



**DOES THE PHARM.D COURSE HAVE CAREER IN CLINICAL, PHARMACEUTICAL,  
RESEARCH AND ACADEMICS? : REVIEW ON SCOPE AND OPPORTUNITIES**

**Pradeep Kumar Thakur<sup>\*1</sup>, Shiv Kumar<sup>2</sup>, Murali Krishna Kandukuri<sup>1</sup>, Binu K Mathew<sup>1</sup> and Sabbu Rahul<sup>1</sup>**

<sup>1</sup>Department of Pharmacy Practice, N.E.T. Pharmacy College, Raichur-584101, Karnataka, India.

<sup>2</sup>Asst. Professor, Department of Pharmacology, N.E.T. Pharmacy College, Raichur-584101, Karnataka, India.

**\*Corresponding Author: Dr. Pradeep Kumar Thakur**

Department of Pharmacy Practice, N.E.T. Pharmacy College, Raichur-584101, Karnataka, India.

Article Received on 14/08/2016

Article Revised on 05/09/2016

Article Accepted on 26/09/2016

**ABSTRACT**

Pharmacy: the art, practice, or profession of preparing, preserving, compounding, dispensing, monitoring and evaluation of medicinal drugs. Pharm.D (Doctor of Pharmacy) is six year professional master degree course in pharmacy. Pharmacists are the 3<sup>rd</sup> largest health care professionals in the world and the pharmacy profession has been evolving steadily over the last decade, due to increased patient demands for variety of clinical services. This review summarizes the scope and opportunities of Pharm.D graduates across a wide range of clinical, pharmaceutical, academia, research and disciplines. The study also explored suggestion to encourage Pharm.D graduates to face challenges and guide a path to get suitable job. All studies that discussed Pharm.D scope and opportunities were considered for inclusion. A computer search was conducted for relevant articles in medline, pubmed, springer, medscape, google scholar and National & International pharmacy journals. The review study concludes that, there is a huge need of Pharm.D graduates in developing Asian countries like India, Nepal, Bhutan, Bangladesh, in several sectors. However, Pharm.D graduates must be competitive, result oriented, qualified and highly skilled to get good opportunity. Policy maker, the government must encourage the scope and utilization of such manpower by updating the policies.

**KEYWORDS:** Academics, Hospital, Opportunity, Pharm.D Career, Pharmaceutical, Research, Scope.

**INTRODUCTION**

**Pharmacy:** the art, practice, or profession of preparing, preserving, compounding, dispensing, monitoring and evaluation of medicinal drugs.<sup>[1]</sup> The Pharm.D course (6 year professional degree program in pharmacy) was introduced by the Pharmacy Council of India (PCI) in 2008. The duration of the course is divided into two phases, the first five years are academic years where as sixth year involves posting in various units in the hospital.<sup>[2]</sup> The main objective of Pharm.D program is to improve patient care, to maximize the clinical effects of medicines, minimizing the risk of treatment-induced adverse events and the patient's compliance with therapy, trying to provide the best treatment alternative for the greatest number of patients.<sup>[2,3]</sup>

After completion of Pharm.D, students have to face interviews in several sectors where they might ask roles and responsibilities of Pharm.D graduates in clinical, pharmaceutical and research field and answer is a bit more complex. Since the course is recently introduced, the scope and opportunities are not clear and also highly controversial in developing Asian countries like India, Nepal, Bhutan, and Bangladesh. Although, to date there are no exact recognition for clinical pharmacist, but it is sure that one has the greatest and the brightest career

in future. On other side, simply passing Pharm.D degree is not enough to get good opportunity but as it is technical and professional degree, students must be highly competent and skilled.

Majority of the pharmacists, who are in pharmacy profession are job dissatisfied or under-utilized in health care system.<sup>[4,5]</sup> A nation-wide study, awareness is warranted to further enhance opportunity and job satisfaction. According to Pharmacy Council of India (PCI), the ratio of pharmacist to patient was 1:1856 and Nepal Pharmacy Council (NPC), the ratio of pharmacist to population was 1:50000.<sup>[6,7]</sup> This reveals a chronic shortage of clinical pharmacist in India and Nepal where there are huge drug related problems, irrational drug use and non-compliance to therapy among patients suffering from various chronic diseases.

Scope and opportunities of Pharm.D is quit varied. It is well developed in some countries while it is in infancy stage in others, especially developing Asian countries. Several studies have mentioned that, pharmacists are the 3<sup>rd</sup> largest health care professionals in the world and the pharmacy profession has been evolving steadily over the last decade, due to increased patient demands for variety of clinical services, thereby leading to an increase in

demand of the clinical pharmacists.<sup>[8]</sup> Today, the pharmacist had expanded their role from solely dispensing and manufacturing to pharmaceutical care by maximizing the benefits of the medication and its safety.<sup>[9]</sup> There is a strong demand for clinically trained individuals who also have formal research training to facilitate bench-to-bedside or translational research. Graduates with the Doctor of Pharmacy are very competitive for research positions in.<sup>[10]</sup>

- Academia
- Governmental agencies (e.g., National Institutes of Health, Food and Drug Administration, Centres for Disease Control and Prevention)

- Pharmaceutical industry
- Research Foundations.

The purpose of this review was to determine the level of scope and opportunities for Pharm.D in developing Asian countries like India, Nepal, Bhutan, Bangladesh. The study also explored suggestions to encourage the Pharm.D students to face challenges and guide a path that they get a suitable job and perform well. The ultimate goal is to increase concentration of recruiting organisations for selection of Pharm.D employee.

#### OBJECTIVES OF PHARM.D GRADUATES<sup>[2,11,12]</sup>

1. To provide patient care in cooperation with patients, prescribers, and other members of an inter-professional health care team based upon sound therapeutics principles and evidence-based data, taking into account relevant legal, ethical, social cultural, economic and professional issues, emerging technologies, and evolving biomedical, pharmaceutical, social, or behavioural or administrative, and clinical sciences that may impart therapeutic outcomes.
2. To manage and use resources of health care system, in co-operation with patients, prescribers and other health care providers and administrative and supportive personnels, to promote health; to provide, assess, and coordinate safe, accurate, and time sensitive medication distribution; and to improve therapeutic outcomes of medication use.
3. To promote health improvement, wellness, and disease prevention in co-operation with patients, communities, at-risk population and other members of an inter-professional team of health care providers.
4. To demonstrate skills in monitoring of the National Health Programmes and schemes oriented to provide preventive and promotive health care services to the community.
5. To develop leadership qualities to function effectively as a member of health care team organized to deliver the health and family welfare services in existing socio-economic, political and cultural environment.
6. To communicate effectively with patients and the community.

