: Chronic effect e.g. peptic ulcer caused by chronic use of NSAIDS.

iv. Type -D: Occur after many year of treatment and it may be due to drug accumulation. E.g. Phenytoin during pregnancy cause teratogenic effect, chemotherapy produces secondary tumors.

v. Type –E: Occur on withdrawal especially when drug is stopped abruptly. E.g. Withdrawal response to morphine.

vi. Type–F: Failure of therapy. It may be due to counterfeit medicine, under dosing of medications, drug interactions.

B. Classification of ADR based on the intensity

i. **Mild ADRs:** This is a minor type of ADR. This does not require an therapy, or prolongation of hospitalization for the treatment is required.
ii. **Moderate ADR:** Require change in drug therapy, Specific treatment or prolong hospital stay at least one day.
iii. **Severe ADR:** Potentially life threatening, cause permanent damage or require intensive medical treatment.
iv. **Lethal:** Directly or indirectly contribute to death of the patient.

C. **Based on duration**: Temporary, persistent/ permeant, for example visual loss with quinine, ethambutol and amiodarone.

D. Based on incidence (Frequency)

a) Very common (>1/10 patients)
b) Common (>1/100)
c) Uncommon (1>1000)
d) Rare (>1/10000)
e) Very rare (>1/100000)

E. Based on onset of events

a) Acute (<60 minutes)
b) Subacute (1-24 hours)
c) Latent (>2 days)

F. Based on location

a) Local
b) Systemic

Management of adverse drug reactions

Adverse drug effects can be minimized but not altogether eliminated by observing the following practice.

- Avoid all inappropriate use of drug in the context of patient's clinical condition.
- Use appropriate dose, route and frequency of drug administration based on patient's specific variable.
- Take previous history of drug reactions.
- Rule out the possibility of drug interactions when more than one drug is prescribed.
- Adopt correct drug administration technique (e.g. Intravenous injections of vancomycin must be slow)
- Consider laboratory value appropriately and evaluate correctly

(e.g. Prothrombin time with warfarin, serum drug level with lithium)

Pharmacovigilance

WHO defines the pharmacovigilance as the "science and activities relating to the detection, assessment, understanding and preventions of adverse effect or any other drug related problem"

The concept of ADR monitoring and pharmacovigilance is new in Nepal. Government of Nepal nominated Department of Drug Administration (DDA) in October 2004 as the focal point (National Pharmacovigilance centre) to liaison with WHO collaborating centre for International Drug Monitoring, Sweden and started collecting adverse drug reactions. Nepal became a WHO programme member in July 2006.

At present, there are 15 regional pharmacovigilance centers in Nepal

1. Tribhuvan University Teaching Hospital, Maharajgunj
2. Civil Service Hospital, Minbhawan
3. Manipal Teaching Hospital, Pokhara
4. KIST Medical College, Imadol
5. Nepal Medical College Teaching Hospital, Jorpati
6. Patan Hospital, Lalitpur
7. B.P Koirala Institute of Health Science (BPKIHS), Dharan
8. Dhulikhel Hospital, Banepa
9. Shree Birendra Hospital, Chhauni
10. Norvic International Hospital, Thapathali
11. Nepal Cancer Hospital and Research Center, Harisiddhi
12. College of Medical Sciences - Teaching Hospital
13. Nepal Mediciti, Kathmandu.
14. Chitwan Medical College, Chitwan.
15. National Tuberculosis Control Center, Bhaktapur

Objective of pharmacovigilance

- To improve patients, care, and safety with respect to the use of medicines and all medical interventions
- To improve public health and safety with respect to the use of medicines

- To detect problems related to the use of medicines and communicate the findings in a timely manner
- To contribute to the assessment of the benefits, harms, efficacy, and risks of medicines to prevent harm and maximize benefits
- To encourage safe, rational, and more effective use of medicines
- To promote understanding, education, and clinical training in PV and effective communication with the public

Why pharmacovigilance?

