Original Article

Overcoming Challenges of Implementing Chronic Care Model in Diabetes Management: An Action Research Approach

Abstract

Background: Reforming the health care system to improve suitable health care model for diabetic patients is essential. This study aimed to implement, identify, and overcome the challenges of implementing the Chronic Care Model in diabetes management in a clinic. **Methods:** This study is a qualitative technical action research with the Kemmis and McTaggart model including planning, action, reflection, observation, and revision plan which was conducted in the specialized polyclinic from 2015 to 2017 in Isfahan city – Iran. Data were gathered through qualitative and quantitative methods. Diabetes team and 17 patients with type 2 diabetes participated in semi-structured interviews that were purposively chosen. Qualitative data were analyzed using content analysis and then quantitative data collected. **Results:** The qualitative findings of this research are in five main categories: System design upgrade, self-management upgrade, decision support, health care organization, and clinical information system upgrade. Results of quantitative data showed that most metabolic indicators like HbA1c have statistical meaningful changes (P value < 0.05). **Conclusions:** Implementing the Chronic Care Model became feasible despite serious challenges and two groups of ready and active team and active patients were developed. The study showed that one important lost link of diabetes management is underestimating the nurses' capabilities in the management of this disease. Inevitably, serious investment on maximum use of nurses' knowledge and skills in improving diabetes management will help diabetes care upgrade significantly.

Keywords: *Action research, diabetes mellitus type II, disease management, patient-centered care*

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Introduction

Diabetes is one of the most common metabolic disorders in the world and is resulted in a very high morbidity and mortality in different countries like Iran.[1-3] The statistics show that in Iran the metabolic control status of patients with type 2 diabetes is far from the desired status and this has caused the higher prevalence of the long-term diabetes complications.[4-6]

The main barrier for delivering desired care to patients who have chronic diseases is related to care delivery system.[7] Health system requires a new model for care and management of chronic disease like diabetes, in which the model changes from treatment-centered, reactive, and unplanned care to an approach based structured care with specialists' teamwork.[1,8] In response to this challenge, Wagner *et al.*, have suggested the Chronic Care Model.[9] This model consists of six components: delivery system (re)design, self-management support, clinical information systems, decision support, health care organization, and community resources and policies.[10] Unfortunately in Iran, there is no teamwork and care delivery system do not have sufficient structure,[11] and using this model for diabetes care improvement has been recommended in standard protocol of diabetes care of the American Diabetes Association (ADA)[12] and despite diabetes' priority in Iran health system priorities,[13] there is no evidence for implementing this model in Iran; therefore, this study was conducted to implement, identify, and overcome the challenges of implementing the Chronic Care Model in diabetes management through an action research approach in Iran.

Methods

This study is a technical action research with the Kemmis and McTaggart model including planning, action, reflection, observation, and revision plan. In the preliminary stage in a meeting with those

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responsible in insurance system management, the model purposes were posed and agreed to be implemented. This research was done in the specialized polyclinic affiliated to this system from 2015 to 2017 in Isfahan city – Iran.

Planning stage

First step: In using methods like interview and checking the records to analyze the situation of care delivery, it was obvious that there were no follow-up system and nutritionist. In patients' records, there were many cases of not recording the visit date or the test results. The interaction between physician and the nurse was limited to refer the patients for learning insulin injection technique; the nurse and the paramedic holding group educational classes do not have enough knowledge. Patients told that the classes were crowded and they did not visit the physician regularly and were not committed to nutrition and drug diet and regular physical activity.

Second step: The challenges resulted from the first step were reported in a meeting with the presence of treatment team members (director, physician, nurse, and secretary) and the research team. Model components were introduced and the team satisfied to implement it.

