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Evaluation of Pharmacist-Based Services for Type 2 Diabetes Mellitus in the Indonesian Community Health Centers

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ABSTRACT

Introduction: Diabetes mellitus is a global epidemic that continues to rise, including in Indonesia, and it has significant impacts on public health. The role of pharmacists in providing pharmaceutical care for diabetic patients in community health centers is crucial, yet challenges in its implementation persist. However, in-depth studies on pharmacists' practice experiences in this context are still limited in Indonesia. This study aimed to explore pharmacists' experiences in implementing pharmaceutical care for diabetic patients at community health centers in Indonesia.

Methods: The cross-sectional study was conducted in community health centers in South Kalimantan Province, Indonesia. Pharmacists practicing at community health centers were recruited between October and December 2023. The survey was distributed in both paper and online (Google Form) formats. The questionnaire used in the survey focused on the provision of assessment, care plan, and follow-up parameters regarding the medication of diabetic patients.

Results: A response rate of 60,3% (n=143) was obtained from pharmacists involved in this survey. Regarding the assessment parameter, the indicator of assessment patient trust was the most dominant implemented by pharmacists (93,7%) compared to other indicators. In terms of the care plan parameter, providing information on medication indications was the most dominant indicator implemented (82,9%). Meanwhile, for the follow-up parameter, the indicator of medication adherence follow-up was the most dominantly implemented by pharmacists (79,1%). Factor analysis revealed that assessment, care plan, and follow-up evaluation each constituted one composite.

Conclusion: The pharmaceutical care provided by pharmacists at community health centers for diabetic patients is still suboptimal. The factors that caused the suboptimal implementation of pharmaceutical care were resource limitations, inadequate specialized training for pharmacists, and insufficient support from the healthcare system.

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INTRODUCTION

Diabetes mellitus is a cluster of metabolic symptoms caused by elevated blood glucose levels due to disruptions in insulin secretion, insulin resistance, or both. It is often referred to as the 'silent killer' because the disease often remains undetected for a long time (1, 2). Patients with persistently high blood glucose levels above the normal range are at risk of experiencing micro- and macrovascular complications, increased healthcare costs, mortality, and decreased quality of life (3, 4).

Diabetes mellitus is one of the diseases with the fastest increasing prevalence in the world (5, 6). In 2021, the number of people with diabetes mellitus worldwide reached 537 million. If this increasing trend continues, it is estimated that the global number of people with diabetes mellitus will reach 783 million by 2045. The costs incurred for managing diabetes mellitus worldwide increased from 232 billion USD in 2007 to 966 billion USD in 2021. In Indonesia, cases of diabetes mellitus rank fifth among the top ten countries with the highest number of patients, reaching 9.5 million people. The country with the highest number of sufferers worldwide is China, with 140.9 million cases (7).

The goal of managing diabetes mellitus is to control blood glucose levels within the normal range, slow disease progression, reduce symptoms, and prevent complications (8, 9). Management of diabetes mellitus is achieved through dietary regulation, physical activity management, and pharmacological therapy. As part of the healthcare team, pharmacists are responsible for providing pharmaceutical care related to the pharmacological therapy (10, 11).

Currently, there is a shift in the pharmaceutical paradigm from a drug oriented to a patient oriented. Formerly, the role of pharmacists was limited to providing drugs of high quality and standards. Nowadays, pharmacists are not only expected to dispense medications but also to provide pharmaceutical care that supports the success of patient therapy (12, 13).

A comprehensive and intensive pharmaceutical care approach is necessary to ensure that the medication provided is appropriate, effective, safe, and adhered to by the patient (14-16). Pharmaceutical care involves three stages: assessing the patient's medication needs, developing a pharmaceutical care plan, and following up to evaluate the implementation of that plan. Therapeutic communication between the pharmacist and the patient facilitates discussions about the patient's medication regimen (17-19).

The implementation of pharmaceutical care has a positive impact on improving the economic, clinical, and health outcomes of patients with diabetes(20, 21). Studies in various countries have reported that pharmacists provide a variety of diverse pharmaceutical care services for patients with diabetes, yet many of these services have not been implemented comprehensively. These services include blood glucose monitoring, hypoglycemia management, pharmacotherapy, comorbid disease management, guidance on healthy living choices, and monitoring medication adherence (22-30).