- Safety information collected during drug development is *incomplete*.
- Animal tests are insufficient to predict human safety
- Clinical trials evaluate *limited* duration and *limited* numbers of carefully selected patients in carefully selected settings
- Information at marketing often *incomplete or not available* on:
  - Rare but serious reactions
  - Use in special populations (pregnancy, children)
  - Persons with multiple diseases and multiple drugs
  - Risk of long-term and/ or repeated use

Importance

- ADRs might lead to suffering and death as catastrophes have occurred in the past.
- ADRs have considerable economic consequences
- Clinical trials are not effective at detecting all ADRs mostly the rare ones.
- Most ADRs can be prevented.

Thus, these necessitated the establishment and implementation of the PV system.

Facilities and equipment for PV

- Subscriptions of Vigi Flow
- Training of Personnel for PV
- ADRs and AEFIs report collection tools
- Subscriptions to Drug information journals, societies, and applications
- Communication system
- Optimum office space
- IT systems
- Quality documentation and record

What to report?

All suspected adverse reactions/events as a result of the following should be reported

- Medicines (modern and traditional/herbal medicines)
- Vaccines
- X-ray contrast media
- Medical devices and health technologies
- Cosmetics
- Nutritional and dietary supplements
- Other health products

Medicine/ vaccines quality related problems can also be reported like

- Color change
- Smell change
- Separation of components
- Powdering/crumbling
- Caking
- Molding
- Poor packaging
- Poor labeling and mislabeling
- Suspected contamination
- Questionable stability
- Defective components
- Expired medicines

When to report?

- Serious adverse events (including fatal ones) should be notified within 24 hours with a complete report submitted within 7 days
- Non-serious adverse events should be reported within 7 days
- Poor quality medicines should be reported as soon as possible

Where to report?

Healthcare Professionals, Consumers
Paper-Based Form
↓
Regional PV Centers
(VigiFlow)
↓
National PV Center/ DDA

Why to report?

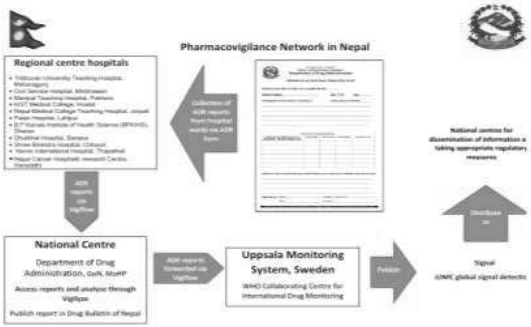
Reporting adverse events helps to:

- Identify new reactions
- Record the frequency with which they occur

- Evaluate factors that may increase the risk for ADRs/AEFIs
- Provide information to prescribers to prevent future ADRs

Reporting system of ADRs / Organogram of Nepal pharmacovigilance system

The regional pharmacovigilance centers operate under DDA (DDA being the National center for ADR monitoring). The regional centers report ADRs to the National center (DDA) via 'Vigiflow' (an online program) which are then forwarded to the Uppsala Monitoring Center (UMC) by the National Centre. The National database contains about 972 ADR reports so far.



Adverse drug reaction reporting form

Government of Nepal
Ministry of Health
Department of Drug Administration

Adverse Drug Reactions Reporting Form

Hospital record No. or chart No. or patient ID No. _____

Patient's Name: _____ **Sex: F/ M** **Age** _____

Description of the adverse reaction/s: **Onset date of reaction:** _____

_____

_____

_____

_____

_____

Information on Suspected Medicine				
Medicines (Brand & Generic Name, Manufacturer, Batch No., Dosage Form)	**Daily dosage**	**Date started**	**Date stopped**	**Reason for use**

Additional relevant information (eg. medical history, test result, known allergies, drug interactions)

_____

_____

_____

_____

Reported by: Name:_____ Hospital / Department:_____

Date: _____ Signature: _____

Please return this form to your local Drug Information Unit or Hospital Pharmacy. Thank you for taking the time to fill in this report!

Requirement to apply for the Regional Pharmacovigilance Center Membership

1. Request a letter from the head of the institution/Director of the hospital
2. Details of the Drug and therapeutics committee (structure with name of members)
3. Details of the Drug Information Center (Structure with the name of members and center's Phone/Email/Fax)
4. Details (Phone/Mob/Email) of the pharmacist responsible for reporting
5. Details of the responsible pharmacist handling the Pharmacovigilance center (focal person)

6. Send the letter with annexes to DDA, Bijulibazar or email at info@dda.gov.np

Medication error

A medication error has been defined by Bates et al as "any error occurring in the medication use process" and focuses on problems with the delivery of a medication to a patient. Importantly, although some medication errors cause harm to the patient, most do not.

