



CODEN [USA]: IAJPB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**

SJIF Impact Factor: 7.187

<https://zenodo.org/records/11141657><https://www.iajps.com/volumes/volume11-april-2024/20-issue-04-april-24/>Available online at: <http://www.iajps.com>

Review Article

**ASSESSMENT OF THE IMPORTANCE OF CLINICAL
PHARMACY EDUCATION PROGRAMS FOR THE
MANAGEMENT AND PREVENTION OF DIABETES****Haindavi Rao Julapelly, Satyanaraya S.V Padi**
Care College of Pharmacy, Warangal, Telangana, India.**Abstract:**

When it comes to improving health, preventing, and managing diseases, and providing rationale in drug use, clinical pharmacists play a pivotal role in patient care programs that comprise the field of clinical pharmacy. In a direct relationship with patients, clinical pharmacists are able to communicate with other medical staff and provide solutions to a wide range of patient health problems. Effective patient counselling, education, drug information services, monitoring of drug therapy, detection of drug interactions, monitoring and filing of adverse drug events, and the creation of awareness in the clinical setting regarding disease prevention and management are all aspects of clinical pharmacy services provided by hospitals. Elevated blood sugar levels are the hallmark of diabetes mellitus, a metabolic disorder that gradually wreaks havoc on the body's essential organs. Clinical pharmacy and NCD education services are well-established and well-functioning in Western nations. When it comes to providing tertiary care hospitals in India with high-quality pharmaceutical treatment and efficient clinical services, clinical pharmacy services still have a ways to go. The primary goal of this research was to shed light on the best practices of advanced clinical pharmacy services in the West and to draw attention to their similarity in Indian clinical pharmacy practice with the hope of improving future health outcomes.

Keywords: *Clinical Pharmacist, Diabetes mellitus, advanced clinical pharmacy services, diabetes education.*

Corresponding author:

Haindavi Rao Julapelly,
Department of Pharmacy Practice,
Care College of Pharmacy,
Warangal,
Telangana, India.
Mail Id: haindavirao476@gmail.com

QR CODE



Please cite this article in press Haindavi Rao Julapelly et al., *Assessment Of The Importance Of Clinical Pharmacy Education Programs For The Management And Prevention Of Diabetes.*, Indo Am. J. P. Sci, 2024; 11 (04).

INTRODUCTION:

An imbalance in insulin production or resistance to its usage causes the development of diabetes, a chronic metabolic condition. Critical bodily organs are vulnerable to injury from elevated blood glucose levels. According to the World Health Organization, low and middle income nations account for about 80% of diabetes-related deaths. By 2030, the predicted global burden of diabetes mellitus would have risen to 438 million. One of the leading chronic diseases in India, diabetes disproportionately affects people living in rural areas. Reducing the prevalence of diabetic complications requires early screening for the disease, identification of co-morbid illnesses, and therapy of these conditions.^{2,3}

Diabetes burden in India:

The number of people diagnosed with diabetes in India is 62 million at now. India had the highest number of diabetes mellitus patients in the world in 2000. Compared to those without diabetes, people with diabetes need two to three times as much medical resources. National healthcare budgets for diabetes care might reach 15%⁴⁻⁶. Obesity due to urban migration, dietary changes, and increased incomes are lifestyle variables that contribute to the multifactorial etiology of diabetes in India. Other factors that may have a role in the development of diabetes include a lack of education, inadequate sanitation, and the prevalence of infectious diseases. Policymakers and local governments should prioritize the rising problem of diabetes by initiating a warning signal.

Diabetes and its co-morbid complications:

The most common complications of diabetes, according to a study on the global status of diabetes, include neuropathy (24.6% of cases), cardiovascular problems (23.6% of cases), renal problems (21.1% of cases), retinopathy (16.6% of cases), and diabetic foot ulcers (5.5% of cases). These findings are in line with previous research on the South Indian population; however, additional data from various Indian states is needed to see if there is a nationwide variation in the patterns of complications^{7,8}. A study compared standard anthropometric indices with waist-to-weight ratio (WHtR) in healthy women (aged 21–45) from urban slums in Mumbai city, India. The study indicated that the mean WHtR value was 0.50 ± 0.1 , however slightly over half of the women (51.9%) had a WHtR of 0.50 or higher. In the Indian diabetic population, micro and macro vascular alterations are mostly caused by poor glycaemia control, which in turn puts diabetic patients at risk for consequences such as diabetic necrosis and muscular infarction.

Dyslipidaemia and low levels of high-density lipoproteins are hereditary risk factors for coronary artery disease in Indians. These factors make Indians more likely to develop diabetes in their twenties and thirties compared to Caucasians, suggesting that all patients in India, regardless of age, need to have their diabetes closely managed and screened^{9,10}.