#### 1. SCOPE OF CLINICAL PHARMACIST IN HOSPITAL SETTING

The patient load on medical practitioners is very high irrespective of the practice setting. A busy practitioner may spend only around 5-10 minutes per patient. Due to crowded environment some doctors tend to write a prescriptions or "a pill for every ill" rather than evidence based medicine which may leads to unnecessary drug-related problems and antibiotic resistance. Hence pharmacists can play meaningful role as clinical pharmacist. Pharm.D graduates are expertise in the field and able to detect medication errors during prescribing, dispensing and administration. Thus they are having tremendous opportunities at various level of hospital.

##### Pharmaceutical Care Services

Pharmaceutical care is the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life. The goal of Pharmaceutical Care is to optimize the patient's health-related quality of life, and achieve positive clinical outcomes, within realistic economic expenditures. Pharmaceutical care services basically based on principal of SOAP notes stand for subjective and objective data collection, assessment and plan for therapy and quality of life.<sup>[11]</sup> Subjective findings include the chief complaints and history of present illness of patient, objective findings include laboratory data, medical and medication history, social history, physical findings, previous allergy, assessment is related to desired outcomes and

end points, drug related problems and to find out whether current therapy is relevant to standard therapy or not and planning is therapeutic selection, awareness and life style modification.

##### Pharmacovigilance Activities

According to WHO, Pharmacovigilance (PV or PhV) is the science and activities relating to the detection, assessment, understanding and prevention of adverse effects and other possible drug related problems.<sup>[13]</sup> Pharmacists use to identify ADRs during ward rounds, at the time of follow up or get informed by the other health care professionals and detect ADR by monitoring patients who are most susceptible to ADR, through routine drug therapy monitoring, by assessing the patients who have had previous history of adverse drug reaction to a drug. After detection of ADR, the pharmacists carry out the causality, severity and preventability assessments for the ADRs as per the different official scales.<sup>[14]</sup> On confirmatory result, clinical pharmacist are responsible to provide ADR alert card to the patient.

##### Adverse Events Following Immunisation (AEFI) reporting services

Pharm. D graduates can play a meaningful role in identifying and reporting AEFI. The WHO defines an AEFI as a medical incident that takes place after an immunisation, causes concern, and believed to be caused by immunisation.<sup>[15]</sup>

### Participation in Ward Rounds

Ward round is a visit made by a medical practitioner with a team of health care professionals, including nurse, pharmacist, medical students to bed side of patient to review and follow-up progress in their health. Clinical pharmacist helps to ensure safe, effective and economical use of drugs and promotes rational drug therapy.<sup>[12]</sup>

### Drug Therapy Review/Prescription Order Review

A definition of drug therapy review (DTR) is “a structured, critical examination of a patient’s medicines with the objective of reaching an agreement with the patient about treatment, optimising the impact of medicines, minimising the number of medication related problems and reducing waste”.<sup>[16]</sup> Clinical pharmacist reviews the prescriptions at out-patient department (OPD) and treatment chart in In-patient department (IPD), during or after completion of ward rounds. Medication review is increasingly recognised as a cornerstone of medicines management, preventing unnecessary ill health and avoiding waste. While reviewing prescription order, Pharmacists check medication duplication, interactions or incompatibilities along with these things. They ensure things like: cost effectiveness for drugs, ensuring that all necessary medications are ordered. Collectively, this is also called as management of medication (MOM) and medication therapy management (MTM).

### Drug Interaction Services

Pharmacist regularly monitors for potential drug-drug and drug-food interactions while reviewing patient drug therapy, particularly in the patients with multiple drug therapy, multiple disease state, especially pediatrics and geriatrics patients.<sup>[17]</sup> The pharmacist, along with the prescriber has a duty to ensure that patients are aware of the risk of side effects and a suitable course of action should they occur. With their detailed knowledge of medicine, pharmacists have the ability to relate unexpected symptoms experienced by patients to possible adverse effects of their drug therapy. Drug-drug interactions can result in unwanted side effects, reduce the effectiveness of concurrent medicine or possibly increase the action of a particular medicine which may be lethal. Thus, pharmacist has a major role to play in relation to prevention, detection, documentation and reporting such effects.<sup>[18]</sup> These documents are required to analyze the clinical pharmacy services. So that recurrence of the same interactions in future can be prevented.

### Patient Counselling Services

Patient education and counselling are an integral part of the health care process. This two-way flow of information is important to improve the quality of care, patient outcomes and to build patient-practitioner relationship.<sup>[19]</sup> The pharmacists make the patient understand about disease condition, drugs and further complication if not treated. The name and description of

the medication, dosage form, route of administration, duration of therapy, special directions, self- monitoring technique, refill information, actions are to be taken in the case of missed doses and storage techniques. The patient is also advised about life style modification which is beneficial to improve his condition. After counselling, pharmacists document the consultation by completing the medication counselling documentation form.<sup>[20]</sup>

### Drug Information Services

Drug information is a process of providing clinically relevant information on any aspect of drug use to nurses, physician, patient himself or other health care professionals. Pharmacists have unique range of knowledge and skills so that they critically analyse, synthesize, document and present the queries asked.<sup>[21]</sup> The centre receives queries via a drug information request form, or through telephone calls or by direct visits to the DIC, ward rounds, internet or by e-mail. After receiving the query, the pharmacist has to categorise the ultimate question, develop search strategy and conduct search referring to drug information sources available in the centre. These sources include primary (journals, bulletin, newsletters etc), secondary (Micromedex, electronic therapeutic guideline (eTG) etc.) and tertiary sources (Martindale, AHFS, BNF etc.).<sup>[22]</sup>

**Poisons Information Service:** Poison information is specialised area of drug information; aimed to aware about, prevent misuse of drugs, toxic substances or hazardous food. It is responsible for risk assessment, diagnosis, management and prevention of exposure of any poison.<sup>[21]</sup>

### Medication History Interview

A medication history interview is a detailed, accurate and complete account of all prescribed and non-prescribed medications that a patient had taken or is currently taking prior to a newly initiated institutionalized or ambulatory care. The goal of medication history interview is to obtain information on aspects of drug use that may assist in over all care of patient. Pharm.D graduates are expertise to screen, assess, compare, verify, appraise, examine drug exposure to the patient and documentation.<sup>[16]</sup>

