

How to Cite:

Anggraeni, T., Sarwoko, S., & Bahri, A. S. (2022). The effect of case manager on patients outcome: A systematic review. *International Journal of Health Sciences*, 6(S3), 10484–10500. <https://doi.org/10.53730/ijhs.v6nS3.9577>

The effect of case manager on patients outcome: A systematic review

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Abstract--The aim of this study is to assess the effect of case manager on patient's outcome with diabetes mellitus. This article was a systematic review study conducted by searching of primary articles from online databases including EBSCO, Google Scholar, and PubMed. We systematically searched full articles with the publication year until 2022. Results: A total of 15 articles reviewed in a systematic review showed that a group with case manager intervention running by community health workers and nurse had better improvements on HbA1c level, blood pressure, LDL level, physical activity, emergency room visit (hospitalization), knowledge of diabetes, and general quality of life compared to group without it (usual care). Conclusion: case manager by nurse and community health worker enhance patient's outcome.

Keywords---case manager, diabetes mellitus, diabetes type 2, nurse.

Introduction

Case management plays a central role in most person-centered and integrated care services. In case management, an individual or a small team is responsible for navigating the patient through a complex process in the most efficient, effective, and acceptable way^{1,2}. The care or case manager is evolving as a response to the evolution of the changes of the health system, with the primary aim of satisfying the bio-psycho-social needs of the person through the management of the entire course of care and through the coordination of the several health and social assistance services³. The The care or case manager is guarantees a global management, promoting a series of integrated interventions

so as to achieve a synergistic result. In particular, the The care or case manager is guarantees the patient's support throughout the entire therapeutic course, plans care and ensures its implementation, evaluates achieved results and guarantees a high level of cooperation between the health, socio-assistance and territorial professionals involved^{3,4}. The The care or case manager is also helps to improve: the quality of life of the patient through the common identification of care goals; the acknowledgement of the system of values and beliefs; the encouragement in identifying resources and capabilities of patient and family, helping them to develop realistic expectations compared to assistance results⁵.

Diabetes mellitus is the prototypical chronic illness because of prevalence and long-term complications, but also because of the proven benefit of several therapeutic interventions for risk reduction. It also is one of the most frequently diagnosed chronic diseases in the world; global diabetes prevalence has nearly doubled since 1980, rising from 4.7% to 8.5% in 2014⁶. It is well established that optimizing cardiometabolic control, as demonstrated by improving glycosylated hemoglobin (HbA1c), blood pressure (BP), and lipids, can lead to significant reductions in morbidity and mortality. However, this can be particularly difficult to achieve in primary care (ie, where the majority of diabetes care is delivered). The 15-minute visit does not allow a physician enough time to provide effective and evidence-based acute, chronic, and preventive care while also building and maintaining rapport with a patient⁷⁻¹⁰. It emerged unequivocally that, taking care and supporting the diabetic subject, leads to significant benefits in the general health and to reduction of possible complications. The Nurse Case Manager Lifestyle Medicine could represent a valid alternative of health management for the improvement of care in Type 2 Diabetic patients¹¹. Therefore, the objective of the study was to evaluate the effect of case manager on outcome of patients with diabetes mellitus.

Method

Data sources and search strategy

This systematic review was conducted according to the Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) guidelines¹². An electronic search of EBSCO, Google Scholar, and PubMed was conducted from their inception to 31th May 2022 with only English language-based literature using the search string: (case manager) AND (diabetes mellitus OR diabetes type 2) AND (nurse) AND (community health worker). In addition, This systematic review included comparative studies. This is defined as RCTs, non-RCTs and observational studies that used a comparison group. The broad inclusion criteria ensured all studies measuring effectiveness of case manager on diabetes mellitus patient treatment.

Study selection

All studies were included if they met the following eligibility criteria: (a) articles about the effect of case manager on patients with diabetes mellitus outcome; (b) the case manager intervention was running by nurse or community health workers; (c) we only conclude the patients with diabetes melitus. Furthermore,

the strategy for research was PECOS: 1) P (population): adult with diabetes mellitus; 2) E (exposure): case manager; 3) C (control): usual care; 4) O (outcome): better outcome; 5) S (Studies): all design of studies published in English only. Literature reviews, editorials, and studies not meeting the inclusion criteria were excluded.