Challenges in the management of Diabetes in India:

Healthcare for people with diabetes in India faces a number of obstacles. A significant portion of the Indian population lacks easy access to hemoglobin A1c, despite the fact that it is the gold standard test globally for initiating and intensifying insulin. In both the medical and patient groups, there is a lack of enthusiasm about starting insulin treatment. Fear of insulin prick, weight gain, and hypoglycemic episodes are the most prevalent anxieties, along with the insulin regimen's complexity. Treatment choices vary greatly across the country of India, which is partly due to inadequate guidelines. Treatment and the start of insulin therapy can be made easier nationwide with the help of clear and practical insulin recommendations that can be integrated into standard clinical practice¹¹.

Diabetes mellitus on a global scale: effective governmental and private programs for the prevention and management of diabetes were established in the United States of America. Likewise, the "National Health Priority Areas initiative" is one of the government programs in Australia that aims to address chronic diseases like diabetes by providing a continuous and focused healthcare system. Care for people with diabetes is a top priority for the British government, and the National Health Service is always looking for new ways to educate patients and test new treatments in an effort to better their quality of life. Guidelines for the management of diabetes and public awareness campaigns will be developed by an expert panel that the United Arab Emirates has established. The good health impacts that have ensued may be enough to halt the alarming increase in diabetes cases in that nation. To curb the modern diabetes epidemic, India needs comparable "grass roots" initiatives and services. Clinical pharmacists are becoming more common in healthcare systems as a result of these regulations, and their numbers are expected to surge in the coming years.

The goal of diabetes care should be to help people with the disease take charge of their own health and control their blood sugar levels. Possible obstacles to diabetes care and treatment were highlighted in a study out of the Philippines that detailed the experiences of a

diabetic patient. Finally, they settled on insurance out-patient coverage and the implementation of standard treatment/management protocols to promote both the provision and receipt of consistent medical attention. Healthcare providers for people with diabetes should encourage self-management of the disease and the adoption and maintenance of healthy lifestyle habits¹². At every stage of their care, they should empower persons with diabetes to make their own decisions and aggressively promote cooperation in decision-making. Each person will have their own unique care plan that has been discussed, negotiated, and approved in a structure and language that is most comfortable for them.

The responsibilities of the diabetes patient include:

Be as proactive as possible in managing their diabetes on a daily basis · The patient with diabetes should be knowledgeable about self-care, which involves controlling their diet, exercising, and monitoring their blood glucose levels · Regularly checking their feet · Understanding how to control their diabetes They should incorporate regular communication with the healthcare staff into their routine. During consultations, they should clarify any questions regarding health-related matters. Keep all scheduled appointments and notify the healthcare staff in advance if any changes are necessary. Patients requiring particular attention, such as, Diabetic children and teenagers Females with diabetes who are either planning to get pregnant or are currently carrying a child. When it comes to managing metabolic control, cardiovascular risk factors, or diabetic complications, any individual with diabetes needs expert counsel. Individuals dealing with intricate mental health issues.

Need for Implementation of Nationalized Awareness Programme (NAP):

Since there is a great deal of regional variance in treatment choices in India, the country's recommendations need serious improvement. To help get people treated and started on insulin therapy across the nation, clear and practical insulin guidelines that primary care doctors can use in their daily practice are badly needed. More government awareness campaigns and suitable public and health care practitioner support are needed to lessen the impact of diabetes on Indian society. In order to effectively implement screening and early detection programs, raise awareness among clinicians, and accomplish the goals of diabetes prevention, self-management counselling, and therapeutic management,¹⁴, it may be necessary to target these professionals. To reduce the epidemic of

diabetes, it is helpful to approach the diabetic guidelines and apply them in clinical practice. Positive societal health outcomes may result from early screening and identification of pre-diabetes, particularly in pregnant women, children, and adults. One important step toward achieving diabetic control and preventing complications from the disease may be for pharmacists to participate in continuing education programs that reveal the "clinical inertia" needed to start program adherence. Another strategy that pharmacists can employ to help patients control their diabetes over the long term is to educate them on aggressive clinical measures, such as starting insulin early, using oral hypoglycaemic medicines at the correct dosages, and making healthy lifestyle changes. Figure 1 lists the programs currently in place for the management of diabetes mellitus.

Role of health care personnel to support and encourage diabetes self-care and self-management¹⁴

- Treating individuals with respect and dignity.
- Ensure that patients with diabetes know how to contact members of the team providing their diabetes care.
- Provide high quality care and regularly review their clinical and psychological needs.
- Answer any questions about the quality of services received.
- Provide interpreting services, if English is not the person's first language and seek appropriate services for those with sensory impairment or learning disability⁶⁰⁻⁶².
- Provide information and structured education about diabetes management and local health related services.
- Remain up to date about diabetes and its care and treatment in order to keep patient with diabetes up to date about their condition.
- Facilitate access to a second opinion where required (subject to the agreement of the person's GP or consultant).
- Give information about local government services if any and details of local support groups.