Third step: The solutions for existing problems were presented based on model definition as follows: In system redesign to redefine the roles, it was suggested that some physician's duties like observing and recording test results and educational counseling of patients are delegated to the nurse and she consults the physician if necessary, the physician visits the patient after studying the nurse report and the secretary follows up on the phone, so that the patients participate in the classes and refers those patients with abnormal test results to the clinic; the director checks delivering cares based on care standard protocol of the ADA in 2016, in addition to observing the performances with a teamwork approach and acting out to recruit a nutritionist and when this person is absent, the nurse presents some general nutrition information. For decision support the diabetes physician is supposed to participate in the special diabetes class based on the ADA Guideline (2016) held in glands and metabolism center every week and then is used with the help of an educated nurse and translated contents by research team about the ADA Guideline (2016) for training diabetes nurse. In order to support self-management, the nurse holds educational classes (during 6 months, 3 days a week and 1 h with six groups, in each session with 14–16 patients) based on the most up to date contents, and educational pamphlets are given to 100 patients who were selected as pilot with systematic regular accidental method. In system organization, the director will consider overtime bonus for diabetes team. In clinical information system, patient needs assessment paper and nurse report will be added and then the electronic record system will be set up and for community resources and policies, social facilities will be planned for patients' use.

Action stage

Components of the Chronic Care Model were implemented based on the decisions made in planning stage.

Reflection stage

In this stage, some meetings (reflection) were held. Therefore, to solve the challenge of system redesign, some plans were considered for the nurses, like managing the visit time of the patients under study, adjusting the days of their presence, delegating some duties to other people among clinic nursing staff, using a patient assessment checklist confirmed by the research team advisor based on diabetes care standard protocol (2016 ADA) instead of nurse report paper in the records to shorten the patients' visit time, and measuring the blood pressure of patients who are not under study by the physician to increase the secretary time, but recruiting the nutritionist was not successful. For solving the challenge of clinical information system, delegating the electronic system to the nurse was posed and implemented, but unfortunately for signing a contract with a sponsor to overcome the financial problems in community resources and policies, there was no agreement between the two parties.

Observation stage

Qualitative and quantitative methods were used to evaluate the affairs. For collecting qualitative data, semi-structured interviews with physician, nurse, secretary, director, and 17 patients with type 2 diabetes were done. Some open questions like "having new experience of new diabetes care and changes in the care procedure during the period of implementing the model comparing the past" were posed. The interviews were done between 30 to 40 min in clinic room that was suitable in terms of physical conditions. The interviews were recorded using a voice recorder and transcribed verbatim on the same day. The data collection continued up to the saturation point and then data analysis were carried out by qualitative content analysis recommended by Graneheim and Lundman.[14] For quantitative data, 100 records of patients were used that were previously selected as pilot with systematic regular accidental method. The results of metabolic indicator tests were observed at three time points (base, 3 months later, and 6 months later).

Reflection and revision plan stage

A meeting was held between two teams for discussing the results and finding a solution for remaining challenges and revising plan.

Data rigor: This study employed credibility, dependability, conformability, and transferability to achieve the various aspects of rigor indicated by Guba.[15] To credibility the data, the researcher was involved with the resulted data from the study with different data collection methods for a long time and the research findings were given to the

study collaborators and researchers and the data were validated with their opinion. For dependability matter, the other research team members' opinions were used and for increasing transferability, in addition to clear explanation of research process and complete description of research environment and participants, the others were provided with the possibility of familiarization with the method and its follow-up. For conformability, some interviews, codes, and classifications were extracted and given to colleagues who were familiar with qualitative research analysis not participating in the study and they were asked to examine the correctness of data coding process.

Ethical considerations

Ethics committee of the Isfahan University of Medical Sciences approved the study. Ethical points of participants like describing the research purpose for them, participants' satisfaction, asking for their permission to record the interviews, and keeping the information as private were considered.

Results

Participants' experiences about this study contained five main categories of "system design upgrade," "self-management upgrade," "decision support," "care delivery system organization," and "clinical information system upgrade" [Table 1].

System design upgrade

This concept was created from two subcategories: Ready and active team, and existence of patients follow-up system. Participants expressed that some physician's duties were delegated to the nurse and, after studying the nurse report, the physician could visit more patients during the same time, as the director was satisfied with the performance of diabetes team in terms of implementing with team approach and he said, "…implementing the model, we understood that the nurse was the lost link between physician and patient and then, they made a team that worked very well…" (P4). Physician said, "…the collaboration was perfect and the nurse sent the patients to me when they were completely ready…(P2)" and contrary to the period before this study, consultancy between physician and nurse for examining the causes of not controlling patients with abnormal results or the problems related to not committing to treatment was also done and following up was done by secretary, that the nurse said, "…before implementing the model, my training was just about insulin injection, but after that the physician became really different and consulted me about the patients with abnormal tests and the secretary called and followed up the patients about the educational classes and caused to have more patients there…" (P1). The results have shown that the system design component of the Chronic Care Model was successful.