According National Coordinating Council for Medication Error Reporting and Prevention Medication error is "Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer".

An unintended failure in the drug treatment process that leads to, or has the potential to lead to, harm to the patient. May be related to professional practice, health care products, procedures, and systems, including prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use.

Cause of medication error

- Characteristics of drugs
- Gaps in biomedical knowledge
- Difficulties in training
- Time constraints and interruptions
- Incomplete access to patient specific data
- Ambiguities in professional practice roles
- Economic barriers
- Multiple and changing formularies
- Patient non-adherence to therapy

Classification of medication error

The multiple steps in the medication chain, from when a drug is prescribed to when a patient receives the drug, leads to significant scope for error. However, significant improvements can be achieved from the prevention of medication errors, in terms of reduced patient morbidity, length of hospital stay, and healthcare costs. Medication errors may also be classified according to where they occur in the medication use cycle, i.e. at the stage of prescribing, dispensing, or administration of a drug.

a. Prescribing error

Prescribing errors may be defined as the incorrect drug selection for a patient.

Contributing factor of prescribing error are

- Prescribing of contraindicated drug.
- Prescribing of wrong dose.
- Lack of knowledge of the prescribed drugs, its recommended dose and patients details.
- Illegible handwriting.
- Inaccurate medication history taking.
- Confusion with the drug name.
- Inappropriate use of decimal points. For example, tenfold errors in dose have occurred as a result of the use of a trailing zero (e.g. 1·0).
- Use of abbreviations (e.g. AZT has led to confusion between zidovudine and azathioprine).
- Use of verbal orders

Approaches to reduce prescribing error

- Prescribers from all professions should be trained and proven competent.
- Technology should be used to guide the prescriber to the correct prescription for that patient.
- Prescriber must be clearly write the medicine.
- Appropriately use the decimal point.
- Generic prescription should be promoted.
- Don't use verbal orders.

b. Dispensing errors

Occur at any stage of the dispensing process, from the receipt of the prescription in the pharmacy to the supply of a dispensed medicine to the patient.

Contributing factor of dispensing error are:

- Drugs that have a similar name or appearance, for example Lasix (furosemide) and Losec (omeprazole) are proprietary name where confusion is created.
- Other examples of pairs of drugs with similar names where confusion occurs include amiloride 5 mg and amlodipine 5 mg tablets.
- Wrong dose
- Wrong drug
- Wrong patient and the use of computerized labelling has led to transposition and typing errors

Approaches to reducing dispensing errors include

- Ensuring a safe dispensing procedure.
- Separating drugs with a similar name or appearance.
- Keeping interruptions in the dispensing procedure to a minimum and maintaining the workload of the pharmacist at a safe and manageable level.
- Awareness of high risk drugs such as potassium chloride and cytotoxic agents.

- Introducing safe systematic procedures for dispensing medicines in the pharmacy.

c. Administration error

Administration errors occur when a discrepancy occurs between the drug received by the patient and the drug therapy intended by the prescriber. Drug administration has long been associated with one of the highest risk areas in nursing practice, with the 'five rights' (giving the right dose of the right drug to the right patient at the right time by the right route) being the cornerstone of nursing education.

Contributing factor for administration error

- Omission of medicine.
- Incorrect administration technique and the administration of incorrect or expired preparations.
- Lack of perceived risk.
- Poor role models.
- Lack of available technology.
- Lack of knowledge of the preparation or administration procedures and the complex design of equipment.
- Failure to check the patient's identity prior to administration
- Environmental factors such a noise, interruptions whilst undertaking a drug round, and poor lighting may also contribute to these errors.

Approaches to reduce drug administration errors include

- Checking the patient's identity.
- Ensuring that dosage calculations are checked independently by another health care professional before the drug is administered.
- Ensuring that the prescription, drug, and patient are in the same place in order that they may be checked against one another.
- Ensuring the medication is given at the correct time.
- Minimizing interruptions during drug rounds.