One of the primary healthcare facilities accessible to diabetes patients is the community health centers (Puskesmas). Puskesmas is a government-managed health facility that provides healthcare services to the general public, including diabetes patients. Improving the quality of pharmaceutical care for diabetes patients in community health centers settings in Indonesia is imperative. The implementation of pharmaceutical care in Indonesia was still carried out partially and had yet to fully meet the standards established by the government. This condition had the potential to result in suboptimal outcomes in diabetes mellitus therapy. Comprehensive surveys on the implementation of pharmaceutical care by pharmacists in Puskesmas have not been conducted in Indonesia. This research serves as an initial step conducted in South Kalimantan Province as a pilot study. This study aims to assess the implementation of pharmaceutical services provided by pharmacists to diabetes patients in community health centers. The findings of this study are expected to provide valuable information to the government, pharmacist professional organizations, and practitioners regarding the development of diabetes pharmaceutical services based in community health centers in developing countries.

METHOD

A descriptive, cross-sectional survey-based study was conducted at community health centers (Puskesmas) in South Kalimantan Province, Indonesia. All pharmacists working in community health centers were included in the study (n = 237). Data collection was carried out between October and December 2023. Two hundred and thirty-seven pharmacists were approached; the questionnaires were given to those who agreed to participate, and they were completed anonymously. Participants provided informed consent to participate in this research. The survey

questionnaires were distributed in both paper and online (Google Form) formats to all pharmacists (https://doi.org/10.5281/zenodo.14248952). The questionnaire was based on the Standards for Pharmaceutical Care in community health centers guidelines in Indonesia (31). Participants expressed their implied consent by responding to and submitting the survey. The questionnaire consisted of two sections. Part A included demographic information of the participant. In Part B, there were twenty-five questions about the list of pharmaceutical care indicators that had been implemented.

The questionnaire was developed for this study to assess pharmacists' experiences in implementing pharmaceutical care for patients with diabetes mellitus in community health centers settings. The questionnaire was developed based on three theoretical pharmaceutical care domain frameworks about assessment, care plan, and follow-up evaluation. The content validity test of the questionnaire was carried out by three experts in the field of pharmaceutical care. The three experts serving as validators have no conflict of interest in this research. The test results showed that the questionnaire was valid (r value for each item > 0.432; n = 21) and reliable with a Cronbach's Alpha value of 0.935.

The questionnaire consists of 25 questions related to aspects of pharmaceutical care provided by pharmacists (assessment, care plan, follow-up, and evaluation). The questions 1–11 relate to assessment parameters, consist of 1-2 (trust indicators), 3-4 (understanding indicators), 5-6 (expectation indicators), 7-8 (concern indicators), and 9-11 (behaviour indicators). The questions 12–21 relate to care plan parameters, consist of number 12 (verification indicator), 13-14 (indication indicators), 15-16 (effectiveness indicators), 17-18 (safety indicators), and 19-21 (adherence indicators). The questions 22–25 relate to follow-up and evaluation parameters, consist of 22-23 (effectiveness indicators), number 24 (safety indicator), and number 25 (adherence indicator). The response of questions used a five-point Likert scale: never, rarely, sometimes, often, and always. Indicators of pharmaceutical care practice parameters are categorized as optimal and suboptimal. An indicator is categorized as optimal if the score was ≥ 75% (The average total score of the answers “always” and “often” from questions in 1 indicator).

The statistical package IBM SPSS® version 25.0 was utilized to analyze the data. Descriptive analysis was used to assess the participants' demographic characteristics and examine each pharmaceutical care indicator. Factor analysis was conducted to identify the patterns of relationships among the indicators comprising the parameters of pharmaceutical care (assessment, care plan, and follow-up evaluation).

Ethical Approval

The study was approved by The Ethical Committee of Medical Research, Medical Faculty, University of Lambung Mangkurat Banjarmasin, Indonesia (No.119/KEPK-FK ULM/EC/IV/2022).

RESULTS

Demographic of participants

This questionnaire was completed by a total of 143 participants with fair representation of the geographic spread. The survey response rate was 60.3%. Most of them were females (71.3%), with the dominant age group being 25-30 years old (66.0%). The most common level of pharmacy education was general pharmacist (98.6%). The most prevalent duration of practice as a pharmacist in a community health center was 1 to 5 years (64.3%). The predominant number of diabetes medication prescriptions served at community health centers was less than 50 prescriptions per month (53.1%) (Table 1).