### Pharmacist’s Intervention Services

The pharmacists can play key role in reducing the incidences of DRPs by making appropriate intervention at each stage and by working with other healthcare professionals. The most common routine interventions performed in the pharmacy included assuring orders, allergy checking and dose verification. Half of all respondents communicated at least 80% of interventions directly to prescribers, and about a third of all respondents said that pharmacists communicated interventions directly to prescribers more than 90% of the time. Ninety four percent of respondents felt that the

medical staff, as a whole, responded well to pharmacists' interventions.<sup>[23]</sup>

### Patient Referral Documentation Services

The purpose of complete and accurate patient record documentation is to foster quality and continuity of care. It creates a means of communication between providers and between providers and members about health status, preventive health services, treatment, planning, and delivery of care. Safe, reliable, healthcare depends on access to, and the use of, information that is accurate, valid, reliable, timely, relevant, legible and complete. Pharm.D graduates are responsible for a timely, safe, effective, equitable and patient-centred referral process documentation into relevant database system which depends critically on the quality of the information which is provided in this referral document.<sup>[24, 25]</sup>

**Clinical Research:** The role of the clinical pharmacist as principal investigator (PI) was first described in a commentary by the American College of Clinical Pharmacy (ACCP) in 2000. From 2000 to the present, the number of individuals with the doctor of pharmacy (Pharm.D) as a terminal degree who have served as PIs has grown.<sup>[26]</sup> Clinical research is a branch of medical science that determines the safety and effectiveness of medications, devices, diagnostic products and treatment regimens intended for human use.<sup>[27]</sup> The clinical pharmacist has been accepted as a Principal investigator by many granting regulatory agencies and the pharmaceutical industry for several years. Further efforts are needed to ensure that the profession of pharmacy understands the need to continue the important contributions to training, educating, and expanding the efforts of those engaged in research. Clinical pharmacists should continue their research development to ensure the provision of optimal, evidenced-based medication therapy based on sound scientific principles and research data. Finally, a reliable database should be established if the profession is serious about tracking statistics relative to clinical pharmacist funding, publications, and roles as PIs or sub-investigators in basic, clinical, and translational research.<sup>[26]</sup>

### Pharmacoeconomics

Pharmacoeconomics refers to the scientific and systemic discipline that compares the value of one pharmaceutical drug or drug therapy to another. It is a sub-discipline of Health economics. A Pharmacoeconomics study evaluates the cost (expressed in monetary terms) and effects (expressed in terms of monetary value, efficacy or enhanced quality of life) of a pharmaceutical product.<sup>[20]</sup> Pharm.D graduates are highly capable to collect sufficient data, critically analyse all the process of Pharmacoeconomics.

### Vaccination and Immunization

A number of countries, including Portugal, Ireland, the US, Australia and the UK, have given pharmacists a hands-on role in administering vaccines, resulting in

higher levels of vaccine coverage.<sup>[15]</sup> Pharmacists can play an important role in disease prevention by advocating and administering immunizations. Pharmacists must understand the legal and professional mechanisms by which authorization to administer vaccines are granted, as well as the additional responsibilities and considerations that accompany this expanded role.<sup>[21]</sup> Pharmacists who do not administer vaccines can promote immunization through six types of activities: (1) history and screening, (2) patient counselling, (3) documentation, (4) formulary management, (5) administrative measures, and (6) public education. These promotional activities can also be integrated into or accompany a pharmacy-based immunization program.<sup>[28, 29]</sup>

### Therapeutic Drug Monitoring (TDM)

Therapeutic drug monitoring (TDM) refers to the measurement and interpretation of principally blood plasma drug concentration measurements with the purpose of optimising a patient's drug therapy and clinical outcome while minimising the risk of drug-induced toxicity. Clinical pharmacokinetic monitoring is essential to achieving positive outcomes for these patients across the continuum of care and in all practice settings of health systems. Examples of such outcomes include decreased mortality, decreased length of treatment, decreased length of hospital stay, decreased morbidity (either improved symptoms of disease or improved recuperation), and decreased adverse effects from drug therapy.<sup>[30]</sup>

### Total Parenteral Nutrition (TPN) and IV admixture

**Services:** Managing infants, children and adolescents, on total parenteral nutrition (TPN) is a challenge. Nutritional requirements differ according to age, and unlike adults, endogenous nutrient reserves are limited in the young paediatric population and can be rapidly depleted by the metabolic stresses from surgical procedures or disease. A lack of adequate nutrition can have significant long term and short-term consequences such as immunosuppression, impaired tissue and muscle function, reduced respiratory and cardiac reserve, and impaired growth, particularly in very-low-birth weight infants.<sup>[31]</sup> Provide patients with safe and quality total parenteral nutrition as prescribed, free of microbial or particulate contamination, unaltered by incompatibilities of interacting additives, and verified by clinical pharmacists.

### Pharmacy Intravenous Admixture Service (PIVAS):

Pharmacy Intravenous Admixture Service (PIVAS) involves the preparation of individualized drug doses in syringes or infusion bags in the pharmacy aseptic unit or respective wards. PIVAS aims not only to reduce nursing time on drug reconstitution and reduce wastage of drugs through vial sharing, but also reduce medication errors and enhance safe and effective use of drugs.<sup>[31]</sup>

**Geriatric Pharmacy:** Several studies stated that geriatric population have been more likely to consume more than half of all health care resources. Careers in this field will serve the needs of this growing population segment.<sup>[27]</sup> Geriatrics is a sub-specialty of internal medicine and family medicine that focuses on health care of elderly people. It aims to promote health by counselling them regarding medications and monitoring medication adherence thereby preventing and treating diseases and disabilities in older adults.