Table 1: Main categories and subcategories

Main categories	Subcategories
System design upgrade	Ready and active team
	Existence of patients follow-up system
Self-management upgrade	Effective role of educational classes
	Sensitive role of patients in self-care
Decision support	Evidence-based care
Care delivery system organization	Support of team by clinic director
Clinical information system upgrade	Electronical organization of patients medical information

Self-management upgrade

The category of self-management upgrade contained two subcategories: Effective role of educational classes and sensitive role of patients in self-care. Holding the planned educational classes, gradually the patients have become motivated to participate in the classes in a way that they were asking about the time of its next session. The number of patients have been increased. The physician mentioned, "…what the nurse did was helping the patients understand what diabetes is and they reached the ideal situation that they were supposed to in this study…"(P2). The director said, "…we were observing the patients coming to the clinic and insisting on being visited by physician and being trained by the nurse in classes. We made them sensitive to their disease and now they are following it up; in fact we reduced our patients' A1C…"(P4). Patients were going walking regularly, they did the taught diet in class, and they consulted the physician or nurse about the written results of controlling blood sugar with glucometer. A patient said, "…when I come to clinic to be visited by the physician, sometimes I ask them about the date of class, but they take the trouble to call us and remind us about that…"(P16). Another patient said' "…during this 5 or 6 months, I lost 10 kilos, I followed the diet and now I am 56 kilos…"(P5). The evidences show that the patients have reached a good level of diabetes self-management.

Decision support

This category contained one subcategory: Evidence-based care. Experiences of participants showed that medicine prescription by the physician changed based on the ADA Guideline 2016 contrary to what happened before implementing the model with just some limited number of medicines and the nurse declared her satisfaction about applying the latest scientific contents in caring and training the patients. The director confirmed delivering cares based on the ADA Guideline 2016. The nurse said, "…I changed a lot comparing the past, my information has increased, the one month course I passed with the trainer nurse was very good, I learned interpreting the test results of the patients and translation of new ADA Guideline and journals that I received from the research team added to my information…"(P1). The physician and director said, "…in this study, visiting our patients were done based on

new ADA…"(P2). The results show that the cares were delivered based on the latest scientific contents while implementing the model.

Care delivery system organization

This category contained one subcategory: Support of team by clinic director. Experiences of participants showed that the team effort for implementing the model increased with overtime bonus. The director said, "…for the team overtime, we paid bonuses as much as we could so that they will be motivated and try more…"(P4). The statement above is in fact a sign of successful implementation of the model.

Clinical information system upgrade

This concept was created from one subcategory: Electronical organization of patients medical information. Experiences of participants showed that with the increase and completion of records' paper, more complete information was recorded in the records, the patients' reference dates were recorded regularly, and then making an electronic system facilitated accessing the patients' background. So the nurse said, "…now I have a system that I can enter the tests and training's results easily in the electronic record through the patient's ID …(P1)." The physician said, "…the electronic system was set up during the model implementation and we can check and record the patients' reference and medical background …(P2)." Therefore, the other component of the model was implemented successfully.

The quantitative data results have been summarized in Table 2.

The quantitative data results show that most metabolic indicators have statistical meaningful changes after 6 months (P value <0.05) comparing before implementing the model.

