

# Revolutionary Role of Clinical Pharmacist in Specialised Clinics: Professional Approach for Better Patient Care

Jude James, Jeeva Joseph, Stephy PS, Suja Abraham\*

Department of Clinical Pharmacy, Nirmala College of Pharmacy, Muvattupuzha, Kerala, INDIA.

## ABSTRACT

The treatment associated economic burden of our country is rising at an alarming rate due to the prevalence of various disease conditions. Since the burden of disease and its management cost is increasing, India has got all reasons to be alarmed over matters of health. Without finding out and implementing newer alternatives to meet the health needs of the population, the present health system has to do more to come up with the struggles in order to provide the adequate healthcare services to get the desired outcome. Focussed or personalised care can be foreseen as a remedy and has been considered as a core component in achieving a sustained high quality health outcome. Specialised clinics devoted to an area of speciality aims at providing focussed or personalised care to the patient which enables to provide more medical attention to the patient by the involvement of multidisciplinary health professionals and is also cost effective. The specialised clinics plays a major role in timely follow ups to ensure that the patient gets the individualised optimal therapy.

**Key words:** Clinical pharmacist, Specialised clinics, Focussed care, Patient care, Individualised therapy.

## INTRODUCTION

Focussed or personalised care can be foreseen as a remedy and has been considered as a core component in achieving a sustained high quality health outcome. Focussed or personalised care is being given by the introduction of specialised clinics devoted to an area of speciality wherein the patient receives the medical attention from an expert team of multidisciplinary health professionals and is also cost-effective.

With time the role of pharmacist has evolved from an individual dispensing a medication product to a patient, to an individual who works in collaboration with general practitioners, nurses and other health care professionals in ensuring proper medication management. The importance of integrated health care that optimises patient compliance and minimises adverse drug reactions provides a wide opportunity for pharmacist to work as a key element in the health care system. The pharmacist is a critical partner of health care with increased demand of personalised care. Pharmacist as medication

experts can contribute towards ensuring quality use of medications.<sup>1</sup>

Studies revealed that one out of ten patients visiting a general practitioner experiences drug related problems which are moderate or severe and preventable.<sup>2</sup> A recent study from UK stated that one in twenty prescription items in general practice contained an error and it affected one out of every 8 patients.<sup>2</sup> The involvement of a drug therapy management expert like pharmacist has helped in reducing such mischances. Poor communication was identified as a major factor causing medication related problems and thus highlights the need for greater collaboration between general practitioners, pharmacist and other health care professionals to attain optimal patient care.<sup>3</sup>

Medication error is regarded as the most common form of medical error which paves way for increase in complications, mortality and economic burden.<sup>4</sup> The results

DOI: 10.5530/ijopp.13.3.34

Address for  
correspondence:

Dr. Suja Abraham (M Pharm,  
PhD)

Associate Professor, Nirmala Col-  
lege of Pharmacy, Muvattupuzha-  
686661, Kerala, INDIA.

Phone no: 9995162188

Email id: suja@nirmalacp.org



www.ijopp.org

of a latest study conducted by the Institute of Medicine states that the medication error assessment accounts for about 44000-98000 deaths each year in hospitals in USA and holds about \$6-29 billion to treat the adverse effects caused by the medication errors.<sup>5</sup>

### Specialised clinics: A newer approach

Multidisciplinary approach in patient care has now gained popularity as the standard of care with the evolving concept of health management. Drug related problems (DRP) which are preventable, is one of the important issue that increases the financial burden.<sup>6,7</sup> Since the specialised clinics are devoted to the treatment of a particular medical condition, the drug related problems including the prescription errors, dispensing errors and administration errors can be reduced. The patient follow up is very much important especially in case of those with chronic medical conditions in order to ensure that the patient receive the appropriate secondary care.<sup>8</sup> In addition to the expected services from a clinical pharmacist like medication chart review, identification and resolution of medication related problems, patient counselling, pharmacist does much beyond by participating in a multidisciplinary health care team through the initiation of various health care clinics.