Clinical Pharmacy Services:

Assuring the appropriate use of pharmaceuticals is an ongoing part of a pharmacist's job in the healthcare system. Especially for lifestyle-related illnesses, advances in clinical pharmacy services have facilitated the launch of novel screening programs, patient education initiatives, and follow-up counseling. Health care practitioners and patients alike can benefit from their drug information services and evidence-

based medication selection recommendations^{17,18}. Results, however, will be contingent upon the widespread adoption of health care recommendations that are good for patients and the correct application of treatment protocols. All aspects of the clinical pharmacist's work, including legal, ethical, social, cultural, economic, and professional considerations, must be considered. A clinical pharmacist needs extensive training in all areas of clinical pharmacy practice and should be an expert in pharmacology, clinical toxicology, pharmacokinetics, and pharmacodynamics.

Clinical Pharmacy Services in diabetes management:

It is common for clinical pharmacists to collaborate with many members of the healthcare team in hospitals, and they may encounter more complex cases as a result of this. That is why it is essential for all pharmacists to have solid education and training in clinical pharmacy education and services. Various areas of patient care necessitate ongoing education and training for evidence-based clinical pharmacists. Preceptors in clinical pharmacy should have a Pharm.D. or a postgraduate degree in clinical pharmacy or hospital pharmacy with sufficient training in clinical pharmacy servicing when they work as clinical pharmacists.

Table 1: Type of services and its purposes²²⁻²⁶

Name of the Department	Type of Clinical care	Clinical Pharmacy services
Teaching Hospitals attached research institutes	Hospital pharmacy practice, teaching activities, drug selection, distribution, management.	Making effective changes in education, training, teaching programmes in medical and health sciences.
Emergency Medicine	Drug therapy monitoring and drug information services	Determine types of critical conditions of the patient, solving the drug related problems, providing evidence based information to the physicians ²⁷ .
Community pharmacies ⁷³	Conducting health screening, awareness programmes, training programmes.	Educational and training opportunities for community pharmacists, thereby improve patient-centred knowledge providing advanced pharmacy services ²⁸ .
In-patient department	providing Pharmaceutical care services	Provision of pharmaceutical care, identification of drug therapy problems, prevention of adverse drug reactions and monitoring of drug therapy management ⁸⁰ .
Out-patient department	Ambulatory care ²⁹⁻³⁰ , patient education	Advancing ambulatory care practice, to achieve the national priorities of improving patient care, adherence, patient health, and affordability of care.
General medicine	Identification of various diagnosis cases	Providing counselling to the chronic, non-communicable cases.
General surgery	Identification antibiotics prescribing pattern in operative cases	Providing drug related information to the physician, antibiotic alternatives.
Pulmonology	Identification of chronic inflammatory lung diseases associated co morbidities.	Providing counselling to the pulmonary disease associated co morbidities patients towards prevention and management.
Obstetrics& Gynaecology	Identification of gynaecological cases	Assessing drug use pattern in a post-operative patients, Providing treatment alternatives to the health care professionals ³¹⁻³⁵ .
Psychiatry	Identification of psychiatry related disorders	Providing patient counselling, drug related services to the patients.
Orthopaedics	Identification of bone related disorders	Providing antibiotic information, lifestyle interventions to the patients.

Paediatric department	Identification and evaluation of multiple diseases ⁸¹	Provision of advanced paediatric care services.
Intensive care units and oncology department	Palliative care services ^{64,82-83}	Introducing the concept of advanced practice roles in pharmacy within the new integrated regionalized palliative care service ³⁶⁻⁴⁰ .

Community pharmacies, teaching hospitals, research institutions, and other facilities can all benefit from modern clinical pharmacy services. The facilities and services offered by them are detailed in Table 1. Health care management, formerly known as disease-state management, presents unique difficulties when dealing with patients' chronic diseases.

Continual education to support basic medication management services is a part of the health systems at Western University. Various educational institutions throughout the world are putting their attention on improving clinical services so that they can reach more people and provide specialized care for patients in a wider range of clinical settings. No specialized training in medication management is currently in use in India outside of university curricula. Important software is installed in various Indian educational institutions, and students use it for free.

Healthcare IT platforms such as Micromedex, Drug Interaction Checker Software, Medline, Medscape, E-medicine, Webmed, etc., need to advance at a rapid pace so that patients can access up-to-date information on a wide range of diseases and drugs. Medication

reconciliation is the primary goal of advanced clinical pharmacy treatments that take place throughout patient admission and discharge.

Continuous patient-tailored education and occasional counselling are given to diabetes patients. During their hospital stay, patients whose diabetes was determined to be severe enough to warrant intervention were chosen and treated in a specialized manner. Antibiotics, analgesics, anticoagulants, antiarrhythmics, and chemotherapeutic medicines are among the treatments given to the patient. Management of drug therapy, patient counselling, illness prevention and management, patient follow-up, and other related tasks are the purview of clinical pharmacists.

