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# The effect of home care on readmission and mortality rate in patients with diabetes who underwent general surgeries

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## Abstract:

**BACKGROUND:** More than one-half of people with diabetes need at least one surgery in their lifespan. Few studies have addressed how to manage the needs of these patients after discharge from the hospital. The present study is designed to determine the effect of home care on readmission of Type 2 diabetic patients who underwent surgical procedures.

**MATERIALS AND METHODS:** The present study was a randomized clinical trial. Sixty-nine patients with Type 2 diabetes undergoing surgery were assigned to the intervention and control groups via blocking order in the selected educational hospitals of Isfahan 2019. Home care was performed for 3 months with interprofessional team approach. Data collection tools were re-admission checklist. Data were entered in SPSS software version 23 and were analyzed by nonparametric tests.

**RESULTS:** The background characteristics in the intervention and control groups were not different. The frequency of readmission in the control and intervention groups from the time of discharge until 3 months later was 25.7% and 18.9%, respectively. Frequency of readmission in the intervention and control groups was not significant in 3 months from discharge,  $P > 0.05$ . The mortality rate was 11.4% and 0% in control and intervention groups, respectively,  $P < 0.05$ .

**CONCLUSION:** It can be argued that continued home care can decrease the rate of readmission and mortality rate in patients with Type 2 diabetes who will discharge from surgical wards.

## Keywords:

Home care, home visit, mortality, readmission, Type 2 diabetes

## Introduction

Patients with diabetes account for a significant proportion of hospitalized patients and a significant cost of hospital admissions.<sup>[1]</sup> The expenditure of hospitalization for people with diabetes is two to three times higher than for people without diabetes, and the complications of diabetes also lead to increased hospitalization costs and longer hospital stays.<sup>[2]</sup>

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The high prevalence of diabetes, especially in developing countries such as Iran, as well as the increase in the life expectancy of patients with diabetes, has increased the need for surgery in these patients.<sup>[3,4]</sup> More than one-half of people with diabetes need at least one surgery in their lifetime. In addition, specific surgeries performed to treat diabetes and its complications such as pancreas transplantation, kidney transplantation, retinopathy treatment, peripheral vascular diseases, debridement, and lower limb amputation are on the rise.<sup>[3,4]</sup>

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Hospitalization of patients with diabetes is not only associated with high costs to the patient and the family and the healthcare system but also the readmission of these patients will increase costs and other serious problems for patients and healthcare systems.<sup>[5]</sup> Despite the complexity of diabetes treatment, the acquiring of self-management skills and adherence to them in these patients lead to health and quality of life promotion and hospitalization cost reduction.<sup>[6,7]</sup>

Prolonged hospital stays and readmission rates more than 1 month after discharge are higher in patients with diabetes than in nondiabetics, and this trend is steadily increasing.

In recent studies, readmission up to 30 days after discharge from hospital for patients with diabetes is estimated at 14.4%–22.7%, which is much higher than all hospitalized patients.<sup>[8]</sup> Patients with uncontrolled hyperglycemia and/or severe hypoglycemia are at higher risk for readmission to the hospital.<sup>[9]</sup> Readmission not only has a negative impact on the quality of life of the patient and the patient's family but also has adverse effects on the healthcare system. Further, the incidence of treatment complications in patients with readmission is more severe. Increasing the duration of hospitalization and subsequent increase in costs for the patient and family are other consequences of readmission. Rehospitalization is also associated with increased mortality.<sup>[10,11]</sup>

Hospital readmission is an undesirable outcome that can be prevented. Recently, more attention has been paid to the readmission of patients with diabetes.<sup>[1]</sup> If a comprehensive strategy such as home care is focused to reduce the stressors of the syndrome after discharge, up to 22% of admission and readmission of patients with diabetes can be prevented.<sup>[9]</sup> Home care can reduce the number of readmissions, increase the overall quality of life of patients with chronic diseases, and at the same time reduce the rising healthcare costs.<sup>[12]</sup>

Continuity of home care is a comprehensive approach for the patient and family to improve prevention and treatment of chronic conditions.<sup>[13]</sup> For patients with diabetes, home care can consider as an effective approach for diabetes self-management education (DSME). DSME is one of the best strategies for improving DM self-management and is critical for patient empowerment, glycemic management, and DM complication prevention.<sup>[14]</sup> Numerous studies conducted in different countries in the form of clinical trial studies, systematic review, retrospective cohorts, or descriptive point to the benefits of home care in relation to various diseases, including diabetes, but none of these studies specifically assess the impact of home care on the readmission of diabetic patients who have undergone surgery.<sup>[15-18]</sup> The aim of this study was to determine the

effect of home care on the readmission rate of patients with diabetes who have undergone surgery and are being discharged from the hospital.