Table 1. Participant Demographic Data

Demographic (n=143)		**n (%)**
Gender	**Male**	41 (28.7)
	Female	102 (71.3)
Age (years)	21-30	66 (46.2)
	31-40	50 (35.0)
	41-50	25 (17.5)
	51-60	2 (1.4)
Highest education	Pharmacist	141 (98.6)
	Pharmacist & Master	2 (1.4)

Demographic (n=143)		n (%)
Gender	Male	
	Female	
Length of pharmacy practice (years)	1-5	92 (64.3)
	6-10	19 (13.2)
	11-15	26 (18.2)
	16-20	4 (2.8)
	21-25	2 (1.4)
Number of Prescriptions for Diabetic Patients Per Month	≤ 50	76 (53.1)
	51-100	61 (42.7)
	>100	6 (4.2)

The state of pharmaceutical care implementation

In the assessment parameter, the most dominant indicator implemented by pharmacists in the pharmaceutical care of diabetic patients in community health centers was the trust indicators (more than 75%). The indicator with the lowest level of implementation in the assessment parameter was the expectation indicators (table 2). In the care plan parameter, the most dominant indicator implemented by pharmacists was the indication indicators, while the lowest was the verification indicators (table 3). In the follow-up evaluation parameter, the most dominant indicator implemented by pharmacists was the adherence indicator, while the lowest is the safety indicator (table 4). The practice of pharmacists in the implementation of pharmaceutical care is analysed based on the performance category of each parameter and indicator. The performance categories of pharmacist practice can be seen in Table 5.

Table 2. Implementation of Assessment Parameter in Pharmaceutical Care

No	Assessment Indicators	n (%)				
		Always	Often	Sometimes	Rarely	Never
1	I verify the completeness of the prescription, the identity of the patient with diabetes mellitus, and the identity of the prescribing doctor upon receiving the prescription	108 (75.5)	24 (16.8)	9 (6.3)	2 (1.4)	0 (0.0)
2	I verify the name of the diabetes mellitus medication, the dosage form, the quantity, the content of active ingredients, and the instructions for use upon receiving the prescription	117 (81.8)	19 (13.3)	7 (4.9)	0 (0.0)	0 (0.0)
3	I ask the patient with diabetes mellitus about the types and quantities of each prescribed diabetes medication	39 (27.3)	51 (35.7)	35 (24.5)	4 (2.8)	14 (9.8)
4	I ask the patient with diabetes mellitus about the purpose of using the diabetes medication, specifically regarding the reduction in blood glucose levels desired by the prescribing doctor	32 (22.4)	42 (29.4)	52 (36.4)	13 (9.1)	4 (2.8)
5	I ask the diabetes mellitus patient about the symptoms they experienced before visiting the doctor	15 (10.5)	58 (40.6)	54 (37.8)	13 (9.1)	3 (2.1)
6	I ask the diabetes mellitus patient about their expectations after using the diabetes medication.	22 (15.4)	50 (35.0)	53 (37.1)	16 (11.2)	2 (1.2)
7	I ask the patient with diabetes mellitus about any complaints or uncomfortable symptoms, such as nausea, dizziness, or cold sweats, that they may experience while using the diabetes medication	25 (17.5)	67 (46.9)	27 (18.9)	18 (12.6)	6 (4.2)
8	I ask the diabetes mellitus patient about the use of any other medications besides their diabetes medication.	30 (21.0)	49 (34.3)	47 (32.9)	8 (5.6)	9 (6.3)
9	I ask the diabetes mellitus patient about any difficulties they have experienced in using their diabetes medication.	16 (11.2)	52 (36.4)	48 (33.6)	16 (11.2)	11 (7.7)
10	I ask the patient with diabetes mellitus about their experience with prematurely discontinuing the use of diabetes medication.	10 (7.0)	35 (24.5)	58 (40.6)	24 (16.8)	16 (11.2)
11	I ask the diabetes mellitus patient about their dietary patterns in relation to the guidelines for using diabetes medication	35 (24.5)	58 (40.6)	28 (19.6)	14 (9.8)	8 (5.6)