Organized patient education in the United Kingdom is defined by the National Service Framework for Diabetes as a course that: Addresses all facets of diabetes, Offers content flexibility, Is pertinent to an individual's clinical and psychological requirements. Flexible enough to accommodate an individual's cultural and educational background

Advanced Clinical Pharmacy Services in the Community Practice

Identification of diabetic patients in the community

Health screening, identification of status of sugar levels

Renew the goals of diabetes mellitus prevention and management

Promoting patient counselling, patient education services

Life style interventions, monitoring the patients

Maintain the sugar levels at normal level, improving the health related outcomes

Advanced Clinical pharmacy service in diabetes

Structured Education Programmes (SEP) for diabetes patient⁴¹⁻⁴⁶

There are two national patient education programmes in U.K that meet all the key criteria for structured education are

- DAFNE for Type 1 diabetes mellitus
- DESMOND for Type 2 diabetes mellitus

DAFNE:

Dose Adjustment for Normal Eating (DAFNE) is skills based course in which people with type 1 diabetes learn how to adjust their insulin dose to suit

what they eat, rather than having to eat to match their insulin dose.

DESMOND:

Diabetes Education and Self-Management for On-going and Newly Diagnosed (DESMOND) is a new course for people with type 2 diabetes which helps to identify their own health risks and to set their own specific treatment goals.

Principles of good clinical practices in Structured Education Programme⁴⁷⁻⁵⁰:

The following figure lists and explains the principles of good clinical practices in Structured Education Programme

Courses should reflect established methods of adult learning and the curriculum should be clearly written down

Courses should be run by appropriately trained professionals from a variety of backgrounds (such as nurses and dietitians) to groups of people with diabetes, unless group work is considered unsuitable for an individual

Sessions should be accessible to the broadest range of people, taking into account the person's culture, ethnicity, and any disability they might have and where they live

Sessions should be held locally, for instance in a community setting or local diabetes centre²¹

Courses should use a variety of teaching styles to promote active learning, where everyone gets involved and can relate what they are learning to their own experiences

Courses should be adapted to meet the different needs, personal choices and learning styles of people with diabetes

Education should become part of the normal diabetes care

Benefits and scope of Structured Education Programme:

Services that promote cooperation, decision-making, and the adoption and maintenance of a healthy lifestyle are required for children, youth, and adults with diabetes⁵¹⁻⁵⁵.

In order to attain the quality of care, structured education is an essential intervention. It is recommended by the National Institute for Clinical Excellence (NICE) that all individuals diagnosed with diabetes have access to formal patient education both upon diagnosis and as needed thereafter. This education should cover topics such as:

1. In order to prevent Type 2 diabetes, practices should have systems in place to identify individuals who are at a higher risk of having the disease. This will allow them to receive support and guidance on how to lower their risk of developing the condition. Pages 56-58.

It is crucial for all members of the primary healthcare team to maintain a high level of suspicion in order to identify and diagnose individuals with diabetes. Unfortunately, many people with diabetes go misdiagnosed. Practices should also prioritize identifying patients at high risk of acquiring diabetes in order to detect those who have the disease but have not yet been diagnosed. Pages 65-67.

3. Right after a diabetes diagnosis has been made, initial evaluation and treatment. Assisting patients in obtaining referrals to diabetes specialty teams and initiating treatment and care as necessary are both important responsibilities. Education on diabetes and its care, including dietary recommendations, should be part of this⁵⁹⁻⁶³.

4. Agreed upon methods of initial and ongoing education to guarantee that all individuals newly diagnosed with diabetes receive knowledge regarding diabetes and its management. Adult learning concepts should inform educational practice, with a focus on active learning in a group setting (unless otherwise deemed inappropriate)⁶⁴.

5. A qualified dietician, general practitioner, or community nurse must provide newly diagnosed patients with diabetic dietary advice⁶⁸⁻⁷¹.

6. Ongoing maintenance of It is important to welcome newly diagnosed individuals to regular evaluations of their day-to-day metabolic management and ongoing education once their diabetes has stabilized. The frequency of these reviews should be tailored to match the individual's needs. The quality of their daily life and metabolic control should be formally reviewed at least once a year, and they should be offered surveillance for cardiovascular risk factors and long-term problems once a year. Any concerns brought up during annual assessments should be the basis for additional follow-up appointments⁷²⁻⁷⁹.

CONCLUSION:

India may be experiencing an outbreak of diabetes mellitus. Worldwide, diabetes and its consequences account for a colossal amount of morbidity and mortality, putting a heavy healthcare strain on families and communities⁸⁴⁻⁸⁶. Consequently, it is imperative to carry out population-based initiatives aimed at preventing diabetes and its complications through improving early detection, promoting healthy lifestyle choices, and pharmaceutical therapies. A number of factors are impacting the prevalence of diabetes in India, including the country's rapid economic growth, changes in lifestyle brought about by it, and the frequent movement of people from rural to urban regions. There is a growing need to launch research and intervention programs at the national and regional levels in India to stem the expected disastrous rise in diabetes cases, which is affecting people from all walks of life.