Data extraction and quality assessment of studies

Two reviewers independently searched the electronic databases. Studies that were searched were exported to EndNote Reference Library software version 20.0.1 (Clarivate Analytics), and duplicates were screened and removed. Data extraction and quality assessment of included studies was performed simultaneously and independently by two reviewers. The National Heart, Lung, and Blood Institute scale 2014 was used to assess the quality of the randomized controlled trials studies. (Details of scoring are provided in Table 1).

Table 1
Quality assessment of randomized controlled trials studies using Critical Appraisal Skills Programme (CASP) Randomised Controlled Trials Checklist

No	Questions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	Did the trial address a clearly focused issue?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2.	Was the assignment of patients to treatments randomized?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3.	Were patients, health workers and study personnel blinded?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4.	Were the groups similar at the start of the trial?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5.	Aside from the experimental intervention, were the groups treated equally?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
6.	Were all of the patients who entered the trial properly accounted for at its conclusion?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
7.	How large was the treatment effect?	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
8.	How precise was the estimate of the treatment effect?	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
9.	Can the results be applied in your context? (or to the local population?)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10.	Were all clinically important outcomes considered?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
11.	Are the benefits worth the harms and costs?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Y= Yes; I=describe in quality assessment section.

Statistical analysis

Review Manager (version 5.3. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014) was used for all statistical analyses. We did not conduct statistical analysis data because the outcome of effect size did not match.

Results

Literature search results

The initial search of the three electronic databases yielded 766 potential studies. After exclusions based on titles and abstracts, the full texts of 15 studies were read for possible inclusion. A total of 15 studies remained for qualitative analysis. Figure 1 summarizes the results of our literature search

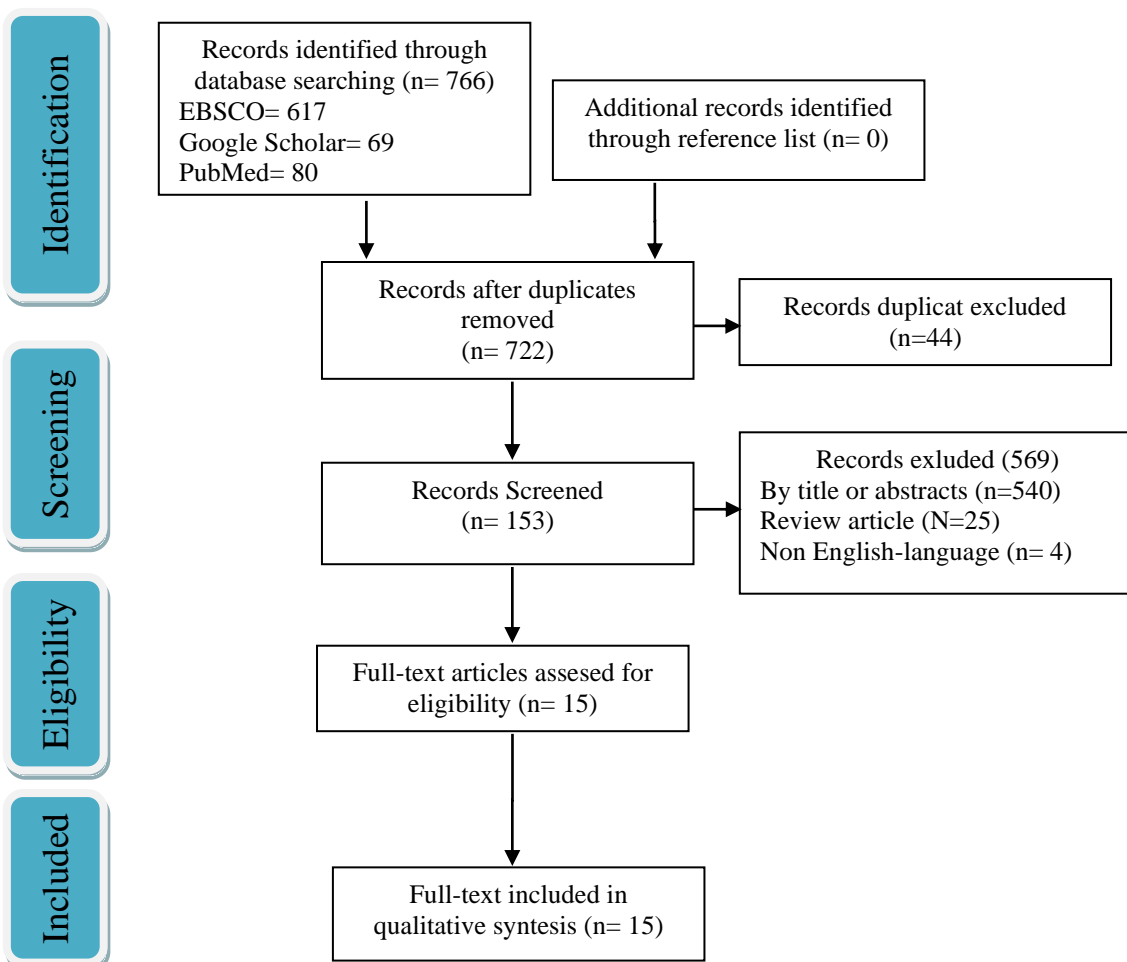


Figure 1. PRISMA flow diagram for systematic reviews and meta-analysis which included searches of databases