Table 3. Implementation of Care Plan Parameter in Pharmaceutical Care

No	Care Plan Indicators	n (%)				
		Always	**Often**	**Sometimes**	**Rarely**	**Never**
1	I record the assessment results of the diabetes mellitus patient, the diabetes medication, and any related issues encountered with the diabetes medication.	10 (7.0)	27 (18.9)	41 (28.7)	30 (21.0)	35 (24.5)
2	I provide written or verbal information to the diabetes mellitus patient regarding the name of the medication, dosage, and usage instructions for the diabetes medication received.	93 (65.0)	38 (26.6)	11 (7.7)	1 (0.7)	0 (0.0)
3	I explain to the diabetes mellitus patient that the purpose of using diabetes medication is to lower blood glucose levels to within normal range.	52 (36.4)	54 (37.8)	21 (14.7)	5 (3.5)	11 (7.7)
4	I provide information to the diabetes mellitus patient about the effects of lowering blood glucose levels after using diabetes medication.	31 (21.7)	65 (45.5)	29 (20.3)	10 (7.0)	8 (5.6)
5	I provide information to the diabetes mellitus patient about the effects of reducing symptoms of the disease after using diabetes medication.	23 (16.1)	52 (36.4)	55 (38.5)	8 (5.6)	5 (3.5)
6	I explain to the diabetes mellitus patient about the possibility of experiencing nausea symptoms while using diabetes medication.	17 (11.9)	40 (28.0)	59 (41.3)	13 (9.1)	14 (9.8)
7	I explain to the diabetes mellitus patient about the possibility of experiencing hypoglycemic symptoms while using diabetes medication.	28 (19.6)	49 (34.3)	38 (26.6)	22 (15.4)	6 (4.2)
8	I explain to the diabetes mellitus patient the actions to take to manage any unwanted effects that may occur during the use of diabetes medication.	18 (12.6)	51 (35.7)	44 (30.8)	24 (16.8)	6 (4.2)
9	I adjust the usage of diabetes medication based on the dietary patterns of the patient with diabetes mellitus to ensure the accuracy and comfort of medication use	29 (20.3)	40 (28.0)	41 (28.7)	7 (4.9)	26 (18.2)
10	I remind the diabetes mellitus patient about the schedule for the next diabetes medication refill.	43 (30.1)	33 (23.1)	28 (19.6)	27 (18.9)	12 (8.4)

Table 4. Implementation of Follow-up Evaluation Parameter in Pharmaceutical Care

No	Follow-up Evaluation Indicators	n (%)				
		Always	Often	Sometimes	Rarely	Never
1	I confirm with the diabetes mellitus patient about the reduction in blood glucose levels after using diabetes medication.	31 (21.7)	46 (32.2)	48 (33.6)	14 (9.8)	4 (2.8)
2	I confirm with the diabetes mellitus patient about the reduction in symptoms of the disease after using diabetes medication.	16 (11.2)	56 (39.2)	46 (32.2)	13 (9.1)	12 (8.4)
3	I confirm with the diabetes mellitus patient about any adverse effects that occurred during and after the use of diabetes medication.	17 (11.9)	55 (38.5)	52 (36.4)	15 (10.5)	4 (2.8)
4	I confirm with the diabetes mellitus patient about their medication intake routine according to the usage instructions.	67 (46.9)	46 (32.2)	21 (14.7)	8 (5.6)	1 (0.7)

Table 5. Pharmacist Practice Category in Implementation Pharmaceutical Care

Parameters	**Indicators**	**Category (%)**
Assessment	Trust	Optimal (93.7)
	Understanding	Suboptimal (57.4)
	Expectation	Suboptimal (50.7)
	Concerns	Suboptimal (59.9)
	Behavior	Suboptimal (48.1)
Care plan	Verification	Suboptimal (25.9)
	Indication	Optimal (82.9)
	Effectiveness	Suboptimal (67.9)

Parameters	Indicators	Category (%)
	Safety	Suboptimal (46.9)
	Adherence	Suboptimal (49.9)
Follow-up evaluation	Effectiveness	Suboptimal (52.1)
	Safety	Suboptimal (50.4)
	Adherence	Optimal (79.1)

Factor analysis of the pharmaceutical care parameters

Each parameter of pharmaceutical care, consisting of several indicators, was tested using factor analysis. The results show that the parameter assessment, consisting of 5 indicators, formed one composite. Similarly, the parameter care plan, also consisting of 5 indicators, also formed one composite. The analysis of the follow-up evaluation parameter, comprising three indicators, similarly revealed its formation into a singular composite. The results are shown in table 6. These findings indicate that each parameter is structured as a solid parameter.