Clinical pharmaceutical services are well-established on a global scale, although they are still in their infancy in India. There is an immediate need to elevate the role of the pharmacist to that of a clinical pharmacist in response to the dynamic nature of pharmacy services. Compounding and supplying medications are part of the job, but so is being involved in the care of patients.

Clinical pharmacists should provide advanced clinical pharmacy education and services at a variety of facilities that offer standard pharmaceutical care, with educators and preceptors actively involved in their clinical services. Paragraphs 87–89. Delaying the start of the illness through improving healthy behaviours and diets should be the primary focus of efforts to lessen the global health and economic burden of diabetes among high-risk persons. Through the primary care system, we can identify individuals at risk for developing diabetes, particularly those with impaired glucose tolerance. This will allow us to offer them with the medical guidance and assistance they need to slow the disease's progression in the community. The short-term strategy for preventing diabetes will involve early detection and management as well as modifications to one's lifestyle. The development of diabetes and its consequences can be greatly delayed with the effective deployment of sophisticated clinical pharmacy services^{93–95}.

REFERENCES:

1. Cho NH, Shaw JE, Karuranga S, Huang Y, da Rocha Fernandes JD, Ohlrogge AW, et al. IDF Diabetes Atlas: global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabetes Res Clin Pract.* 2018;138:271–81.
2. Liu X, Li C, Gong H, Cui Z, Fan L, Yu W, et al. An economic evaluation for prevention of diabetes mellitus in a developing country: a modelling study. *BMC Public Health.* 2013;13:729.
3. Joshi SR, Parikh RM et al. India - diabetes capital of the world: now heading towards hypertension. *J Assoc Physicians India.* 2007; 55:323–4.
4. Kumar A, Goel MK, Jain RB, et al. India towards diabetes control: Key issues. *Australas Med J.* 2013;6(10):524–31.
5. UHC (2010) Pharmacy practice model for academic medical centers. In: consortium UH. oak book.
6. ACCP(2012)Desired Professional Development Path ways for Clinical Pharmacists. *American College of Clinical Pharmacy* 33:e34-e42.
7. American Diabetes Association. Economic Consequences of Diabetes Mellitus in the U.S. in 1997. *Diabetes Care* 1998; 21:296-309.
8. International Diabetes Federation, World Health Organization. *The Economics of Diabetes and Diabetes Care.* Brussels: International Diabetes Federation, 1996.
9. Anjana RM, Ali MK, Pradeepa R et al .The need for obtaining accurate nationwide estimates of diabetes prevalence in India - rationale for a national study on diabetes. *Indian J Med Res.* 2011 Apr; 133():369-80.
10. Rao CR, Kamath VG. A cross-sectional analysis of obesity among a rural population in coastal Southern Karnataka, India. *Australas Med J.* 2011; 4(1):53-7.
11. Mohan V, Shah S, Saboo BJ et al. Current glycemic status and diabetes related complications among type 2 diabetes patients in India: data from the Alchieve study. *Assoc Physicians India.* 2013 Jan; 61(1 Suppl):12-5.
12. Legesse M, Teklay G, Fikadu D, et al. Clerkship guideline for undergraduate pharmacy students. In: Mekelle, Mekelle University College of Health Sciences Department of Pharmacy. (2012).
13. Giberson S, CDR Yoder S, CDR P Lee M (2011) Improving Patient and Health System Outcomes through advanced Pharmacy Practice. In: A Report to the US Surgeon General, RADM.
14. Recognition of advanced pharmacy practice in Australia (2010) In: Competency Standards Review Steering Committee RPSGB.
15. Wubben DP, Vivian EM et al. Effects of pharmacist outpatient interventions on adults with diabetes mellitus: a systematic overview. *Pharmacotherapy.* 2008;28(4):421–436.
16. ACCP (2008) The Definition of Clinical Pharmacy. *Pharmacotherapy.* 28: 816-817.
17. Veterans Health Administration (2015) Clinical pharmacy services. In: Affairs DoV. Washington.
18. Mohan V, Seshiah V, Sahay BK et al. Current status of management of diabetes and glycaemic control in India: Preliminary results from the Diabcare India 2011 Study. *Diabetes.*2012; 61:a645–a677.
19. Misra A, Khurana LInt et al. Obesity-related non-communicable diseases: South Asians vs White