**Managed Care:** Broadly stated, managed care is planned, comprehensive and integrated provision of health care in a cost-effective manner that emphasizes preventive care. Optimization of drug therapy, development of drug formularies, evaluation of therapeutic protocols, patient consultation, and reduction in unnecessary doctor visits and hospitalization are all responsibilities of pharmacists who practice in the managed-care environment.<sup>[27]</sup>

**Oncology Services:** Clinical oncology pharmacists provide therapeutic information about chemotherapy, including expected clinical outcomes, potential adverse effects and its management. They also identify and solve patients' drug-related problems through the multi-disciplinary team so as to improve the quality of patient care.<sup>[31]</sup>

**Pharmacogenomics:** Pharmacogenomics is the study of how an individual's genetic makeup affects the body's response to particular medicines. Pharmacogenomics provides an opportunity to individualise drug therapy to maximise efficacy and minimise toxicity, based on patients' genetic data. Pharmacists' responsibilities include advocating for pharmacogenomic testing, interpretation of result and clinical guidance, optimizing medication therapy, educating, supporting and participating in research.<sup>[32]</sup>

**Hospital Committees:** Several hospital committees such as hospital ethics committee, medication record, pharmacy and therapeutic committee, infection control committee etc., providing job prospectus for clinical pharmacist. Clinical pharmacists are able to conduct,

participate, organize, education, implementation, documentation of such committee. Hospital/clinical ethics committees (HEC) are chiefly designed to ensure good healthcare decision-making practices and to assist patients and healthcare professionals, but without interfering in the patient-physician relationship. The HEC is responsible to permit any type of research and development work in the hospital.<sup>[33]</sup> The pharmacy and therapeutics committee (PTC) is a policy forming and recommending body to the medical staff and the administration of hospital on matters related to therapeutic use of drugs. The PTC committee is responsible for managing the formulary system, medication-use evaluation (MUE), adverse-drug-event monitoring and reporting, medication-error prevention, and development of clinical care plans and guidelines.<sup>[33,34]</sup> A formulary is a continually updated list of medications and related information, representing the clinical judgment of physicians, pharmacists, and other experts in the diagnosis, prophylaxis, or treatment of disease and promotion of health. A formulary includes, but is not limited to, a list of medications and medication-associated products or devices, medication-use policies, important ancillary drug information, decision-support tools, and organizational guidelines.<sup>[35]</sup> Infection Control committee develops health care facilities and implements specific policies and procedures to prevent the spread of infections among health care staff and patients.

**Hospital Pharmacy:** A hospital pharmacy is concerned with pharmacy service to all types of hospital and differs considerably from a community pharmacy. The role of hospital pharmacist includes appropriate procurement, proper inventory control, storage, dispensing, refill, formulary maintenance and documentation of medicines in both In-patient and Out-patient pharmacy. They are also responsible for floor stock or bed side drug distribution and their accountability.

**Emerging Area:** Clinical pharmacists are having tremendous scope in specializes areas like Diabetes centre, Hypertension centre, Neoplastic centre, chronopharmacy, anticoagulant centre etc.

#### Roles and Responsibilities as Clinical Pharmacist

- To provide expert advice on either patient's therapy management or hospital management
- Patient medication history interview
- Out-patient medication order review
- Patient counselling regarding drugs, disease and life style modification
- Adverse drug reaction monitoring and reporting
- Drug interaction monitoring
- Therapeutic drug monitoring and drug therapy review
- Attending ward rounds
- Providing drug information queries requested either by patient or physician
- Liaising with other departments
- Developing and maintaining professional guidelines
- Educating medical and nursing staff, students and others health care professionals
- Demonstrating and acquiring leadership qualities

- Participation and conduct of research
- Participate, organise, conduct, education and documentation of different hospital committee.
- Participation and conduct of awareness programme, collaboration with other organisations like INGO, WHO, UNICEF etc.
- Preparation and issue of hospital pharmacy formulary.

## 2. SCOPE IN COMMUNITY PHARMACY

### Community Pharmacy

Recent research has shown that consumers very often self-select complementary medicines. The information which guides their selection comes mostly from friends, family member, the internet, general practitioners and naturopaths. Nevertheless, the majority of consumers expect pharmacists to be knowledgeable about complementary medicines.<sup>[36]</sup>

A community pharmacy is a community-based pharmacy where pharmacists are able to counsel the patients about their drugs and diseases, identify drug-related problems and case management. The main responsibilities of a community pharmacy include appropriate procurement, storage, dispensing, and documentation of medicines.<sup>[37]</sup>

Community pharmacists are key person selling OTC medications, minimizing drug abuse, preventing antibiotic resistance, increasing drug availability at backward community, reducing morbidity and mortality as well as providing first aid management co-corporation with other health care professionals, nurse, and health

assistants. Some of the jobs in this field include pharmacy technicians, pharmacy in-charge and pharmacy managers.

In compliance with the vision of the community pharmacy section of the International Pharmaceutical Federation, community pharmacists should<sup>[37]</sup>

- be experts in pharmaceutical care, pharmacotherapy, and health promotion.
- be professional communicators with patients, other healthcare providers, and decision makers.
- deliver good quality in products, services, and communication.
- document their actions and make descriptions and publications.

The above mentioned requirement is being fulfilled by the Pharm.D course. Pharm.D graduates have opportunities to be entrepreneurs by starting their own community pharmacy.

### Key Responsibilities as Community Pharmacist<sup>[38]</sup>

- Managing medication-related information while promoting integration, interoperability, and information exchange.
- Delivering medication-related information and knowledge throughout the clinical knowledge lifecycle, from the point of knowledge generation through cataloging, embedding knowledge into the workflow, and measuring the usage and effectiveness of that knowledge.
- Developing point-of-business analytic solutions for improving decision-making.
- Applying user experiences, research, and theoretical informatics principles to improve clinical practice and usability.
- Leading and participating in the procurement, development, implementation, customization, management, evaluation, and continuous improvement of clinical information systems.
- Advice patients on how their medicines are to be taken or used in the safest and most effective way in the treatment of common ailments.
- Isolation and first professional care taker of patients with chronic illness, diabetes, hypertension, cancer, communicable diseases (CDs) and sexually transmitting diseases (STDs).

**Home Health Care:** Home Care, (also referred to as domiciliary care or social care), is health care or supportive care provided in the patient's home by healthcare professionals (often referred to as home health care or formal care). Often, the term home health care is used to distinguish non-medical care or custodial care, which is care that is provided by persons who are not nurses, doctors, or other licensed medical personnel, as opposed to home health care that is provided by licensed personnel.<sup>[20,37]</sup>

**Pharmacy Business:** In simple, establishment of the "drugstore" either retail or wholesale is a business. During the latter part of the twentieth century, greater concerns about the role of business in the practice of pharmacy became evident. It was the likely result of a profession that had become more specialized owing to the complexity of the products and services it provided

thus community pharmacies are on the one hand businesses and another as providers of a range of professional health services. There is no doubt; pharmacists are responsible for accounting, finance, human resource management, operations management, and marketing.<sup>[39]</sup>

### The most important misconceptions happening during pharma business are the following

- The practice of pharmacy is ethically inconsistent with good business. This may be due to high-pressure salespeople, innocuous advertisements, and sale of products of poor quality.
- In business, quality of care is secondary to generating profit.
- Business is not a profession guided by the same types of ethical standards of practice that apply to pharmacy.
- A good pharmacist is one who is a "clinical purist."