Table 2: Results of metabolic indicator statistical test in three time period, including base, 3 months, and 6 months after model implementation

Variable		Mean±standard deviation	Statistical test result variance analysis with observation repetition
BMI	Base	29/84±4/19	P=0.11
	3 months	29/48±4/34	
	6 months	29/40±4/15	
FBS	Base	173/07±59/02	P=0.007
	3 months	156/60±64/75	
	6 months	154/05±55/36	
2hPG	Base	265/29±88/91	P=0.001
	3 months	246/53±77/94	
	6 months	226/74±70/57	
HbA1C	Base	8/04±1/71	P=0.000
	3 months	7/96±1/48	
	6 months	7/31±1/29	
Cho	Base	167/67±39/54	P=0.000
	3 months	161/23±44/13	
	6 months	150/95±30/50	
HDL	Base	38/14±14/97	P=0.000
	3 months	39/10±11/78	
	6 months	42/65±8/96	
LDL	Base	88/87±32/19	P=0.050
	3 months	89/16±33/51	
	6 months	82/05±14/97	

BMI=Body mass index, FBS=Fasting blood sugar, 2hPG=2 hour plasma glucose, HDL=High-density lipoprotein, LDL=Low-density lipoprotein

Discussion

The results of this research are some pieces of evidence of the Chronic Care Model applicability. The results of system design upgrade point out a situation in which the cares were delivered with team approach. The follow-up system of patients was set up and implemented. In fact, we can say that the health system redesign to make effective treatment teams is a vital factor for patient-centered care.[16] Developing the nurses role caused the physician visit more patients during the same period of time comparing the period before implementing the model. The research results with the same purpose showed that 17% of physician's visit time in the initial care is spent on prevention care and 37% on training the patient, consulting about lifestyle, and medical care that can be done by trained non-clinicians.[17] In addition, a research showed that participant who followed responsibility delegation method in teamwork reported great satisfaction.[18] Having serious challenges while implementing the model demonstrates that teamwork culture is weak in Iran and they should change the structures in between profession training programs and extend the researches in the field so that they can move toward change in attitude and implementing team-centered educational approaches and cares.[19] Studies which examined the effectiveness of the Chronic Care Model also reported some progress related to health consequences for those who live with chronic diseases while the applied components were delivery system design and self-management support[20,21] and the results of these studies were in line with these research findings.

Diabetes self-management upgrade means doing something to really change the implementation of patients training programs and their self-care. A research showed that those patients who were trained in diabetes self-management achieved high awareness in managing the disease and it had a positive effect on the results of care process.[22] Another research results showed that applying the Chronic Care Model is an ideal framework to support self-management training and concentrates on patient-centered care,[23] which is in line with this research findings.

In decision support, diabetes team took care of patients based on latest scientific contents. The results of a research show that decision support is necessary to ensure that those

delivering cares and patients have the latest guidelines based on care evidence.[23] The results of another research have shown that using this model for those delivering initial care and passed diabetes self-management training course has positive effect on patients' health[7] and these results are in line with this research findings.

The other result of this study was delivery system organization in which diabetes team were encouraged through overtime bonus to implement the model and consequently the team worked more for service delivery. The results show that salary increase and bonus can improve the personnel's work situation and increase their motivation[24,25] which was confirmed in this study.

Clinical information system upgrade is another result of this research. Using electronic system, diabetes team members accessed all patients' medical information easily. In a research, chronic disease electronic management system was used to implement the Chronic Care Model for recording data and they understood that this method facilitates supporting and following up those patients who were left alone.[26] The result of systematic review in this field showed that electronic tools were important helps for chronic care and[23] these are also verifying the results of this research. Unfortunately, in this research, community resources and policies component were not implemented because of system financial problems.

After implementing the components of the Chronic Care Model, quantitative data collection showed that most metabolic indicators have changed meaningfully after 6 months. The research by Coca *et al.* about implementing this model has also shown that preparing the residents and nurses who deliver cares for developing patients' self-management skills, care delivery system redesign, making clinical information system for following up the quality indicators among the target population resulted in improving the patients' care process, and results of metabolic control indicators.[26]

Conclusions

Implementing the Chronic Care Model became feasible despite serious challenges. Ready and active team, and active patients were developed. This model changed treatment-centered, reactive, and unplanned care to an approach based on teamwork, patient-centered, and integrated care. The study showed that one important lost link of diabetes management is underestimating the nurses' capabilities in the management of this disease. Inevitably, serious investment on maximum use of nurses' knowledge and skills in improving diabetes management will help diabetes care upgrade significantly.

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Conflicts of interests

There are no conflicts of interest.

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