- Caucasians. *J Obes (Lond)*. 2011 Feb; 35(2):167-87.
20. Unnikrishnan RI, Anjana RM, Mohan V et al. Importance of Controlling Diabetes Early–The Concept of Metabolic Memory, Legacy Effect and the Case for Early Insulinisation. *JAPI (Suppl)* 2011; 50:8–12.
21. Kaveeshwar SA, Cornwall J. The current state of diabetes mellitus in India. *AMJ* 2014, 7, 1, 45-48.
22. Global Burden of Metabolic Risk Factors for Chronic Diseases Collaboration. Cardiovascular disease, chronic kidney disease, and diabetes mortality burden of cardiometabolic risk factors from 1980 to 2010: a comparative risk assessment. *Lancet Diabetes Endocrinol* 2014; 2: 634–47.
23. Seuring T, Archangelidi O, Suhrcke M et al. The economic costs of type 2 diabetes: a global systematic review. *Pharmacoeconomics* 2015; 33: 811–31
24. WHO (2006) Developing pharmacy practice: A focus on patient care. In: Standards DoMPa Geneva, Switzerland FIP.
25. West J, Amey J, Knapton C, Illing S (2012) Clinical pharmacy in general practice Midlands Health Network.
26. SHPA (2005) Standards of Practice for Clinical Pharmacy. *J Pharm Pract Res* 35: 122-146.
27. Council on Credentialing in Pharmacy (2009) Scope of Contemporary Pharmacy Practice: Roles, Responsibilities, and Functions of Pharmacists and Pharmacy Technicians. In: Pharmacy TCoCi, Washington, DC.
28. Carter BL, Elliott WJ. The role of pharmacists in the detection, management, and control of hypertension: a national call to action. *Pharmacotherapy*. 2000; 20:119–122.
29. Carter BL, Helling DK. Ambulatory care pharmacy services: the incomplete agenda. *Ann Pharmacother*. 1992; 26:701–708.
30. Pharmacy NBO (2008) Pharmacy NAoBo: Model State Pharmacy Act and Model Rules of the 3.
31. Implementation of Advances and Challenges in Clinical Pharmacy (2015) In: 3rd International Conference on Clinical Pharmacy. Atlanta, USA.
32. Toronto UO (2015) Advanced Pharmacy Practice Experience. In: Toronto Uo.
33. WSOP (2015) Advanced Pharmacy Practice Experiences (APPE) Manual.
34. Pharmacy TUoGCo (2014) Introductory Pharmacy Practice Experience (IPPE) and Advanced Pharmacy Practice Experience (APPE) Manual.
35. Belfast QU (2013) MSc in Advanced Pharmacy Practice with Independent Prescribing.
36. TTUHSC SOP (2012) Introduction to Pharmacy Practice. In: Amarillo.
37. University of Houston (2014) Advanced hospital pharmacy practice experience course description. In: UoHCo.
38. AAU (2009) Pharmacy course syllabus. School of pharmacy, University J.
39. Mekonnen AB, Yesuf EA, Odegard PS et al. (2013) Implementing ward based clinical pharmacy services in an Ethiopian University Hospital. *Pharmacy Practice* 11: 51-57.
40. AAU (2010) Pharmacy practice course syllabus. School of Pharmacy.
41. Janet PE, Brian LE, Douglas CA et al. (2013) Minimum Qualifications for Clinical Pharmacy Practice Faculty. In: ACoC.
42. ACCP (2004) Guidelines for Clinical Research Fellowship Training Programs. In: The ACCP Board of Regents.
43. Kumar A. Insulin guidelines: taking it forward. *Medicine Update (API India)*. 2010;20:127–30.
44. Unnikrishnan RI, Anjana RM, Mohan V et al. Importance of Controlling Diabetes Early–The Concept of Metabolic Memory, Legacy Effect and the Case for Early Insulinisation. *JAPI (Suppl)* 2011;50:8–12.
45. Sui Z, Turnbull D et al. Enablers of and barriers to making healthy change during pregnancy in