### Anticoagulation clinics

The problem with anticoagulant is that, the anticoagulation effect varies from person to person and different persons may require different doses to attain the same level of anticoagulation. Hence specialised anticoagulation clinics devoted to this purpose can help in attaining the desired level of anticoagulation thereby reducing the associated risks.<sup>9</sup> A vigilant physician, co-operative patient and a readily available lab was stated as the essential triad for the anticoagulation clinic.<sup>10</sup>

The physician who manages the oral anticoagulation therapy should do it in a coordinated and systematic manner and should include patient education, timely INR monitoring, tracking, follow-up and dose adjustment to maintain the INR.<sup>11</sup> Thus the involvement of a clinical pharmacist in the anticoagulation clinics had led to the implementation of them effectively and was seen to have an improvement in the surrogate outcomes like INR stability, time in INR goal range, decrease in medication errors and reduction in the occurrence of adverse events and mortality associated with the use of anticoagulants. The rate of hospitalisation and emergency department visits was found to be reduced by 73% in the anticoagulation clinic compared to the other.<sup>12</sup> The benefits usually seen with the pharmacist led anticoagulation clinics are mainly due to the adherence to guidelines and protocols.<sup>13</sup>

Pharmacist in anticoagulation clinics played a significant role in improving patient understanding of anticoagulant drugs through the provision of patient counselling, identification and management of drug interactions and drug related adverse events. A study proved that the patient knowledge about anticoagulation increased from  $5.6 \pm 3.2$  to  $13.8 \pm 0.94$  ( $P=0.00$ ) followed by one month patient counselling within the intervention group. 73.45% of patients had their INR ranges within the therapeutic range in the intervention group. The involvement of pharmacist has also caused significant reduction in ADRs associated with anticoagulants.<sup>14</sup>

### Heart failure clinics

Heart failure is considered as a global health issue as it affects about 26 million people worldwide.<sup>9</sup> Heart failure has got a negative impact on the health related-quality of life of the patients, hence the proper management of heart failure should be considered as a fundamental goal.<sup>13</sup>

The International congestive heart failure study (INTERCHF) states that the heart failure patients in India had one of the highest mortality rates compared to Southeast Asia, China, West Asia and Africa after one year of diagnosis.<sup>12</sup> So specialised heart failure management programs are necessary for the proper management of heart failure patients, among which heart failure clinics have significantly shown better outcomes in many studies in reducing rehospitalisation, mortality and improved quality of life.<sup>15</sup> The main goal of heart failure clinic is to identify the contributors to HF progression, manage medical, socio-economic and psychological factors and improve the clinical outcomes thereby improving the overall wellbeing and quality of life of the patient.<sup>16</sup> In HF clinic the pharmacist gets the privilege of initiating and adjusting medication doses, under defined protocols by tracking the patient monitoring parameters like body weight, vital signs, volume status and laboratory investigations by patient interviews or telephone monitoring technology.<sup>17,18</sup> The drug therapy evaluation, counselling over telephone, extensive education on medications, recommendations for drug therapy changes and optimization of drug regimens with physician consultation by the pharmacist led to reduction in clinical events, hospitalisation and death rates and improved compliance.<sup>19-21</sup>

### Tb clinics

Non-adherence to the TB regimen is a worldwide problem with an alarmingly striking magnitude and it is the main factor leading to multi drug resistant TB that leads to increased morbidity and mortality. TB clinical services offered by various hospitals plays a major role in ensuring patient adherence to anti TB regimen and to

avoid the development of multi drug resistant TB.<sup>22</sup> The pharmacist led education for the patients in a TB clinic led to enhanced medication adherence and addressed the patients pharmaceutical care issues.<sup>23</sup> In a pharmacist managed clinic for treatment of latent TB infection, pharmacist was designated as primary care provider and if the physician finds a patient with LTBI, refers him to the clinic for continuous treatment. The specific goals of such clinics were to provide information on drug therapy including the benefit and risk, facilitate therapeutic drug monitoring, minimise adverse drug reactions and increase the rate of successful completion of LTBI treatment.<sup>24</sup>