### Pharmacoepidemiological Research

Being as researcher, pharmacists are capable for doing project related with drugs and diseases exposure on community population. They are expertise in the field of planning, designing, data collection, data interpretation of the study. Data suggesting that pharmacist are first informer to agency, government regarding immersing infections, lucrative promotion of health related policy and first care taker for patients at villages.

### Medical Campaign Participation

Pharmacists can actively participate in varieties of medical campaign at community level collaboration with teaching or governmental hospital or non-governmental organisation like NGO, UNICEF etc. They can organise, conduct and operate the programme for example, screening test, drug distribution, awareness regarding drugs and diseases, communicable diseases, sexually transmitting diseases, complications of diabetes, hypertension etc.

### Vaccination and Immunisation

Pharmacists are having specialized knowledge on vaccination and immunization, their dosing schedule, route of administration, dose, side effects and complications. Hence they can effectively participate and conduct such programme globally. (See previous section)

### First-Aid services

The clinical pharmacist receives requests from members of the public for advice on a variety of symptoms and, when indicated, refers the inquiries to a medical practitioner. If the symptoms relate to a self-limiting minor ailment, they can supply a non-prescription medicine, with advice to consult a medical practitioner if the symptoms persist for more than a few days. Alternatively, the clinical pharmacist may give advice without supplying medicine.<sup>[40]</sup>

### Family Planning Services

Pharmacies also play a role in other reproductive health services, providing referrals for clinical family planning methods, serving the best devices, advice on pregnancy, and treatment or referral for STD/CDs related symptoms.

### Education and Training

Beyond the professional community pharmacy job, pharmacist can execute education and training programme especially to geriatrics, paediatric, teen age or pregnancy population via different health related clubs. This can be considered as part time leadership job for a community pharmacist.

## 3. SCOPE IN PHARMACEUTICAL INDUSTRY

The prime (No.1) sectors which need the service of Pharm.D are the pharmaceutical industries.<sup>[41]</sup> The government's drug policies are mainly aimed at the pharmaceutical industries rather than at the patient. Pharmaceuticals manufacture medicines and they need the professionals first than any other sector. Then the

second priority comes to the hospitals of pharmacies where it is used or distributed.<sup>[37]</sup> The demand of pharmacists is further growing with the growth of the industry within the country and outsourcing from abroad. Among the biggest factors fuelling the growth are contract research for pharma R&D and contract manufacturing for global pharma companies.

Pharmaceutical company consists of several departments, more importantly are production, quality assurance (QA), quality control (QC) and research and development (R&D). Basically, Pharm.D graduates are able to perform most of responsibilities which is already implemented in production and QC. However new innovations are challenging and hence Pharm.D graduates may not needed. The departments of choice are QA and R&D. Clinical pharmacists contribute to research, clinical trials and their expertise in quality assurance, regulatory affair, labelling and design, medical writing as key responsibilities.<sup>[42]</sup> The numerous and diverse career options available to Pharm.D graduates are

### Quality Assurance (QA)

Quality Assurance Department (QAD) was formed to ensure compliance with the quality policy in every aspect of production and quality control. The QA department confirms that the products are designed and developed according to the GMP and GLP practices to assure quality of products until its shelf life.<sup>[43,44]</sup> Two principal included in QA are; "Fit for purpose" (the product should be suitable for the intended purpose); and "right first time" (mistakes should be eliminated).<sup>[45]</sup>

### Research and Development (R&D)

The phrase research and development refers to the "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications".<sup>[37]</sup> They may design or conduct clinical drug trials and help to develop new drugs. They may also help to establish safety regulations and ensure quality control for drugs.

Clinical research is a branch of medical science that determines the safety and effectiveness of medications, devices, diagnostic products and treatment regimens intended for human use.

Senior scientists in clinical research and drug discovery typically are PhDs. But associate positions and some management roles are open to Pharm.D graduates, typically with some research experience. Clinical research associates help to conduct the investigational studies required for a drug to gain FDA approval, design and process case report forms, and write and process study protocols.<sup>[46]</sup> The focus of clinical research is wide enough to include important items such as data management, medical writing, regulatory consultation, and biostatistics.

### Contract Research Organizations

Contract research organizations are private, independent companies that assist and support investigators and industry in the research process. The CRO may be involved in various aspects of the research process including protocol development, protocol research, pharmacokinetic sample processing and analysis, data analysis, and preparation of regulatory reports.<sup>[47]</sup>

### Clinical Trials and Post-marketing Surveillance

The pharmacist has the knowledge of drugs and health care provision required to facilitate collaboration between companies, health professionals and governments in relation to clinical trials and surveillance.<sup>[42]</sup>

### Sales and Marketing

The pharmacist, whose professional ethics demand a concern for the interest of patients, can make a contribution to proper marketing practices related to health care and to the provision of appropriate information to health professionals and the public.<sup>[42]</sup>

### Management

The inclusion of pharmacists in all levels of management promotes an ethical approach within management policies.

### Medical Writing

Medical Writing: Is the activity of producing scientific documentation by a specialized writer. The medical writer typically is not one of the scientists or doctors who performed the research. A medical writer, working with doctors, scientists, and other subject matter experts, creates documents that effectively and clearly describe research results, product use and other medical information. The medical writer also makes sure the documents comply with regulatory, journal, or other guidelines in terms of content, format and structure.<sup>[37]</sup>

These professionals write information related to healthcare, the medical profession and medical science in general for industry professionals, as well as general audiences. Not everyone has the skill set required to do this type of work and Pharm.D graduates are ideally suited for these lucrative jobs.<sup>[48]</sup>

### Regulatory Affairs

Regulatory Affairs (RA), also called Government Affairs, is a profession within regulated industries, such as pharmaceuticals and medical devices. Regulatory affairs specialists help ensure that drugs under development meet the complex web of federal and state regulations that protect the public. Pharmacists in this role work with safety data and produce communications such as product labels for patients and healthcare providers.<sup>[46]</sup>

### Regulatory Affairs professionals usually have responsibility for the following general areas

- Ensuring that their companies comply with all of the regulations and laws pertaining to their business.
- Working with federal, state, and local regulatory agencies and personnel on specific issues affecting their business.
- Advising their companies on the regulatory aspects and climate that would affect proposed activities.