## Materials and Methods

### Study design and setting

The present study was a randomized controlled clinical trial (IRCT20190730044386N1). The data collection lasted from August to December 2019 in the selected educational hospitals of Isfahan.

### Study participants and sampling

The sample size of the study was 72 patients with Type 2 diabetes undergoing surgery to be discharged from the hospital with a minimum age of 45. Patients were randomly assigned to the intervention and control groups by permuted block randomization.

### Data collection tool and technique

The data collection tool was a researcher-made readmission checklist. The checklist had seven items including date of readmission, chief complaint (hypoglycemia, hyperglycemia, complications of surgery [bleeding, infection, adhesions, and embolism], and other causes), medical diagnosis, duration of readmission, hospital of admission, ward, and date of discharge. The validity of the checklist was confirmed by five faculty members of the School of Nursing and the Endocrine and Metabolism Research Center. This checklist was given to the patients in the control group at the time of sampling, and the patients were asked to complete the checklist for 3 months each time they were hospitalized. The researcher reminded the patients in the control group about the completion of the checklist by frequent regular telephone calls. In patients in the intervention group, the checklist was completed by the researcher for 3 months each time the patient was readmitted to the hospital.

In the intervention group, the researcher obtained written consent from the patient and his/her family members to enter the patients' homes. Based on the data obtained from the initial assessment of the patient in the hospital, the nurse determined the date of the patient's first visit at home for 24–72 h after discharge. At the first home visit, the patients' educational and care needs were determined, and based on that, the date and next visit of the nurse to the home for educational and care activities were planned with the help of the patient and family members. In addition, the researcher's contact number was provided to patients and their families so that they could contact the nurse whenever they had a problem outside of the designed home visit. The nurse's actions at home for the patient included changing dressings, monitoring blood sugar, adjusting the amount of injectable and oral diabetes medications under the

supervision of the endocrinologist, and adjusting the patient’s diet in consultation with the nutritionist.

Data were analyzed with parametric and nonparametric statistical tests via SPSS version 23.0 statistical software (SPSS, Inc., Chicago, IL, USA). One-way analysis of variance was used for quantitative variables confirming the assumption of normal data distribution and for qualitative variables with nominal scale. Chi-square test was used.

### Ethical considerations

The necessary authorization for conducting the study was obtained from the Ethics Committee of the Isfahan University of Medical Sciences with the code IR.MUI.RESEARCH.REC.1398.210. The researcher then obtained informed consent from all participants in the hospital, introducing herself and explaining the study goals. The researcher completed the informed consent form for each participant. Participants were free to leave the study at any stage, and there was no loss and damage for them.

## Results

In the intervention and control groups, 40.54% and 54.29% of the patients were men, respectively. Chi-square test with  $P = 0.655$  did not show a significant difference in terms of sex distribution between the two groups. The mean age was  $59.26 \pm 13.26$  years in the intervention group and  $64.47 \pm 13.78$  years in the control group. ANOVA test with  $P = 0.123$  did not show a significant difference between the mean age of patients in the two groups. The highest frequency of duration of diabetes in each of the intervention and control groups was between 1 and 10 years. Chi-square test with  $P = 0.949$  did not show a significant difference in terms of duration of diabetes in the two groups. The highest frequency of surgery in both intervention and control groups was skeletal and gastrointestinal surgery, respectively. Chi-square test with  $P = 0.274$  did not show a statistically significant difference between patients in the two groups in terms of type of surgery [Table 1].

Although the frequency of readmission in the control group was higher than the intervention group from the time of discharge until 3 months later, Chi-square test with  $P = 0.488$  did not show a statistically significant difference between the two groups in terms of frequency of readmission [Table 2].

Among the readmission patients, 6 patients in the intervention group and 5 patients in the control group were females.

The highest frequency of readmission was in the first 2 weeks after discharge from the hospital in each of the intervention and control groups [Table 3].