Pharmacist provides multiple patient care services in TB clinics such as patient education, monitoring, follow up and ensuring drug adherence which is important in the management of TB. 59% completion rate was observed in a 9 month isoniazid regimen and 67% completion rate was observed in a 6 month isoniazid regimen in a study conducted within a pharmacist managed community pharmacy involved in management of latent TB infection.<sup>24</sup> Another study proved that patients who received patient education from pharmacist had greater adherence to drug therapy when compared with those patients who do not ( $P < 0.005$ ).<sup>25</sup>

CB-DOT or community based directly observed treatment can be seen as a way to investigate the health status of TB patients in a community based setting. Community based treatment for drug resistant TB done in Bangladesh proved to be feasible and clinically effective.<sup>24</sup> Pharmacist can educate patients and clinicians about the importance of compliance and implementation of DOT to minimise the occurrence of resistance. In a study conducted by Juwan G *et al.* to compare the directly observed treatment provided through pharmacies with self-administered treatment demonstrated that patients in the DOT group led by pharmacist completed treatment and cured, compared to those in the other group (75.2% vs 26.7%), ( $P < 0.001$ ).<sup>26</sup> Many studies have shown better outcomes and improved rate of patient compliance by the addition of pharmacist into the TB management team.<sup>22</sup>

### Immunization clinics

Immunization clinics are an area of clinical practice where they deal with immunization queries in several ways depending on local expertise. They provide services like telephone advice and clinical consultations (General Paediatric or immunisation clinics).<sup>26</sup> Childhood immunization is an important aspect of immunization clinics. Children are assessed, investigated and immunized under observed conditions; also the timeliness of childhood vaccination is an important factor in determining the effect.<sup>27</sup>

Elimination of preventable diseases through vaccination can be achieved only by enthusiastic professionals committed to immunization.<sup>28</sup> A study demonstrated the success of pharmacist – led influenza vaccination in driving up the immunization rates by increasing the access to patients at risk.<sup>29</sup>

Bounthavong *et al.* conducted a study on measuring patient satisfaction of a pharmacist led immunization clinic; the patients reported that the pharmacist in the clinic spend as much necessary time (97.87% answered agree or strongly agree) and the patients also stated of good satisfaction in the communication between patient and pharmacist and in patient counselling (97% agree).<sup>30</sup> Another study on the impact of a pharmacist led vaccine recommendation program for paediatric kidney transplant candidates by Carthon *et al.* compared the patients who received pharmacist led vaccination via pharmacist recommendation with those who did not had pharmacist recommendation. The result showed that timely vaccination was given to those in the intervention group (91%, IQR 86% - 100%) compared to the control group (80%, IQR 71%-80%), ( $P < 0.0001$ ).<sup>31</sup>

### Diabetes clinic

Diabetes is a rapidly growing disease internationally with a current 6.6% of occurrence. By 2030 this may reach an estimated 7.8% among international population.<sup>32</sup> Drug related problems are common in the management of type 2 diabetes mellitus.<sup>33</sup> Pharmacists were involved in identification of drug complications, interactions or treatment failures which were vital to the physicians for modification of treatment regimen.<sup>32</sup> Clinical pharmacist has to work jointly with the physician in the identification, resolving and preventing drug related problems to ensure safe, accurate and cost effective use of medications. Studies have proven that the counselling and patient education provided by the pharmacist has dramatically improved patient medication adherence.<sup>34</sup> A study on management of diabetes by pharmacist showed that patients who were managed by the pharmacist had a better HbA<sub>1c</sub> control when compared with patient groups not managed under a pharmacist.<sup>35</sup>