### Patent Applications and Drug Registration

The pharmacist is ideally qualified to understand and collate the diverse information required for patent and authorization submissions.<sup>[42]</sup>

<b>Top</b>	<b>Level</b>	<b>Medical</b>
<b>Representatives/Manager/Marketing Executives</b>		

Pharmacists are able to prepare product formulary, patient information leaflets (PILs) required for promote sales. They are also highly skilled to counsel a physician regarding pharmacokinetics and pharmacodynamics of the drugs as well monitor drug utilisation and suggest technical information on high utilizing drugs to company for future manufacture.

### Pharmacovigilance Centre

Documentation, analysis and prevention of ADRs are needed for epidemiological studies and patient safety. Presently, PV centre is mandatory for all pharmaceutical and some are recruiting peoples in pharmacovigilance. Skills needed to work in the area of pharmacovigilance are: Sound knowledge of pharmacology and ADRs, laboratory results, clinical research etc. (See previous section)

### Drug information and consumer complaints

The pharmacist has the knowledge and expertise to provide detailed information on medicines to members of the health professions and the public. Also, pharmacists provide an information service within the company and actively synthesize data to resolve consumer complaints.<sup>[42]</sup>

### Drug safety training

Pharmacists may be called on to review adverse effects revealed in clinical studies, work with databases of study results and communicate safety information to a pharmaceutical firm's R&D department.

### Education and Training

Offering a complex array of products, drug companies face a daunting task when it comes to educating their own staffs, the healthcare community at large and the public. Pharm.D graduates can play meaningful role in implementation of cGMP guidelines by education and training. The major criteria for education are safety handling of drug, cross contamination, environment sanitation, biological hazards, line clearance etc.



**Roles and Responsibilities as an Industrial Pharmacist**

- Quality assurance responsibilities
- R&D responsibilities
- cGMP implementation
- Product promotional programme
- Clinical trials participation
- Routine Health check-up programme participation
- Pharmacy database operation
- Drug distribution campaign
- New innovation approach and implementation
- Regulatory affair, validation and implementation
- First-Aid, Medical information department
- SOP preparation and presentation
- Labelling and packaging design
- Black label analysis and summarization
- Patient Information Leaflet (PILs) design
- Pharmaceutical News letter
- Pharmacovigilance and Consumer complaint's centre
- High movable drug & their combinations list
- Fixation of drug combinations
- Product formulary
- Conduct of meeting and documentation
- Education and training
- Documentation

**4. SCOPE IN ACADEMICS**

Currently, nearly 1500 pharmacy schools in India offer a variety of pharmacy degrees like diploma in pharmacy (D.Pharm), bachelor in pharmacy (B.Pharm), master in pharmacy (M. Pharm) and doctor of pharmacy (Pharm.D).<sup>[4, 49]</sup> Numerous Pharm.D colleges are creating a shortage of qualified staff in the educational institutions, in-order to fill the shortage of pharmacy faculty positions there is necessary to motivate Pharm.D students to get job prospectus in academics at Diploma/Degree/Postgraduates pharmacy institute, as Associate professor, Professor, Head of the department, Principal or Director with suitable experience.<sup>[50]</sup>

As Pharm.D are expertise in subjects of pharmacology, patho-physiology, clinical toxicology, pharmacotherapeutics, clinical, community & hospital pharmacy, they can contribute their knowledge and skills to these related faculty. In developing Asian countries like India and Nepal, Pharm.Ds are also seen actively engaging with other faculties of short duration course such as nursing, laboratory assistant and technician, health assistant (HA), community medicine assistant (CMA), auxiliary nurse midwifery (ANM), and even basic pharmacology and pharmaceuticals for MBBS. Medicinal chemistry and others cannot be separated from their credit.

**Expectation from Pharm.D**<sup>[51,52]</sup>

- All the graduates are expected to be experts in their pharmacy teaching field by engaging in publications of their scholarly work and also participate in service activities.
- They are expected to be with updated knowledge and accurate in their respective subjects and should be able to

communicate with the students in understandable manner and has to be accessible to students whenever necessary.

- They have to maintain both professional and ethical behaviour with fellow faculty members.
- Mutual co-ordination has to be maintained among colleagues and confidentiality has to be maintained in matters concerned with students and faculty.
- They have to work collectively with management for the progress and development of institution.
- They should have passion of teaching.

**Benefits in academia career**<sup>[51]</sup>

- Develop an identity within speciality and enhance career by working in collaboration with other healthcare professionals.
- An opportunity to contribute to scientific and clinical knowledge.
- Enhance their own knowledge by being up to date in the field of pharmacy.
- Pharmacy Practice faculty are also called as Educators, Practitioners and Clinical Scientists because in addition to their work in teaching and research they also have main responsibility for patient care.

**5. SCOPE IN RESEARCH FOUNDATION (As a CRA)**

Apart from hospital, pharmaceutical and community, the Pharm.D graduates are highly qualified to perform research work as clinical research associate in non-government health related organisation such as NGO, INGO, UNICEF, WHO etc.

Research is critical to the advancement of pharmacy practice. The need for pharmacist researchers who possess both clinical knowledge and biomedical research skills has long been recognized. A variety of career pathways are available for individuals entering the profession of pharmacy that allow them to embark on a career in research. However, many students and graduates of schools or colleges of pharmacy are unfamiliar with the research opportunities that exist. To have a successful research career, acquisition of specific characteristics and skills are important. Self-motivation, attention to detail, excellent time-management skills, strong communication skills, and an ability to work independently are important attributes. Other attributes of successful researchers include creativity, curiosity, patience, and a passion to search for new knowledge.<sup>[53]</sup>

### OTHER OPPORTUNITIES

Pharmacists can also work as locums and in fields such as the military, police service especially narcotic department, politics and law, journalism, pharmaceutical policy at local, state and national government levels and in rural and remote areas, and even abroad.