Table 6. Factor analysis of the pharmaceutical care parameters

Pharmacists' practice Parameters	Number of Indicators	Total composite
Assessment	5	1
Care plan	5	1
Follow-up evaluation	3	1

DISCUSSION

Pharmaceutical care is a crucial element in the management of chronic diseases, including diabetes mellitus. Chronic diseases, such as diabetes mellitus, require a sustained and coordinated treatment approach to ensure patient adherence to therapy regimens, symptom management, and complication prevention (32, 33). The effective implementation of pharmaceutical care can play an essential role in improving patients' quality of life and reducing the healthcare burden associated with these chronic diseases (34).

As integral members of the healthcare provider, pharmacists possess a unique position to implement comprehensive pharmaceutical care. Pharmacists can facilitate the selection of appropriate medications, provide education on medication use, and monitor the effectiveness and safety of therapy. By offering detailed consultations, pharmacists can help patients understand the importance of adherence to therapy, identify early drug side effects, and make therapy adjustments as needed. This is particularly crucial considering that diabetes melitus is a condition that requires continuous adjustment and monitoring (35, 36).

The dominant parameter of assessment implemented by pharmacists in this study was solely patient trust assessment. Meanwhile, the assessment of patient understanding, expectations, concerns, and behaviors remains non-dominant. Assessment should be conducted comprehensively to identify drug therapy problems (37). It can start with pharmacists building a therapeutic relationship with the patient. A therapeutic relationship is established by learning why the patient has come to the community health centers, the patient's demographics, medication experiences, and other clinical information (38).

The implementation of the care plan parameter was also suboptimal in this study. Only education regarding medication indications was predominantly implemented by pharmacists. Pharmacists are still not optimal in documenting drug therapy problems, as well as providing education regarding effectiveness, safety, and medication adherence. Dispensing medication to patients must be accompanied by comprehensive education and information about the medication (39). Patients who understand the treatment goals, effects of medication use, medication safety, and the importance of adherence to medication have a higher potential successfull treatment (40).

Follow-up and evaluation medication outcomes in patients with diabetes mellitus are also crucial aspects to be implemented by pharmacists (41). The implementation of the follow-up and evaluation parameter was also suboptimal in this study. Only medication adherence follow-up indicator was the most dominantly implemented by pharmacists. Medications are not commodities "unsupervised sale" to patients. Medications used by patients must be monitored and their effect evaluated. If problems arise due to medication use, it is important to identify the causes of these problems so that further care can be provided (42). Monitoring and evaluation related to medication

effectiveness, safety, and adherence should be conducted by pharmacists for each individual patient to improve health outcome.

These same results align with another study conducted in pharmacies in Indonesia. The study revealed that implementation of pharmaceutical care for diabetes mellitus also found that only 'prepare medications' and 'provide labels with instructions for use' were 100% performed by pharmacists (43). The study in Kuwait also showed that providing pharmacy services to diabetes patients is still not optimal. Only services related to pharmacotherapy are predominantly implemented (22). However, the implementation of pharmaceutical care often encounters various challenges, including resource limitations, inadequate specialized training for pharmacists, and insufficient support from the healthcare system. Time constraints and high workloads also frequently inhibit pharmacists from providing optimal care. This results in suboptimal medication outcomes for patients (44-46).

The factor analysis results indicate that the assessment parameter is composed into one composite factor from 5 indicators. Similarly, the care plan and follow-up evaluation parameters each comprise one solid composite factor. This suggests that assessment, care plan, and follow-up evaluation conducted by pharmacists must be comprehensive, encompassing all indicators, to ensure the success and quality of therapy for patients with diabetes mellitus (47). Collaborative efforts among various stakeholders in the healthcare system, management support, continuous professional development, and the development of robust supporting systems to ensuring that pharmacists can improve contributions to the management of chronic diseases (48). Thus, significant improvements in patient health outcomes and more effective diabetes management are expected to be achieved.