Another study evaluating the impact of patient education on insulin use, storage and administration of insulin pen done in Iran showed that pharmacist has a significant role in safe, effective and correct usage of insulin pens. The mean errors were reduced to  $1.49 \pm 0.13$  from a higher value of  $3.99 \pm 0.22$  as a result of education on insulin given by the pharmacist. Fasting blood sugar control shifted from 45% prior to insulin education to 63.9% after interventions were made ( $P < 0.05$ ).<sup>36</sup>

### Asthma clinic

Pharmacist led clinic provides education on how to use the inhalers and has shown to improve the quality of self-management behaviour in patients. By engaging in various pharmaceutical care activities like monitoring of symptoms, patient education/ medication counselling and helping with drug related problems, the pharmacist led clinics have shown to improve the patient compliance.<sup>37-39</sup> The pharmacist intervention has led to reduction in the beclomethasone dipropionate equivalence in the asthma patients, improvement in measures of asthma and COPD control, ability to self-manage their disease and achieve smoking cessation through education.<sup>40-41</sup>

Improvements were seen in use of reliever inhalers with dose adjustments of inhaled corticosteroids. Hence overall patient medication adherence and disease control were improved with pharmacist interventions. With the above interventions being made, the incidence of exacerbations significantly reduced from 1.7 to 0.36 in asthma patients and 3.0 to 0.19 in COPD patients.<sup>42</sup>

The provision of patient counselling in asthmatic and COPD patients has significantly reduced the number of hospitalisation and emergency department visits from  $0.74 \pm 0.77$  to  $0.20 \pm 0.69$ . This medication adherence rate were also improved from the baseline values.<sup>43</sup> Better asthma control with enhanced knowledge about drugs and diseases resulted in enhanced quality of life and improved patient medication control in asthma patients.<sup>44</sup>

### Rheumatology clinic

Rheumatoid arthritis is an inflammatory condition that typically involves smaller joints which is characterised by symmetric poly-articular inflammation and affects 1% of the world's adults.<sup>45</sup> The development of new therapeutic strategies and the increased scientific understanding of them form the basis of the new advancements they led to improved outcomes and remission of many patients.<sup>46</sup> The initiation, follow-up and switching to a bio similar can be a complex process in case of biologic drugs and requires expertise. A pharmacist led specialised biologic clinic have shown to improve the management of drug therapy, patient condition and patient experience. Rapid initiation of biologic treatment in most of the severely affected patients and the continuous assessment of the patient to the drug therapy was possible by the introduction of such biologic clinics led by pharmacist.<sup>47</sup> Moreover the clinic provided opportunity for patient counselling, time to voice patient concern, rationalise the biologic prescription by enhanced reconciliation process and implementation of new audit process.

Thus the management of rheumatoid arthritis requires an integrated approach and the pharmacist expertise have shown to improve the quality of medical care through various strategies including the education thereby improving the patient compliance and the health outcome.<sup>48</sup>

An article by Thomas M regarding the prescribing in a rheumatology clinic stated that few clinics had a supplementary prescribing pharmacist and a clinical specialist physiotherapist. The prescription pharmacist reviews the medication and analyse it for any contraindications; discuss the management plan with clinician and prescribe the medicines with the limit of BNF, evidence based practice and to review the effectiveness of pharmacist interventions and to titrate the dose of drugs as needed in the follow up.<sup>49</sup>