### REQUIREMENTS FOR IDEAL PHARM.D GRADUATES

- Practically skilled and trained.
- Select job of own interest or expertise field.
- Self confidence and believe in own capabilities.
- Think high and have only positive thoughts and can automatically go high.
- Make a network of innovators and a network of users.
- Attend national and international conferences, seminars, workshop, continuing educational programme.
- Development of writing skills as well as communication skills.
- Work hard and develop analytical thinking and result oriented vision.

### SUGGESTIONS FOR REGULATORY AUTHORITY TO PROMOTE/UPLIFT PHARMACY PROFESSION

- Provision of hiring of pharmacists should be considered in the government policies.
- Pharm.D graduates should be placed in hospital, clinical and community settings.
- Pharmacy degree and national pharmacy licensure should be considered essential in order to acquire procure registration.
- Pay scale of pharmacists should be determined on both qualification and experience.
- Pharm.D graduates should be given the right to prescribe medicines alongside physicians as well as community area out of reach of physician.
- The policy makers should consider the results and apply the concepts to raise opportunity and employee satisfaction at their respective workplace.
- Scope, role and responsibilities of pharmacist in different area should be clarified.

- Availability of jobs in hospital, pharmaceutical, research, community and academics and acceptance by medical and paramedical staff in clinical settings.

### CONCLUSION

The review study concludes that, there is a huge need of Pharm.D graduates in developing Asian countries like India, Nepal, Bhutan, Bangladesh, in several sectors. One side Pharm.D graduates must be competitive, result oriented, qualified and highly skilled to get good opportunity. Pharmacist should identify area of expertise/interest in which they perform well. On another side, Regulatory frame work does not recognise the need of clinical pharmacist at the national level. This may be due to the lack of policies or inappropriate role of regulatory authorities. This may be also the major reason of lack of opportunity and dissatisfaction among pharmacist. The hospital management has no any standard criteria for pharmacy practice so the clinical pharmacy is the least priority for the hospital management as there is no supervision and monitoring of the practice by authority. Hence, policy maker, the government must encourage the scope and utilization of such manpower by updating the policies.

### ABBREVIATION

- DTR : Drug Therapy Review  
 DRP : Drug Related Problem  
 Pharm.D: Doctor of Pharmacy  
 PCI : Pharmacy Council of India  
 CRA : Clinical Research Associate  
 IPA : Indian Pharmaceutical Association  
 NPC : Nepal Pharmacy Council  
 PI : Principal Investigator  
 PV : Pharmacovigilance  
 MOM : Management of Medicine  
 MTM : Medication Therapy management

### REFERENCE

1. Sheri LK, Oseph B. What is pharmacy research?. *Can J Hosp Pharm.* 2011; 64(2): 154-155.
2. Pharm.D. Regulations 2008. Pharmacy Council of India. Available at: <http://pci.nic.in/PDF-Files/PharmD-Revised-A.pdf>.
3. Srikanth BA, Ahmad A, Reddy RK, Balkrishnan R, Nagappa AN. Acceptance of doctor of pharmacy in India: A survey based study. *Arch Pharm Pract* 2013; 4: 93-97.
4. Ahmad A, Khan MU, Elkalmi RM, Jamshed SQ, Nagappa AN, Patel I, Balkrishnan R. Job satisfaction among Indian pharmacists: an exploration of affecting variables and suggestions for improvement in pharmacist role. *Ind J Pharm Edu Res.* 2016; 50(1): 9-16.
5. Jose J, Laxman KT, Rao GMP. Career satisfaction among Indian pharmacists. *J Pharm Prac Res.* 2005; 35(4): 333.
6. Jain V, Priya R, Shubhi R, Preeti S, Ashuthosh P, Yashumati R. Evaluation of job satisfaction and