Study characteristics

Table 2 provides the basic characteristics of the included studies. Our analysis included 15 published studies¹³⁻²⁷. Thirteen studies were randomized controlled trials and 1 study was a quasi experiment. In total, 4,113 respondents were involved in this review. Twelve studies was from USA, one from Australia, China, and Nepal each.

Table 2
Basic characteristics of selected studies

No	Author (Year)	Country	Study Design	Sample Size (Year/ Mean)	Intervention	Outcome
1.	Babamoto et al., (2006)	USA	Randomized controlled trial (RCT).	189 (18 years older)	Community Health Worker Intervention	That people with the case manager interventions achieved greater improvements than did the controls in program measures: general health status, emergency department utilization, dietary habits, physical activity, and medication adherence. They also had 2.9 times greater odds of decreasing body mass index
2.	Carrasquillo et al., (2017)	Florida, USA	RCT	300 (18-65)	Community Health Worker Intervention	Systolic blood pressure (SBP): The reduction in SBP did not meet the preplanned target and was not statistically significant in unadjusted models. LDLC: No significant differences in LDLC levels. Post hoc analyses suggest that the intervention

						may be more beneficial among those with worse control of their type 2 diabetes at baseline.
3.	DePue et al., (2013)	USA	RCT	268 (55)	Primary care-based nurse-community health worker	HbA1c: At 12 months, mean HbA1c was significantly lower among intervention participants, compared with usual care, after adjusting for confounders. There were no significant differences in blood pressure, weight, or waist circumference at 12 months between groups.
4.	Edelman et al., (2015)	USA	RCT	377 (10.9)	A tailored telephone-delivered behavioral nurse intervention	HbA1c: at 24 months, intervention patients had similar A1c and SBP values compared to control patients. Likewise, Diastole (DBP) and Physical activity levels were similar between control and intervention patients. Results were also similar at the 6- and 12-month time points.
5.	Egede et al., (2017)	USA	RCT	255	12 telephone-delivered 30-min intervention sessions specific to their assigned group.	HbA1c: HbA1c at 12 months for the intervention groups did not differ significantly from that of the control group.

						For African Americans with poorly controlled type 2 diabetes, combined education and skills training did not achieve greater reductions in glycemic control (i.e., HbA1c levels) at 12 months compared to the control group, education alone, or skills training alone.
6.	Gabbay et al., (2013)	Pennsylvania, USA	RCT	545	Nurse Case Management	SBP: Systolic BP was better in the intervention group. HbA1c, LDL, and diastolic BP improved in both groups. Depression symptom scores were better in the intervention group.
7.	Gary et al., (2009)	USA	RCT	488	Nurse Case Manager and a Community Health Worker Team	ER Visit: At 24 months, compared with the minimal intervention group, those in the intensive intervention group were 23% less likely to have ER visits. In on-treatment analyses, the rate reduction was strongest for patients who received the most Nurse Case Manager and Community Health Worker visits.
8.	Gyawali et al.,	Nepal	RCT	244	Female	Fasting blood

	(2021)				Community Health Volunteer-Delivered Intervention	glucose: At 12-month follow-up, the mean fasting blood glucose decreased by 22.86 mg/dL in the intervention group, whereas it increased by 7.38 mg/dL in the control group. The mean reduction was 27.90 mg/dL greater with the intervention. SBP: In secondary outcome analyses, there was a greater decline in mean systolic blood pressure in the intervention group than in the control group. There was detectable difference in the intake of antihyperglycemic medication between the groups.
9.	LeBrón et al., (2021)	Michigan, USA	RCT	326	Community health worker diabetes intervention	Knowledge: The group-based healthy lifestyle component was significantly associated with improved knowledge. Self-management: The group-based self-management section was significantly associated with reduced diabetes-related distress.