### Oncology clinics

The degree of adherence of cancer patients to the oral chemotherapy regimens determines the effectiveness of the therapy and also the adherence decreases potential toxicity. Though it is stated that patients with extreme life threatening conditions like cancer usually show compliance to the treatment regimen, a substantial proportion of the patients like teenagers and young adult patients have difficulty adhering to the regimen due to factors like patient health beliefs including the perceived illness severity and emotional functioning of the patient like depression and self-esteem.<sup>50</sup> Complexity of treatment regimen and its cost, side effects and the delayed benefits are usually considered as the treatment related factors that influence medication adherence and it was stated that usually the patients lack adequate support system or lack the understanding of the need of medication and in most settings providers does not fully succeed in communicating this to the patient.<sup>51</sup> There are many studies showing the benefits of a clinical pharmacist in the oral chemotherapy in a pharmacist managed clinic.<sup>52-58</sup> For instance in an outpatient oncology clinic, the feedback from the patients and colleagues in the clinic reported of the beneficial services provided by the clinical pharmacist in recommending the interventions and cost saving, providing education and support to patients.<sup>54-55</sup> A study stated that the involvement of clinical pharmacist helps in providing effective pharmaceutical care thereby reducing the incidence of delayed chemotherapy induced nausea and vomiting and improved medication adherence.<sup>56</sup>

### Specialised clinics in India

In the Indian scenario specialised clinics are definitely



emerging as a trend because people today want dedicated services on their health without wasting much time. Some of the specialised health management programs that were adopted from the other countries were a success in India, among which the anticoagulation clinic is an important example. In a specialised anticoagulation clinic, a variety of health-care professionals are involved in patient care during the course of therapy.<sup>59</sup> Though the practise of specialised or focussed health care is increasing in the country, the data are scarce. There are few studies showing the results of patients treated in specialised clinics in India. A study conducted in India evaluating the outcome of an anticoagulation clinic led by clinical pharmacist involving the multidisciplinary health professional's states that more number of patients that remained in the target INR range were those treated in the anticoagulation clinic, less number of ADRs and more drug interactions were identified and resolved among those treated in the anticoagulation clinic.<sup>14</sup>

Involvement of pharmacist in the specialised health care team or in specialised clinics thereby providing effective pharmaceutical care in a country like India is very much essential in improving the status and quality of health care system in the country.

## CONCLUSION

With evolving roles of pharmacist from the traditional services to the new and novel roles provides more patient oriented practice and ensure that the patient receives optimal, individualised, safe and effective drug therapy. Pharmacist currently recognised as the drug experts works in collaboration with the other healthcare professionals and patients to optimise the treatment to produce the positive health outcomes. The pharmacist's roles in specific areas of practice helps in achieving the greatest outcomes and in the pharmacist led specialised clinics, the outcomes were shown to be superior. Thus this evolutionary role of pharmacist can be adopted in a developing country like India, where the incorporation of the pharmacist into the multidisciplinary health care team helps in better patient care.

## ACKNOWLEDGEMENT

First and Foremost, we sincerely, thank the "Almighty" for his grace for the successful and timely completion of our work.

This project was completed with the full support of our college and its administration. We owe special thanks to our management for providing facilities for doing our project work.

We are profoundly grateful to Dr. Suja Abraham, Associate Professor and Department of Pharmacy practice, for her excellent guidance innovative ideas and immense help rendered for the successful completion of review article.

We are greatly indebted to our beloved parents who inspired and guided us in the right path and also for being the backbone for all successful endeavours in our life. We also express our sincere gratitude to all our friends and teachers who supported us in the successful completion of the work.

## CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

## ABBREVIATIONS

**DRP:** Drug related problems; **INR:** International normalized ratio; **HF:** Heart failure; **TB:** Tuberculosis; **LTBI:** Latent tuberculosis infection; **CB-DOT:** Community based directly observed treatment; **COPD:** Chronic obstructive pulmonary disease; **BNF:** British national formulary; **ADR:** Adverse drug reaction.

## SUMMARY

Management of chronic disease patients under a pharmacist involved patient focused clinic can lead to significant improvement in patient health outcomes. Multiple studies analyzed in this article highlighted the fact that involvement of a clinical pharmacist in a healthcare team can significantly reduce disease associated rehospitalisation, mortality, adverse drug reactions and hence improve patient quality of life and medication adherence.