Although it makes a significant contribution, our study has several limitations that need to be acknowledged. This research has not been able to identify the barriers that cause the suboptimal implementation of pharmaceutical care. Future research should aim to identify these inhibiting factors so that a more effective pharmaceutical care implementation model can be developed. Potential bias in this study emerges from the possibility that pharmacists, as respondents, may not accurately recall the implementation of pharmaceutical care they have conducted in the past. Such inaccuracies can lead to inconsistent reporting, either in the form of overestimation or underestimation, regarding the actual level of pharmaceutical care implementation, thereby affecting the validity and reliability of the study's results.

CONCLUSION

Pharmaceutical care has not yet been optimally implemented by pharmacists for patients with diabetes mellitus at community health centers. It has the potential to result in suboptimal therapy outcomes for patients. Various efforts are needed to ensure that pharmaceutical care can be comprehensively implemented for patients with diabetes mellitus.

AUTHOR'S CONTRIBUTION STATEMENT

All authors have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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BIBLIOGRAPHY

1. Poznyak A, Grechko AV, Poggio P, Myasoedova VA, Alfieri V, Orekhov AN. The Diabetes Mellitus-Atherosclerosis Connection: The Role of Lipid and Glucose Metabolism and Chronic Inflammation. Int J Mol Sci. 2020;21(5).
2. Kostov K. Effects of Magnesium Deficiency on Mechanisms of Insulin Resistance in Type 2 Diabetes: Focusing on the Processes of Insulin Secretion and Signaling. Int J Mol Sci. 2019;20(6).
3. Pertiwi MV, Alfian R, Nita Y, Athiyah U. Medication adherence of diabetes mellitus patients in Indonesia: A systematic review. Pharmacy Education. 2022:188-93.
4. Patty Y, Mufarrihah, Nita Y. Cost of illness of diabetes mellitus in Indonesia: a systematic review. J Basic Clin Physiol Pharmacol. 2021;32(4):285-95.
5. Khan MAB, Hashim MJ, King JK, Govender RD, Mustafa H, Al Kaabi J. Epidemiology of Type 2 Diabetes - Global Burden of Disease and Forecasted Trends. J Epidemiol Glob Health. 2020;10(1):107-11.
6. Balooch Hasankhani M, Mirzaei H, Karamoozian A. Global trend analysis of diabetes mellitus incidence, mortality, and mortality-to-incidence ratio from 1990 to 2019. Sci Rep. 2023;13(1):21908.
7. IDF. IDF Diabetes Atlas 10th edition: International Diabetes Federation; 2021.
8. Jia W, Weng J, Zhu D, Ji L, Lu J, Zhou Z, et al. Standards of medical care for type 2 diabetes in China 2019. Diabetes Metab Res Rev. 2019;35(6):e3158.
9. Reddy M, Oliver N. The role of real-time continuous glucose monitoring in diabetes management and how it should link to integrated personalized diabetes management. Diabetes Obes Metab. 2024;26 Suppl 1:46-56.
10. Alfian R, Athiyah U, Nita Y. Social media health interventions to improve diabetes mellitus patient outcome: a systematic review. J Basic Clin Physiol Pharmacol. 2021;32(4):297-304.
11. Dilles T, Heczkova J, Tziaferi S, Helgesen AK, Grondahl VA, Van Rompaey B, et al. Nurses and Pharmaceutical Care: Interprofessional, Evidence-Based Working to Improve Patient Care and Outcomes. International journal of environmental research and public health. 2021;18(11).
12. Dockendorf MF, Hansen BJ, Bateman KP, Moyer M, Shah JK, Shipley LA. Digitally Enabled, Patient-Centric Clinical Trials: Shifting the Drug Development Paradigm. Clin Transl Sci. 2021;14(2):445-59.
13. Kharaba Z, Farhat J, Mahboub BS, Buabeid MA, Alfoteih Y, Al-Worafi Y, et al. Current views of community and hospital pharmacists on pharmaceutical care services in the United Arab Emirates: A mixed methodological study. F1000Res. 2022;11:694.
14. Ilardo ML, Speciale A. The Community Pharmacist: Perceived Barriers and Patient-Centered Care Communication. International journal of environmental research and public health. 2020;17(2).
15. Lima TM, Aguiar PM, Storpirtis S. Evaluation of quality indicator instruments for pharmaceutical care services: A systematic review and psychometric properties analysis. Res Social Adm Pharm. 2018;14(5):405-12.
16. Moltó-Puigmartí C, Vonk R, van Ommeren G, Hegger I. A logic model for pharmaceutical care. Journal of Health Services Research & Policy. 2018;23(3):148-57.
17. Hazen ACM, de Bont AA, Leendertse AJ, Zwart DLM, de Wit NJ, de Gier JJ, et al. How Clinical Integration of Pharmacists in General Practice has Impact on Medication Therapy Management: A Theory-oriented Evaluation. Int J Integr Care. 2019;19(1):1.
18. Abrahamsen B, Burghle AH, Rossing C. Pharmaceutical care services available in Danish community pharmacies. Int J Clin Pharm. 2020;42(2):315-20.
19. Babar ZU, Kousar R, Murtaza G, Azhar S, Khan SA, Curley L. Randomized controlled trials covering pharmaceutical care and medicines management: A systematic review of literature. Res Social Adm Pharm. 2018;14(6):521-39.
20. Ebid AI, Mobarez MA, Ramadan RA, Mahmoud MA. Impact of a Clinical Pharmacist Intervention Program on the Follow-up of Type-2 Diabetic Patients. Hosp Pharm. 2022;57(1):76-82.
21. Desse TA, Vakil K, Mc Namara K, Manias E. Impact of clinical pharmacy interventions on health and economic outcomes in type 2 diabetes: A systematic review and meta-analysis. Diabetic medicine : a journal of the British Diabetic Association. 2021;38(6):e14526.
22. Al Haqan AA, Al-Taweel DM, Awad A, Wake DJ. Pharmacists' Attitudes and Role in Diabetes Management in Kuwait. Med Princ Pract. 2017;26(3):273-9.