- overweight and obese women. *Australas Med J.* 2013;6(11):565–77.
46. Minnie Au, Rattigan S et al. Barriers to the management of Diabetes Mellitus – is there a future role for Laser Doppler Flowmetry? *Australas Med J.* 2012; 5(12):627–32.
47. Verma R, Khanna P et al. National programme on prevention and control of diabetes in India: Need to focus. *Australas Med J.* 2012;5(6):310–5.
48. State-based diabetes prevention and control program. Centers for Disease Control and Prevention. U.S Department of Health & Human Services. 2013 Accessed on 13 Dec. 2013.
49. National Diabetes Education Program. Centers for Disease Control and Prevention. Accessed on 13 Dec. 2013.
50. Authoritative Institute of Health and Welfare (AIHW) National health priority areas. 2013 Accessed on 13 Dec. 2013.
51. Ali M, Knight A. Comparative healthcare: Diabetes Mellitus. *Australas Med J.* 2009;1(5):1–9.
52. National service frameworks and strategies. National Health Services. 2011 Jul; Accessed on 13 Dec. 2013.
53. Mathew E, Ahmed M, Hamid S et al. Hypertension and dyslipidaemia in Type 2 diabetes mellitus in United Arab Emirates. *Australas Med J.* 2010;3(11):699–706.
54. Auta A, Maz J et al. Perceived facilitators to change in hospital pharmacy practice in England. *International Journal of Clinical Pharmacy* 2015, 37: 1068-1075.
55. Delgado O, Kernan WP et al. Advancing the pharmacy practice model in a community teaching hospital by expanding student rotations. *American Journal of Health-System Pharmacy AJHP: Official Journal of the American society of Health-System Pharmacists* 2014,71: 1871-1876.
56. Woolley AB, Berds C, Edwards RA et al. Potential cost avoidance of pharmacy students' patient care activities during advanced pharmacy practice experiences. *Am J Pharm Educ* 2013.77: 164.
57. Assemi M, Corelli RL et al. (2011) Development needs of volunteer pharmacy practice preceptors. *Am J Pharm Educ* 75: 10.
58. Keresztes JM (2010) Education. A must in all levels of pharmacy practice. *The Annals of Pharmacotherapy* 44: 1826-1828.
59. Rickles NM, Brown TA, McGivney MS et al. (2010) Adherence: A Review of education, research, practice, and policy in the United States. *Pharm Pract (Granada)* 8: 1-17.
60. Slazak EM, Zurick GM (2009) Practice-based learning experience to develop residents as clinical faculty members. *American Journal of Health-system Pharmacy AJHP: Official Journal of the American Society of Health-System Pharmacists* 66: 1224-1227.
61. Kheir N, Zaidan M, Younes H, et al. (2008) Pharmacy education and practice in 13 Middle Eastern countries. *Am J Pharm Educ* 72: 133.
62. Gong SD, Millares M et al. (1992) Drug information pharmacists at health-care facilities, universities, and pharmaceutical companies. *American Journal of Hospital Pharmacy* 49: 1121-1130.
63. Vollman KE, Adams CB, Shah MN et al. (2015) Survey of Emergency Medicine Pharmacy Education Opportunities for Students and Residents. *Hospital Pharmacy* 50: 690-699.
64. Butt F, Ream E (2016) Implementing oral chemotherapy services in community pharmacies: a qualitative study of chemotherapy nurses' and pharmacists' views. *The International Journal of Pharmacy Practice* 24: 149-159.
65. Sriram D, McManus A, Emmerton L et al. (2015) Will Australians pay for health care advice from a community pharmacist? A video vignette study. *Research in Social and Administrative Pharmacy RSAP* 11: 579-583.
66. Rickles NM, Skelton JB, Davis J et al. (2014) Cognitive memory screening and referral program in community pharmacies in the United States. *International Journal of Clinical Pharmacy* 36: 360-367.
67. Warshany K, Sherrill CH, Cavanaugh J et al. (2014) Medicare annual wellness visits conducted

- by a pharmacist in an internal medicine clinic. *American journal of health-system pharmacy AJHP: Official Journal of the American Society of Health-System Pharmacists* 71: 44-49.
68. McKee BD, Larose-Pierre M et al. (2015) A survey of community pharmacists and final-year student pharmacists and their perception of psychotherapeutic agents. *Journal of Pharmacy Practice* 28: 166-174.
 69. O'Connor SK, Ferreri SP, Michaels NM et al. (2012) Making pharmacogenetic testing a reality in a community pharmacy. *JAPHA* 52: e259-e265.
 70. Hardin HC, Hall AM, Roane TE et al. (2012) An advanced pharmacy practice experience in a student-staffed medication therapy management call center. *Am J Pharm Educ* 76: 110.
 71. Bosse N, Machado M et al. (2012) Efficacy of an over-the-counter intervention follow-up program in community pharmacies. *JAPHA* 52: 535-540.
 72. Hata M, Klotz R, Sylvies R et al. (2012) Medication therapy management services provided by student pharmacists. *Am J Pharm Educ* 76: 51.
 73. Mandt I, Horn AM, Ekedahl A et al. (2010) Community pharmacists' prescription intervention practices-exploring variations in practice in Norwegian pharmacies. *RSAP* 6: 6-17.
 74. Blake KB et al. (2010) Perceived barriers to provision of medication therapy management services (MTMS) and the likelihood of a pharmacist to work in a pharmacy that provides MTMS. *The Annals of Pharmacotherapy* 44: 424-431.
 75. Salter C (2010) Compliance and concordance during domiciliary medication review involving pharmacists and older people. *Sociology of Health and Illness* 32: 21-36.
 76. Bolt J, Semchuk W, Loewen P et al. (2015) A Canadian Survey of Pharmacist Participation during Cardiopulmonary Resuscitation. *The Canadian Journal of Hospital Pharmacy* 68: 290-295.
 77. Grindrod KA, Marra CA, Colley L et al. (2010) Pharmacists' preferences for providing patient-centered services: a discrete choice experiment to guide health policy. *The Annals of Pharmacotherapy* 44: 1554-1564.
 78. Karralli R, Tipton J, Dumitru D et al. (2015) Development of a metrics dashboard for monitoring involvement in the 340B Drug Pricing Program. *American Journal of Health-System Pharmacy. AJHP: Official Journal of the American Society of Health-System Pharmacists* 72: 1489-1495.
 79. Lancaster JW, Douglass MA, Gonyeau MJ et al. (2013) Providers' perceptions of student pharmacists on inpatient general medicine practice experiences. *Am J Pharm Educ* 77: 26.
 80. Rovers J, Miller MJ, Koenigsfeld Cet al. (2011) A guided interview process to improve student pharmacists' identification of drug therapy problems. *Am J Pharm Educ* 75: 16.
 81. Stacey SR, Coombes I, Wainwright C et al. (2015) What does advanced practice mean to Australian pediatric pharmacists? A focus group study. *The International Journal of Pharmacy Practice* 23: 141-149.
 82. Swetenham K, Rowett D, Stephenson D (2014) Clinical networks influencing policy and practice: the establishment of advanced practice pharmacist roles for specialist palliative care services in South Australia. *Australian Health Review: Australian Hospital Association* 38: 238-241.
 83. Walker KA, Scarpaci L, McPherson ML (2010) fifty reasons to love your palliative care pharmacist. *The American Journal of Hospice & Palliative Care* 27: 511-513.
 84. Eric Gilliam, Wesley Nuffer, Megan Thompson et al. Design and activity evaluation of an Advanced-Introductory Pharmacy Practice Experience (AIPPE) course for assessment of student APPE readiness. *Currents in Pharmacy Teaching and Learning*. Volume 9, Issue 4, July 2017, Pages 595-604.
 85. Erini S, Serag-Bolos, Aimon C et al. Assessing students knowledge regarding the roles and responsibilities of a pharmacist with focus on care transitions through simulation.. *Currents in Pharmacy Teaching and Learning* .Volume 9, Issue 4, July 2017, Pages 616-625