## REFERENCES

1. Robert A, Michael L. The Role of the Pharmacist in Health Care, Expanding and Evolving. *North Carolina Med J.* 2017;78(3):165-7.
2. Pui S, Lisa N, Pei S, Vivienne M, *et al.* Exploring the role of pharmacists in private primary healthcare clinics in Malaysia: The views of general practitioners. *J Pharm Pract Res.* 2017;47(1):27-33.
3. Edwin T, Kay S, Rohan A, Johnson G. An exploration of the role of pharmacists within general practice clinics: The protocol for the pharmacists in practice study (PIPS). *BMC Health Services Research.* 2012;12:246.
4. Avery T, Barber N, Ghaleb M, Dean F *et al.* Investigating the prevalence and causes of prescribing errors in general practice: The Practice study. *Br J Gen Pract.* 2013;63(613):543-53.
5. Britten N. Medication errors: The role of patient. *Brit J Clin Pharmacol.* 2009;67(6):646-50.
6. Throckmorton T, Etchegaray J. Factors affecting incident reporting by registered nurses: the relationship perceptions of the environment for reporting errors, knowledge of the nursing practice act and demographics on intent to report errors. *J Perianasth Nurs.* 2007;22(6):400-12.
7. Adepur R, Adusumilli PK. Assessment of drug related problems in patients with chronic diseases through health status survey in a south Indian rural community setting. *Ind J Pharm Sci.* 2016;78(4):537-42.