**Table 1: Distribution of readmission in intervention and control groups over a quarterly period**

| Readmission | Frequency (%) |           |            | $\chi^2$ | P     |
|-------------|---------------|-----------|------------|----------|-------|
|             | Intervention  | Control   | Total      |          |       |
| Yes         | 7 (18.9)      | 9 (25.7)  | 16 (22.22) | 0.481    | 0.488 |
| No          | 30 (81.1)     | 26 (74.3) | 56 (77.78) |          |       |
| Total       | 37 (100)      | 35 (100)  | 72 (100)   |          |       |

**Table 2: Distribution of time-based readmission in the intervention and control groups**

| Readmission time                           | Frequency (%) |           |           |
|--|---------------|-----------|-----------|
|  | Intervention  | Control   | Total     |
| First 2 weeks                              | 4 (57.14)     | 4 (44.45) | 8 (50)    |
| Second 2 weeks                             | 1 (14.29)     | 2 (22.22) | 3 (18.75) |
| 2 <sup>nd</sup> and 3 <sup>rd</sup> months | 2 (28.57)     | 3 (33.33) | 5 (31.25) |
| Total                                      | 7 (100)       | 9 (100)   | 16 (100)  |

The intervention and control groups were not different in terms of the reasons for readmission ( $P = 0.334$ ) [Table 4]. The frequency of mortality in the control group was 11.4% and mortality did not occur in the intervention group. Chi-square test with  $P = 0.034$  showed a significant difference in the frequency of mortality between the two groups.

## Discussion

Considering that readmission of patients with diabetes has serious consequences for the patient and family, healthcare system, and society, the findings of several studies indicate that by adopting practical strategies, the rate of readmission of patients with diabetes can be reduced. The aim of this study was to investigate the effect of home care on the readmission rate of diabetic patients who underwent surgery.

In the present study, the readmission rate during 3 months was 22.22%. In a case-control study by Hatam *et al.*, 26.8% of patients who were readmitted had diabetes.<sup>[19]</sup> The readmission rate of patients with diabetes in Hatam *et al.*'s study is close to the present study, and patients in both studies underwent general surgery. Considering the difference between the target population in the present study and Hatem *et al.*'s study, it is better to interpret the proximity of the readmission percentage in the two studies with more caution. Further, in a study of 4769 inpatients, diabetes was associated with a statistically significant re-admission risk of 40% over 3 months.<sup>[19]</sup>

The highest frequency of readmission in the intervention and control groups was in the first 2 weeks after discharge. In the study by Maru *et al.* 2017, three quarters (75%) of patients had readmission during 2 weeks after discharge from hospital. The rate of readmission of patients with diabetes in a retrospective cohort with a sample size of

**Table 3: Distribution of causes of readmission in a quarterly period in the intervention and control groups**

| Readmission causes       | Frequency (%) |           | $\chi^2$ | P     |
|--------------------------|---------------|-----------|----------|-------|
|                          | Intervention  | Control   |          |       |
| No readmission           | 30 (81.1)     | 26 (74.3) | 3.39     | 0.334 |
| Hypoglycemia             | 0             | 2 (5.7)   |          |       |
| Complications of surgery | 3 (8.1)       | 5 (14.3)  |          |       |
| Other causes             | 4 (10.8)      | 2 (5.7)   |          |       |
| Total                    | 37 (100)      | 35 (100)  |          |       |

**Table 4: Distribution of mortality in a quarterly period in the intervention and control groups**

| Postdischarge mortality | Frequency (%) |           | $\chi^2$ | P     |
|-------------------------|---------------|-----------|----------|-------|
|                         | Intervention  | Control   |          |       |
| Yes                     | 0             | 4 (11.4)  | 4.47     | 0.034 |
| No                      | 37 (100)      | 31 (88.6) |          |       |
| Total                   | 37 (100)      | 35 (100)  |          |       |