						Self efficacy: Intervention class attendance was positively associated with self-efficacy.
10.	McDermott et al., (2015)	Queens-land, Australia	RCT	213	Community health workers	HbA1c: HbA1c reduction was significantly greater in the intervention group. There were no significant differences between the groups for blood pressure, lipid profile, BMI or renal function. Intervention group participants were more likely to receive nutrition and dental services according to scheduled care plans. Smoking rates were unchanged.
11.	Ni et al., (2019)	China	A quasi-experimental	179	Nurse-Led Multidisciplinary Team Management	HbA1c: During the 24-month project, the intervention group demonstrated 1.08% reduction in HbA1c, whereas the control group achieved an increase of 0.45%. The differences between the two groups were statistically significant. QOL: The intervention group showed greater increase in QOL scores. Hospitalization: More decrease

						in hospitalization compared with the control group. Seeking help from nurses: The percentage increase of seeking help from nurses in the intervention group was significantly greater than that in the control group after the intervention.
12.	Rothschild et al., (2014)	Chicago, USA	RCT	144	Community Health Worker Intervention	A1c: Intervention participants showed significantly lower hemoglobin A1c levels than control participants at both year. Blood Pressure: We observed no effect on blood pressure control, glucose self-monitoring, or adherence to medications or diet. Physical Activity: Intervention participants increased physical activity from a mean of 1.63 days per week at baseline to 2.64 days per week after 2 years.
13.	Skelly et al., (2009)	USA	RCT	180	Nursing Interventions	HbA1c: HbA1c declined significantly in the whole sample (0.57%) with no differences

						<p>between study arms. Participants in the booster arm decreased HbA1c by 0.76%. Symptom distress, perceived quality of life, impact of diabetes, and self-care activities also improved significantly for the whole sample with no significant differences between study arms.</p>
14.	Spencer et al., (2011)	Michigan, USA	RCT	183	Community Health Worker Intervention	<p>HbA1c: Participants in the intervention group had an improved at 6 months, for an adjusted change. There was no change in mean HbA1c among the control group. Intervention participants also had significantly greater improvements in self-reported diabetes understanding compared with the control group.</p>
15.	Spencer et al., (2018)	Michigan, USA	RCT	222	Community Health Worker and Peer Leader	<p>HbA1c: Participants in the community health worker intervention at the 6-month follow-up had greater decreases in HbA1c and in diabetes distress compared with enhanced</p>

						<p>usual care. Community health worker+Peer Leader participants also had significantly fewer depressive symptoms at 18 months compared with enhanced usual care. Participants in community health worker-led diabetes self-management education had significant improvements in diabetes social support and in understanding of diabetes self-management at 6 months relative to enhanced usual care, but these intervention effects were not sustained at 18 months.</p>
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Quality assessment

In general, most of the studies included were of reasonable methodological quality and the abstract of the included studies was able to provide adequate information particularly on the aims, methods and findings of each study.. All studies used the standart measurement of outcome (HbA1c, SBP, DBP, etc). All studies used proper statistical measurement with 95% confidence interval. However some studies presented results with insignificant difference statistically.

Results of the review

Impact of the case manager on HbA1c

Studies by DePue et al., (2013); McDermott et al., (2015); Ni et al., (2019); Rothschild et al., (2014); Skelly et al., (2009); Spencer et al., (2011); Spencer et al., (2018) stated that HbA1c in intervention (case manager group) decreased or declined significantly compared to control group (usual care group or group with no case manager intervention). Meanwhile, Edelman et al., (2015); Egede et al.,

(2017); Gabbay et al., (2013) stated that there was no significantly difference on HbA1c level in both intervention and control group.

Impact of the case manager on blood pressure

Only two studies by Gabbay et al., (2013) and Gyawali et al., (2021) stated that there is a better improvement on blood pressure in intervention group compared to control group. Meanwhile, study results by Carrasquillo et al., (2017); Edelman et al., (2015); McDermott et al., (2015); Rothschild et al., (2014) observed no effect on blood pressure control. Case manager also had impact on LDLC, depression symptom, ER visit, hospitalization, fasting blood glucose, knowledge and self management related diabetes, the intake of antihyperglycemic medication, QOL, physical activity, BMI or weight or waist circumference, renal function, nutrition and dental services, smoking and seeking help from nurses. Study by Carrasquillo et al., (2017) and Gabbay et al., (2013) observed no significant different on LDLC level after the intervention on group treatment compared to control group.