8. Shashikal CW, Ganachari MS, Praveen T, Prakash R, *et al.* Obstacles and preventions of drug related problems a review. *Ind J Pharm Pract.* 2013;6(2):1-5.
9. Katie W, Keefai Y. Improving patient follow up after inpatient stay. *BMJ Quality Improvement Reports.* 2012;1(1):1-2.
10. Hart RG, Pearce LA. Antithrombotic therapy to prevent stroke in patients who have nonvalvular atrial fibrillation. *Ann Intern Med.* 2007;857-67.
11. John M, Clifford B. Thromboembolism associated with auricular fibrillation. *J Am Med Assoc.* 1950;144(2):97-100.
12. Ansell J, Hirsh J, Hylek E, Jacobson A. Pharmacology and management of vitamin K antagonist: American college of chest physician's evidence based clinical practice guidelines. *Antithrombotic and Thrombolytic Therapy.* 2008;133(6 Suppl):160S-198S.
13. Lakshmi R, James E, Kirthivasan R. Study on impact of clinical pharmacist's interventions in the optimal use of oral anticoagulants in stroke patients. *Ind J Pharm Sci.* 2013;75(1):53-9.
14. Lee T, Davis T, Kielly J. Clinical impact of a pharmacist led inpatient anticoagulation service: A review of the literature. *Integ Pharm Res Pract.* 2016;5:53-63.
15. Dokainish H, Teo K, Zhu J, *et al.* Heart failure in low and middle income countries: background, rationale and design of the international congestive heart failure study (INTER CHF). *Am Heart J.* 2015;170(4):627-34.
16. Ana A, Joana P, Paulo B, Dias P. Effect of heart failure clinics on survival and hospital readmission in patients discharged from acute hospital care. *Eur J Heart Failure.* 2002;4(3):353-9.
17. Sandeep S, Ramakrishnan S, Neeraj P, Karthikeyan G, *et al.* Heart Failure guidelines for India: Update 2017. *J Pract Cardiovas Sci.* 2017;3(3):133-8.
18. Martinez AS, Saef J, Paszczuk A, Bhatt-Chugani H. Implementation of a pharmacist managed heart failure medication titration clinic. *Am J Healthsystem Pharm.* 2013;70(12):1070-6.
19. Judy WM, Cheng BS, Hannah C. Pharmacist's role in the care of patients with heart failure: Review and future evolution. *J Manag Care Pharm.* 2014;20(2):206-13.
20. Patel K, Sansgiri SS, Miller L. Pharmacist participation in home health heart failure programmes. *Am J Healthsystem Pharm.* 2003;60(21):2259-60.
21. Goodyer LI, Miskelly F, Milligan P. Does encouraging good compliance improve patient's clinical condition in heart failure?. *Br J Clin Pract.* 1995;49(4):173-6.
22. Gattis WA, Hasselblad V, Whellan DJ, Connor OCM. Reduction in heart failure events by addition of a clinical pharmacist to the heart failure management team: Results of the pharmacist in heart failure assessment recommendation and monitoring (PHARM) study. *Arch Intern Med.* 1999;159(16):1939-5.
23. Clark PM, Karagoz T, Apikoglu RS, Izzettin FV. Effect of pharmacist led patient education on adherence to TB treatment. *Am J Healthsystem Pharm.* 2007;64(5):497-505.
24. Sandra M, Tavitian S, Spalek V, Bailey R. A pharmacist managed clinics for treatment of latent TB infection in healthcare workers. *Am J Healthsystem Pharm.* 2003;60(18):1856-61.
25. Addisu A, Megbaru D, Kalid S, Kiberalem B, *et al.* Assessment of Anti-TB Drug Nonadherence and Associated Factors among TB Patients Attending TB Clinics in Arba Minch Governmental Health Institutions, Southern Ethiopia. *Tubercul Res Treat.* 2018;1-7.
26. Juan G, Llorer T, Lopez P, Perez C. Directly observed treatment for TB in pharmacies compared with self-administered therapy in Spain. *Int J Tuberc Lung Dis.* 2006;10(2):215-21.
27. Kenneth L, David B. An immunisation clinic: Care, comfort and convenience. *Arch Dis Child.* 2007;92(7):653-4.
28. Bynley P, Peter B. Timeliness of childhood immunisation in Australia. *Vaccine.* 2006;24(20):4403-8.
29. Nicoll A, Elliman D, Begg NT. Immunisation: Causes of failure and strategies and tactics for success. *BMJ.* 1989;299(6703):808-12.
30. Kikdale CL, Nebout G, Megerlin F, Thornley T. Benefits of pharmacist led flu vaccination services in community pharmacy. *Ann Pharm Fran.* 2017;75(1):3-8.
31. Bouthavong M, Christopher M, Mendes M, Foster E. Measuring patient satisfaction in the pharmacy speciality immunisation clinic: A pharmacist run immunisation clinic at the veterans affairs San Diego healthcare System. *Int J Pharm Pract.* 2010;18(2):100-7.
32. Carthon CE, Hall RC, Maxwell TR, Crowther BR. Impact of pharmacist led vaccine recommendation programme for paediatric kidney transplant candidates. *Paed Transplant.* 2017;21(6).