17,284 was 20.4% in the period of 30 days after discharge.<sup>[20]</sup> In addition, the results of the retrospective study by Ostling *et al.* with a sample size of 37,702 showed a readmission rate of 20.9% among patients with diabetes over a period of 1 month.<sup>[11]</sup> The reason for the difference in readmission rate within 1 month after discharge in the present study compared to the studies by Ostling and Karankarn could be due to the difference in sample size. Hajikazemi *et al.*, 2002 conducted a study of three home visits for 6 months for patients with heart failure. The rate of readmission in patients in the intervention group was significantly lower than in the usual treatment group.<sup>[21]</sup> According to the findings of Hajikazemi *et al.*, it seems that the short duration of the home care in the present study is related to the statistically insignificant difference in the frequency of readmission in the intervention and control groups. Lembec *et al.*, 2019 in a clinical trial investigated the effect of single follow-up home visit on readmission in a group of frail elderly patients. The results did not show a statistically significant difference in readmission rate in the intervention and control groups.<sup>[22]</sup>

Rubin, 2018 in a review of literature found that male sex is a risk factor for readmission,<sup>[23]</sup> and a systematic review of identifying readmission predictors showed that women compared to men are at less risk of being readmitted within 1 month after discharge. However, in the present study, the most re-admitted patients were women. Sang Soh *et al.* pointed to issues such as women having more support and self-management education, as factors protecting women from readmission.<sup>[24]</sup> In the present study, despite the fact that the patients in the intervention group had the support and education of diabetes self-management, the frequency of readmission of women patients was significantly higher than men. Poor health literacy is one of the particular important

factors in readmission. Rubin, 2018 concluded that patients with lower health literacy may not remember discharge training or had difficulty understanding the subjects that has been taught to them.<sup>[23]</sup> Similarly, in the present study, the majority of patients were illiterate.

In the present study, despite four deaths in patients in the control group, there was no mortality in the intervention group. This finding could confirm the positive effect of home care in diabetic patients who have undergone surgery. Turki *et al.*, 2018, conducted a clinical trial to investigate the effect of home visits on self-management behaviors and glycated hemoglobin (HbA1C). After 3 months, there was a significant reduction in HbA1C and improvement in self-management behaviors in the intervention group.<sup>[25]</sup>

### Limitation and recommendation

It seems that it is the first study that has investigated the effect of home care on readmission of people with diabetes undergoing general surgery in Iran and probability around the world. Despite the lower number of readmissions in patients receiving home care, this difference was not statistically significant, which can be due to the short duration of the follow-up period, so it is recommended that this study be done with a longer follow-up period.

### Conclusion

Patients with diabetes who underwent surgery have higher readmission rates than patients without known diabetes. Numerous studies have dealt with the factors influencing the readmission of patients with diabetes. It is necessary to focus on the application of strategies that can help reduce readmission through DSME and patient support to cover their care needs. Home care is one of the best solutions in this regard. It seems that expanding the team approach in providing home care services and continuing home care over time will have a greater and more lasting effect on improving patient outcomes and will help reduce readmission.

### Ethical considerations

The necessary authorization for conducting the study was obtained from the Ethics Committee of the Isfahan University of Medical Sciences with the code IR.MUI.RESEARCH.REC.1398.210. The researcher then obtained informed consent from all participants at the hospital, introducing herself and explaining the study goals. The researcher completed the informed consent form for each participant. Participants were free to leave the study at any stage, and there was no loss and damage for them.

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### Conflicts of interest

There are no conflicts of interest.