Studies by Gabbay et al., (2013), Skelly et al., (2009), and Spencer et al., (2018) observed decrease in depression symptom or diabetes distress in intervention group compared to control group. Gary et al., (2009) and Ni et al., (2019) stated that ER visit and hospitalization decreased both in intervention group compared to control group. Gyawali et al., (2021) observed decrease in fasting blood glucose in intervention group compared to control group. Studies by LeBrón et al., (2021), Skelly et al., (2009), Spencer et al., (2011), and Spencer et al., (2018) stated that knowledge, self management/ care and self efficacy related diabetes were better in intervention group than in control group. Futhermore, Skelly et al., (2009) and Ni et al., (2019) stated that QOL also improved more intervention group. Babamoto et al., (2006) and Gyawali et al., (2021) observed detectable difference in the intake of antihyperglycemic medication between the groups.

Babamoto et al., (2006), Edelman et al., (2015), and Rothschild et al., (2014) had different conclusion on the effect of case management on physical activity which stated simillar in both groups or increased in intervention group, respectively. Babamoto et al., (2006), DePue et al., (2013), and McDermott et al., (2015) stated that there were no significant differences between the groups for BMI, weight, and waist circumference. Study by McDermott et al., (2015) and Babamoto et al., (2006) observed no difference in renal function between two groups and smoking rate was unchanged. However, intervention group tends to have more nutrition and dental services. Ni et al., (2019) stated that the percentage increase of seeking help from nurses in the intervention group was significantly greater than that in the control group after the intervention.

Discussion

There are findings of this review are simillar with previous reviews^{28,29}. There is evidence that standard case management is superior on a number of domains. Results are not unanimous and factors contributing to this are worthcloser examination. It was found that most group of case manager interventions provided a good effect on HbA1c, SBP and DBP, LDL, fasting blood glucose,

diabetes distress, depression symptom, knowledge, self management/ care and self efficacy related diabetes, seeking help from nurses, intake of antihyperglycemic medication, physical activity, BMI, weight, waist circumference, nutrition and dental services, ER visit, and hospitalization, compared with usual care. However some study found there is no effect of group-based case manager interventions on HbA1c and blood pressure in patients with diabetes mellitus.

Once considered a disease of western society, type 2 diabetes mellitus (T2DM) has now spread globally, and Asia accounts for approximately 60% of the world's diabetic patients³⁰. Obesity and T2DM have become a serious public health problem³¹. Effective interventions must integrate coordination of care and discharge planning into today's best practice models. Case management using physician extenders (nurses, pharmacists, etc.) is a method that has previously been used to improve risk factor control³². The American Nurses Association has defined NCM as "a dynamic and collaborative approach to providing and coordinating health care services to a defined population. It is a participative process to identify and facilitate options and services for meeting individuals' health needs, while decreasing fragmentation and duplication of care and enhancing quality, cost-effective clinical outcomes"³³.

The nurse care manager intervention addresses important questions regarding the use of nurse case managers in overall diabetes care, the role of health care providers to initiate or intensify therapy when indicated, and the psychosocial effects of diabetes on emotional distress, quality of life, and self-care behaviors. If proven beneficial, nurse care manager could be integrated in practices worldwide with a substantial impact on improving costs, outcomes, and the lives of those with diabetes. The intervention could also be adapted to other chronic illnesses and conditions through other randomized, controlled interventions³⁴.

Limitation

Springer Link, ScienceDirect, and some other databases, were not included in our search; therefore, there is a risk of partial selection bias. In addition, the inclusion of only English literature may have resulted in selection bias for language limitations, which potentially affected the credibility of the pooled results of this study. Furthermore the prevalence of inpatient hyperglycemia in people without preexisting diabetes is mostly not captured in this studies. This study only accounts for those patients with a diagnosis of diabetes. Patients with stress induced hyperglycemia who also have increased risk of mortality and morbidity.

Conclusion

This review identified and summarized the available evidence from the 14 studies regarding the effectiveness of case manager by nurse and community health workers to improve diabetes outcome. The results suggest that overall group-based is associated with improved clinical and psychosocial outcomes and interventions underpinned by behavioural theory with longer contact hours and the inclusion of active, hands-on participatory sessions may maximize the

potential benefit of these programmes. Likewise, involving the participation of the multidisciplinary team may also be important. However, what we do not yet know is how to target the program in each region so that it is culturally appropriate. Beliefs and attitudes towards diabetes in ethnically diverse communities are varied, which suggests more research is needed.

Conflict of Interest Statement

No competing interests are declared by the authors of this article.

Source of Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Ethical Approval

Not needed.

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