86. Andrew R. Miesner, Wesley Lyons et al. Educating medical residents through podcasts developed by PharmD students. *Currents in Pharmacy Teaching and Learning*. Volume 9, Issue 4, July 2017, Pages 683-688.
87. Tatummead stephanies chauner. Pharmacy student engagement in the evaluation of medication documentation within an ambulatory care electronic medical record. *Currents in Pharmacy Teaching and Learning*. Volume 9, Issue 3, May 2017, Pages 415-420.
88. Lindsey B. Amerine John M. Valgus Joseph D et al . Implementation of a longitudinal early immersion student pharmacist health system internship program. *Currents in Pharmacy Teaching and Learning*. Volume 9, Issue 3, May 2017, Pages 421-426.
89. Karen M.S. BastianelliLucas Nelsonlaura palombi et al. Perceptions of pharmacists' role in the health care team through student-pharmacist led point-of-care screenings and its future application in health care. *Currents in Pharmacy Teaching and Learning*. Volume 9, Issue 2, March–April 2017, Pages 195-200.
90. Shawn Riser Tayl, Michelle DeGeeter, et al. Preceptor perceptions of fourth year student pharmacists' abilities regarding patient counseling on therapeutic lifestyle changes. *Currents in Pharmacy Teaching and Learning*. Volume 8, Issue 3, May–June 2016, Pages 353-358.
91. Sharvari Dilip Malshe et al. Waist-to-Height Ratio in Indian Women: Comparison with Traditional Indices of Obesity, Association with Inflammatory Biomarkers and Lipid Profile. *Asia Pacific Journal of Public Health*. Vol 29, Issue 5, pp. 411 – 421,2017. 10.1177/1010539517717509.
92. Michiyo Higuchi et al. Access to Diabetes Care and Medicines in the Philippines. *Asia Pacific Journal of Public Health*. Vol 22, Issue 3_suppl, pp. 96S - 102S.2010. 10.1177/1010539510373005.
93. A. Porselvi, M.S. Uma Shankar, K.S. Lakshmi, A. Bharath Kumar. Comprehensive Review on Diabetic Foot Ulcer – A Brief Guide to Pharmacists. *International Journal of Chem Tech Research*. Vol.10 No.9, pp843-851, 2017.
94. A. Porselvi, M.S. Uma Shankar, K.S. Lakshmi. A Retrospective Qualitative Study on Current Diabetic Foot Ulcer Management and Discussion on Extended Role of Clinical Pharmacist *Marmara Pharmaceutical Journal* 21/2: 412-418, 201.
95. Ashwitha Shruti Dass, Sarala Narayana, P. N. Venkatarathnamma. Effect of Vitamin E and omega 3 fatty acids in type 2 diabetes mellitus patients. *Journal of Advanced Pharmaceutical Technology & Research*. 9; 1: January-March 2018.