## References

1. Karunakaran A, Zhao H, Rubin DJ. Pre-and post-discharge risk factors for hospital readmission among patients with diabetes. *Med Care* 2018;56:634.
2. Dungan KM. The Effect of Diabetes on Hospital Readmissions. *J Diabetes Sci Technol* 2012;6(5):1045-1052
3. King JT Jr., Goulet JL, Perkal MF, Rosenthal RA. Glycemic control and infections in patients with diabetes undergoing noncardiac surgery. *Ann Surg* 2011;253:158-65.
4. Shahrzad M, Ardeshiri M, Aghakhani SH. Surgery in diabetic patients: A review article. *Iran J Diabetes Metabol* 200;1:107-14.
5. Maru S, Byrnes J, Carrington MJ, Chan YK, Stewart S, Scuffham PA, *et al.* Economic evaluation of a nurse-led home and clinic-based secondary prevention programme to prevent progressive cardiac dysfunction in high-risk individuals: The Nurse-led Intervention for Less Chronic Heart Failure (NIL-CHF) randomized controlled study. *Eur J Cardiovasc Nurs* 2017;17:439-45.9
6. Kashani F, Abazari P, Haghani F. Challenges and strategies of needs assessment implementing in diabetes self-management education in Iran: A qualitative study. *Iran J Nurs Midwifery Res* 2020;25:437-43.
7. Kashani F, Abazari P, Haghani F. The components of diabetes educator's competence in diabetes self-management education in Iran: A qualitative study. *J Educ Health Promot* 2021;10:111.
8. Sonmez H, Kambo V, Avtanski D, Lutsky L, Poretsky L. The readmission rates in patients with versus those without diabetes mellitus at an urban teaching hospital. *J Diabetes Complications* 2017;31:1681-5.1
9. Association AD. Economic costs of diabetes in the US in 2012. *Diabetes Care* 2013;36:1033-46.
10. Maliakkal AV, Sun AZ. Home care program reduces hospital readmissions in patients with congestive heart failure and improves other associated indicators of health. *Home Health Care Manag Pract* 2014;26:191-7.
11. Ostling S, Wyckoff J, Ciarkowski SL, Pai CW, Choe HM, Bahl V, *et al.* The relationship between diabetes mellitus and 30-day readmission rates. *Clin Diabetes Endocrinol* 2017;3:1-83.
12. Sadjadi SH, Alimohammadzadeh K, Hosseini SM. Assessment of prevalence of readmission in admitted ward of Tehran Oil Company's hospital in 2016. *J Urmia Nurs Midwifery Fac* 2018;16:1-11.
13. Moro JV, Caliri MH. Pressure ulcer after hospital discharge and home care. *Esc Anna Nery* 2016;20(3):e20160058
14. Yazdani F, Abazari P, Haghani F, Iraj B. Restrictors of the effectiveness of diabetes self-management education: A qualitative content analysis. *J Educ Health Promot* 2021;10:18.
15. Khodaveisi M, Miri F, Omidi A, Karami M, Vardanjani A, Mohammadi N. The effects of home-based nursing care on metabolic control among patients with type ii diabetes mellitus: A randomized clinical trial. *Nurs Midwifery Stud* 2018;7:1-5.
16. Garg R, Hurwitz S, Rein R, Schuman B, Underwood P, Bhandari S. Effect of follow-up by a hospital diabetes care team on diabetes control at one year after discharge from the hospital. *Diabetes Res Clin Pract* 2017;133:78-84.
17. Hirschman KB, Bixby MB. Transitions in care from the hospital to home for patients with diabetes. *Diabetes Spectr* 2014;27:192-5.
18. Wei NJ, Nathan DM, Wexler DJ. Glycemic control after hospital discharge in insulin-treated type 2 diabetes: A randomized pilot study of daily remote glucose monitoring. *Endocr Pract* 2015;21:115-21.1
19. Hatam N, Askarian M, Khamzade F, Jafari P, Bastani P. Readmission risk factors in patients of general surgery wards in Shiraz hospitals: Applying LACE index as a predictive indicator. *Acade J Surg* 2015;2:33-8.
20. Maru S, Byrnes J, Carrington MJ, Chan YK, Stewart S, Scuffham PA, *et al.* Economic evaluation of a nurse-led home and clinic-based secondary prevention programme to prevent progressive cardiac dysfunction in high-risk individuals: The Nurse-led Intervention for Less Chronic Heart Failure (NIL-CHF) randomized controlled study. *Eur J Cardiovasc Nurs* 2018;17:439-45.
21. Hajikazemi E, Falahat K, Assemi S, Hosseini F. Effect of home visit on hospital readmission. *Iran J Nurs* 2002;14:51-8.
22. Lembeck MA, Thygesen LC, Sørensen BD, Rasmussen LL, Holm EA. Effect of single follow-up home visit on readmission in a group of frail elderly patients – A Danish randomized clinical trial. *BMC Health Serv Res* 2019;19:751.
23. Rubin DJ. Correction to: Hospital readmission of patients with diabetes. *Curr Diab Rep* 2018;18:21.1
24. Soh JG, Wong WP, Mukhopadhyay A, Quek SC, Tai BC. Predictors of 30-day unplanned hospital readmission among adult patients with diabetes mellitus: A systematic review with meta-analysis. *BMJ Open Diabetes Res Care* 2020;8:e001227.
25. Torki-Harchegani F, Shirazi M, Keshvari M, Abazary P. The effect of home visit program on self – Management behaviors and glycemic control in patients with type 2 diabetes treated with insulin. *J Isfahan Med Sch* 2020;38:310-6.