33. Samia A, Maha A, Ali F. An evolving role of clinical pharmacists in managing diabetes: Evidence from the literature. *Saudi Pharm J.* 2016;24(4):441-6.
34. Hasniza Z, Lee C. Drug-related problems in type 2 diabetes mellitus patients with dyslipidemia. *BMC Public Health.* 2013;13:1192.
35. Javedh S, Jennifer F, Laxminarayana S. Evolving role of clinical pharmacist in the management of diabetes mellitus. *Int J Res Med Sci.* 2015;3(6):1305-8.
36. Stading J, Herrman J, Walters R, Destache C, *et al.* Impact of interventions on diabetes patients in an ambulatory setting. *Diabetes Spectrum.* 2009;22(4):241-6.
37. Forough A, Esfahani P. Impact of pharmacist intervention on appropriate insulin pen use in older patients with type 2 diabetes mellitus in a rural area in Iran. *J Res Pharm Pract.* 2017;6(2):114-9.
38. Weinberger M, Murray MD, Marrero DG, Brewer N, *et al.* Effectiveness of pharmacist care for patients with reactive airway disease: A randomised control trial. *JAMA.* 2002;288(13):1594-602.
39. Benavides S, Rodriguez JC, Maniscalpo-Feichtl M. Pharmacist involved in asthma outcomes in various healthcare setting: 1997 to Present. 2009;43(1):85-97.
40. Jarab AS, Alqudah SG, Khmour M, Shamssain M, *et al.* The impact of pharmaceutical care on health outcomes in patients with COPD. *Int J Clin Pharm.* 2012;34(1):53-62.
41. Ottenbros S, Teichert M, DeGroot R, Griens F, *et al.* Pharmacist led intervention study to improve drug therapy in asthma and COPD patients. *Int J Clin Pharm.* 2014;36(2):336-44.
42. Hackney CCG. Impact of pharmacist led asthma and COPD respiratory clinic in general practice. NICE Guidance. 2016.
43. Khachi H, Karikari P. Impact of a pharmacist led asthma and COPD reviews in general practice. *Thorax.* 2013;68(suppl 3):A1-220.
44. Kovacevic M, Culafic M, Jovanovic M, Vucicevic K, *et al.* Impact of community pharmacists' interventions on asthma self-management care. *Res Social Adm Pharm.* 2018;14(6):603-11.
45. Lim T, Kowski S, Tan K. Impact of asthma counselling by pharmacist on asthma control and medication adherence in Asia. *J Allergy Clin Imm.* 2012;129(2):AB125.
46. Kahlenverg J, Fox D. Advances in the medical treatment of rheumatoid arthritis. *Hand Clinics.* 2011;27(1):11-20.
47. Ellis J. How adolescents cope with cancer and its treatment. *MCN Am J Matern Child Nurs.* 1991;16(3):157-61.
48. Sahni A, Kirkpatrick P, Lloyd N. Value for money a biologic pharmacist clinic. *Rheumatology.* 2018;57(3):38.
49. Flick C, Farren J. The pharmacist role in managing rheumatic diseases. *The Rheumatologist.* 2013.
50. Mark T. Prescribing in a rheumatology clinic. *Pharmaceutical Clinic.* 2005;13(5):221-5.
51. Kondryn HU, Edmondson CL, Hill J, Eden TOB. Treatment non-adherence in teenage and young adult patients with cancer. *Lancet Oncol.* 2012;12(1):100-8.
52. McCue DA, Lohr LK, Pick AM. Improving adherence to oral cancer therapy in clinical practice. *Pharmacotherapy.* 2014;34(5):481-94.
53. Shah S, Dowell J, Greene S. Evaluation of clinical pharmacy services in a haematology/ oncology outpatient setting. *Ann Pharmacotherapy.* 2006;40(9):1527-33.
54. Chan A, Shih V, Chew L. Evolving roles of oncology pharmacist in Singapore: A survey on prescribing patterns of anti-emetics for chemotherapy induced nausea and vomiting. *J Oncol Pharm Pract.* 2008;14(1):23-9.
55. Mckee M, Frei BL, Garcia A, Fike D, *et al.* Impact of clinical pharmacy services on patients in an outpatient chemotherapy academic clinic. *J Oncol Pharm Pract.* 2011;17(4):387-94.
56. Ruder AD, Smith DL, Madsen MD, Kass FH. Is there a benefit to having a clinical oncology pharmacist on staff at a community oncology clinic?. *J Oncol Pharm Pract.* 2011;17(4):425-32.
57. Valgus JM, Faso A, Gregory KM, Jarr S, *et al.* Integration of a clinical pharmacist into the haematology-oncology at an academical medical centre. *Am J Healthsystem Pharm.* 2018;68(7):613-9.
58. Wong SF, Bounthavong M, Nguyen C, Bechtoldt K, *et al.* Implementation and preliminary outcomes of a comprehensive oral chemotherapy management clinic. *Am J Healthsystem Pharm.* 2014;71(11):960-5.
59. Chedepudi P, Mounika O, Chandrika G, Franklin A, Ramesh M, *et al.* Impact of pharmacist led anticoagulation monitoring and patient education on oral anticoagulation therapy with acenocoumarol. *Asian J Pharm Clin Res.* 2017;10(10):314-7.