23. Wang J, Pei Y, Yu F, Kang Z, Zheng Y. Understandings, Attitudes, and Barriers About Diabetes Care: Analysis of Factors Influencing Community Pharmacists in China. Diabetes Metab Syndr Obes. 2021;14:1999-2009.
24. El Hajj MS, Abu Yousef SE, Basri MA. Diabetes care in Qatar: a survey of pharmacists' activities, attitudes and knowledge. Int J Clin Pharm. 2018;40(1):84-93.
25. Douglas E, Power A, Hudson S. Pharmaceutical care of the patient with diabetes mellitus: pharmacists' priorities for services and educational needs in Scotland. International Journal of Pharmacy Practice. 2007;15(1):47-52.
26. Alzubaidi H, Saidawi W, Mc Namara K. Pharmacist views and pharmacy capacity to deliver professional services in the United Arab Emirates. Int J Clin Pharm. 2018;40(5):1106-15.
27. Woodhams L, Chalmers L, Hillis GS, Sim TF. Developing community pharmacists' role in the management of type 2 diabetes and related microvascular complications: a nationwide survey in Australia. PeerJ. 2023;11:e14849.
28. Al Assaf S, Zelko R, Hanko B. The Effect of Interventions Led by Community Pharmacists in Primary Care for Adults with Type 2 Diabetes Mellitus on Therapeutic Adherence and HbA1c Levels: A Systematic Review. International journal of environmental research and public health. 2022;19(10).
29. Cooney P, Hanley J, Ryan-O'Brien N, Okada H, Bermingham M. The views and experiences of people with type 2 diabetes being cared for by their community pharmacist: a cross-sectional patient survey. J Diabetes Metab Disord. 2022;21(2):1619-24.
30. Sendekie AK, Tesfaye AH, Tadesse YB, Dagnaw AD, Belachew EA. Actual practices of community pharmacists in the management of diabetes: a comparison of simulated patient-based study with perceived role of involvement. J Pharm Policy Pract. 2024;17(1):2326381.
31. Kemenkes. Regulation of The Minister of Health of The Republic of Indonesia Number 74 of 2016 on Standards of Pharmaceutical Services In Community Health Centers. In: Department H, editor. Jakarta: Ministry of Health of the Republic of Indonesia; 2016.
32. Roach M, Land N, Hernandez J, Rau R, Chou JW, Hickson SS, et al. The Role of Pharmaceutical Innovation in Clinical Practice Guidelines for Chronic Diseases. Int J Clin Pract. 2024;2024:5877687.
33. Ruiz-Ramos J, Hernandez MH, Juanes-Borrego AM, Mila R, Mangues-Bafalluy MA, Mestres C. The Impact of Pharmaceutical Care in Multidisciplinary Teams on Health Outcomes: Systematic Review and Meta-Analysis. J Am Med Dir Assoc. 2021;22(12):2518-26.
34. Sousa Pinto G, Bader L, Billberg K, Criddle D, Duggan C, El Bizri L, et al. Beating non-communicable diseases in primary health care: The contribution of pharmacists and guidance from FIP to support WHO goals. Res Social Adm Pharm. 2020;16(7):974-7.
35. Davis CS, Ross LAR, Bloodworth LS. The Impact of Clinical Pharmacist Integration on a Collaborative Interdisciplinary Diabetes Management Team. J Pharm Pract. 2017;30(3):286-90.
36. Musselman KT, Moczygemba LR, Pierce AL, Plum MF, Brokaw DK, Kelly DL. Development and Implementation of Clinical Pharmacist Services Within an Integrated Medical Group. J Pharm Pract. 2017;30(1):75-81.
37. Armistead LT, Cruz A, Levitt JM, McClurg MR, Blanchard CM. Medication therapy problem documentation and reporting: A review of the literature and recommendations. Jaccp: Journal of the American College of Clinical Pharmacy. 2021;4(10):1337-47.
38. Esmalipour R, Salary P, Shojaei A. Trust-building in the Pharmacist-patient Relationship: A Qualitative Study. Iran J Pharm Res. 2021;20(3):20-30.
39. Belachew EA, Sendekie AK, Wondm SA, Ayele EM, Netere AK. Misunderstanding of dosing regimen instructions among patients with chronic diseases receiving polypharmacy at the University of Gondar comprehensive specialized hospital. PLoS One. 2023;18(1):e0280204.
40. Manchanayake M, Bandara G, Samaranayake NR. Patients' ability to read and understand dosing instructions of their own medicines - a cross sectional study in a hospital and community pharmacy setting. BMC Health Serv Res. 2018;18(1):425.
41. Yaghoubi M, Mansell K, Vatanparastc H, Steeves M, Zeng W, Farag M. Effects of Pharmacy-Based Interventions on the Control and Management of Diabetes in Adults: A Systematic Review and Meta-Analysis. Can J Diabetes. 2017;41(6):628-41.