- social identity of rural Indian pharmacists. *Ind J Pharm Prac.* 2013; 6(1): 47-58.
7. NHSSP. Human Resources for Health (HRH) Country Profile for Nepal 2012. Available at: [http://www.nhssp.org.np/human\\_resources/HRH%20profile%20\(QA\).pdf](http://www.nhssp.org.np/human_resources/HRH%20profile%20(QA).pdf)
  8. Nicola H, Anderson C. The global pharmacy work force: Systematic review of the literature. *Hum Resource Health* 2009; 7(48): 1478-4491.
  9. Ahmad A, Atique S, Balkrishnan R, Patel I. Pharmacy profession in India: Current scenario and Recommendations. *Ind J Pharm Edu Res.* 2014; 48(3): 1-4.
  10. Career opportunity of doctor of pharmacy. Available at: <http://pharmacy.ufl.edu/files/2010/05/PharmDPH D.pdf>
  11. American Society of Hospital Pharmacists. ASHP statement on pharmaceutical care. *Am J Hosp Pharm.* 1993; 50: 1720-3.
  12. UK Clinical Pharmacy Association. Statement on Pharmaceutical Care. *The Pharm J.* 1996; 256: 345-46.
  13. World Health Organization. Pharmacovigilance; Essential Medicines and Health Products. Available at: [http://www.who.int/medicines/areas/quality\\_safety/safety\\_efficacy/pharmvigi/en](http://www.who.int/medicines/areas/quality_safety/safety_efficacy/pharmvigi/en).
  14. Naranjo CA, Busto U, Sellers EM, Sandor P, Ruiz I, Roberts EA. A method for estimating the probability of adverse drug reactions. *Clin Pharmacol Ther.* 1991; 30: 239-245.
  15. Pharmacists can play key role in immunisation. Available at: <http://www.vaccinestoday.eu/vaccines/pharmacists-can-play-key-role-in-immunisation/>.
  16. Rajanandh MG. Medication history interview and communication skills. Available at [http://www.srmuniv.ac.in/sites/default/files/downloads/Medication\\_history\\_interview.pdf](http://www.srmuniv.ac.in/sites/default/files/downloads/Medication_history_interview.pdf).
  17. Shaw J, Seal R, Pilling M. Room for Review: A guide to medication review. 1<sup>st</sup> Ed. London: Medicines Partnership Lambeth High Street; 2002.
  18. Palanisamy S, Arul Kumaran KS, Rajasekaran A. A study on assessment, monitoring, documentation and reporting of adverse drug reactions at a multi-specialty tertiary care teaching hospital in South India. *Int J PharmTech Res.* 2009; 4: 1519-22.
  19. Ginimathad KMV. A pocket book of patient counselling. India: Chittara publication; 2011.
  20. Krishna SG. Doctor of Pharmacy: A New Born and Emerging Course in India. *Res Pharm Health Sci.* 2015; 1(1): 35-41.
  21. Nagari BG. Clinical pharmacy in India. In: Parthasarathi G. *Textbook of Clinical Pharmacy Practice.* 2<sup>nd</sup> ed. India: University press private limited, 2012; 1-8.
  22. Surulivel RM, Fayazkhan M, Kishore GS, Leelavathi DA, Padma GMR. Evaluation of Drug Information Service provided by Clinical pharmacy department based on provider and enquirer perspective. *Indian J Pharm Pract.* 2008; 1(1): 37-44.
  23. Pharmacy interventions can reduce clinical errors - Part I of findings from ISMP survey 2002. Available at: [HTTPS://WWW.ISMP.ORG/NEWSLETTERS/ACUTECARE/ARTICLES/20020626.ASP](https://www.ismp.org/newsletters/acutecare/articles/20020626.asp)
  24. Health Information and Quality Authority. Report and Recommendations on Patient Referrals from General Practice to Outpatient and Radiology Services 2011. Available at: [file:///C:/Users/HP/Downloads/gp\\_referral\\_report.pdf](file:///C:/Users/HP/Downloads/gp_referral_report.pdf).
  25. Shargel L, Alen HM, Peggy CY. *Comprehensive pharmacy review: Pharmaceutical care and disease state management.* 7th Ed. Lippincott; 465-73.
  26. American college of clinical pharmacy. The clinical pharmacist as a principal investigator: a commentary. *Pharmacotherapy* 2000; 20: 599-608. Update 2010; 485e-489e.
  27. Pharm.D Career Opportunities. Available at: [https://pharmacyschool.usc.edu/programs/pharmd/p\\_harmdprogram/career/](https://pharmacyschool.usc.edu/programs/pharmd/p_harmdprogram/career/)
  28. Nichol KL, Lind A, Margolis KL, Murdoch M, McFadden R, Hauge M, Magnan S, Drake M. The effectiveness of vaccination against influenza in healthy, working adults. *N Engl J Med.* 1995; 333: 889-93.
  29. Grabenstein JD. Immunizations: what's a health system pharmacy to do? Part 2. *Hosp Pharm.* 1998; 33: 870-2, 876-80.
  30. American Society of Health-System Pharmacists. ASHP statement on the pharmacist's role in clinical pharmacokinetic monitoring. *Am J Health-Syst Pharm.* 1998; 55: 1726-7.
  31. Seres D, Sacks GS, Pedersen CA, Canada TW, Johnson D, Kumpf V, Guenter P, Petersen C, Mirtallo J. Parenteral nutrition safe practices: results of the 2003 ASPEN survey. *J Parenter Enteral Nutr* 2006; 30: 259-65.
  32. American Society of Health-System Pharmacists. ASHP statement on the pharmacist's role in clinical pharmacogenomics. *Am J Health-Syst Pharm.* 2015; 72: 579-81.
  33. Muge D. What are Hospital/Clinical Ethics Committees? *Acta Medica* 2013; 2: 38-44.
  34. World Health Organization. Drug and therapeutics committees: A practical guide. Department of Essential Drugs and Medicines Policy Geneva. Switzerland; 2004.
  35. American Society of Health-System Pharmacists. ASHP guidelines on the pharmacy and therapeutics committee and the formulary system. *Am J Health-Syst Pharm.* 2008; 65: 1272-83.
  36. Chapman C. The professional pharmacist and the pharmacy business. *Aust Prescr* 2011; 34: 34-5.
  37. Pharm. D Career opportunity. Available at: <https://pharmawiki.in/scope-pharmd-india/>
  38. American Society of Health-System Pharmacists. Statement on the Pharmacist's Role in Clinical Informatics. *Am J Health-Syst Pharm.* 2015; 12-15.

39. Glen T, Godwin W. Business planning for pharmacy programs. In: Shane P, David P. Pharmacy management. 2<sup>nd</sup> Ed. Newyork: Mc Graw Hill; 2009; 47-61.
40. World Health Organization. The Role of the Pharmacist in the Health Care System. Available at: <http://apps.who.int/medicinedocs/en/d/Jh2995e/1.6.2.html>
41. Scope of Pharm.D in India. Available at: <https://pharmawiki.in/scope-pharmd-india/>
42. The role of the pharmacist: quality pharmaceutical services - benefits for governments and the public. Available at: <http://apps.who.int/medicinedocs/en/d/Jh2995e/1.6.4.html>
43. Manghani K. Quality assurance: Importance of systems and standard operating procedures. *Perspect Clin Res.* 2011; 2(1): 34–37.
44. Mangino J. Quality assurance and quality control. Available at: [http://www.ipcc-nggip.iges.or.jp/public/gp/english/8\\_QA-QC.pdf](http://www.ipcc-nggip.iges.or.jp/public/gp/english/8_QA-QC.pdf)
45. Production, Quality and Manufacturing. Available at: <http://www.acqnotes.com/acqnote/careerfields/quality-assurance>
46. Rossheim J. Diverse Opportunities Await Pharmacists in Industry. Available at: <http://www.monster.com/career-advice/article/pharma-industry-jobs-for-pharmacists>
47. Chapman ID. Contract research pharmacology. *Trends Pharmacol Sci* 1996; 17: 60–1.
48. David AH, Thomas RB. Introduction to hospital & health system. *Am J Pharm Educ.* 2010; 75(2): 31b.
49. Ahmad A, Patel I, Sanyal S, Balkrishnan R, Mohanta GP. A study on drug safety monitoring program in India. *Ind J Pharm Sci.* 2014; 76(5): 379-86.
50. Prasanna DR, Vantipalli R, Chaitanya L, Rao J, Regmi B, Ahmad A, Nirojini PS. Clinical pharmacists: The major support to Indian healthcare system in near future. *J Pharm Bioallied Sci.* 2015; 7(3): 161–174.
51. Benefits of a Career in Academic Pharmacy. Available at: <http://www.aacp.org/resources/student/pharmacyfor-you/pharmacycareerinfo/Documents/careeroverview.pdf>
52. JoLaine DR, Joseph TD, Mario MZ, Terry LS. A Career in Academic Pharmacy: Opportunities, Challenges, and Rewards. *Am J Pharm Educ.* 2006; 70(1): 1-15.
53. Judith A. Pharmacy Practice Research Careers. *Pharmacotherapy* 2009; 29(8): 1007–1011.