42. van Heuckelum M, van den Ende CHM, Houterman AEJ, Heemskerk CPM, van Dulmen S, van den Bemt BJF. The effect of electronic monitoring feedback on medication adherence and clinical outcomes: A systematic review. PLoS One. 2017;12(10):e0185453.
43. Wibowo Y, Parsons R, Sunderland B, Hughes J. An evaluation of community pharmacy-based services for type 2 diabetes in an Indonesian setting: patient survey. PeerJ. 2015;3:e1449.
44. Moecker R, Terstegen T, Haefeli WE, Seidling HM. The influence of intervention complexity on barriers and facilitators in the implementation of professional pharmacy services - A systematic review. Res Social Adm Pharm. 2021;17(10):1651-62.
45. Pereira CEO, Bambirra EHF, Fernandes BD, Sousa M, Mendonca SAM, Chemello C. Factors influencing the implementation of pharmaceutical care in outpatient settings: A systematic review applying the Consolidated Framework for Implementation Research. Res Social Adm Pharm. 2022;18(4):2579-92.
46. Jairoun A, Al-Hemyari S, Shahwan M, Jairoun S, Alorfi N, Zyoud Se, et al. Current Perspectives, Practices, and Barriers Faced by Community Pharmacists Regarding Pharmaceutical Care Services for Diabetes Mellitus in the United Arab Emirates. Journal of Multidisciplinary Healthcare. 2024;Volume 17:2563-76.
47. Shaya FT, Chirikov VV, Rochester C, Zaghab RW, Kucharski KC. Impact of a comprehensive pharmacist medication-therapy management service. J Med Econ. 2015;18(10):828-37.
48. Marjadi B, Alfian R, Susanto Y, Tjandra L, Pratama ANW, Schneider C. Pharmacists' continuing professional development for non-communicable diseases management: A consensus study. Res Social Adm Pharm. 2022;18(11):3964-73.