Risk factors for hospital readmission among home health care patients at PSMMC, Riyadh, Saudi Arabia, 2019

Lamees Alruwaili, Tariq Alsaid and Mostafa Kofi

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Abstract

**Background:** Worldwide the home health care (HHC) has many benefits. It improves countries health systems and clinical outcomes of patients, it is good solution for bed occupancy in hospitals. Home Health care (HHC) provides nursing services supported with Medicare for patients with chronic medical issues that prevent them from leaving the home.

**Objectives:** This study aimed to describe frequency and rate of readmission to hospital by HHC patients according to diagnoses, and identify the factors associated with non-elective, readmission of HHC patients, at PSMMC, Riyadh, Kingdom of Saudi Arabia, 2019.

**Methods:** Cross-sectional study with a total number of participants 213 done by using self-administered chart review.

**Result:** A total of 213 Saudi health care patients participated, and most of them were in the age group of 75-85 years. The overall prevalence of readmission was 43.66%, and it was significantly higher among males at 55.81%. Poly-pharmacy and diabetes mellitus were the highest frequent causes of readmission at 75.27% and 65.59%, respectively. A significantly higher percentage of readmitted subjects have urinary tract infection and on NGT at 8.60% and 13.89% vs. 1.67% and 5% on the not readmitted group, respectively. On the other hand, the functional disability severity frequency and hypothyroidism were higher in the not readmitted groups compared to the readmitted one at 46.67%, and 27.5% vs. 32.26 and 12.9%, respectively. There was a significant difference between the two groups in the distance 25Km from central Riyadh. Male gender is associated with more than two folds risk of non-elective readmission of HHC compared to females, with OR =2.30, and a P-value of 0.004. Patients with urinary tract infections were more than five folds (OR= 5.55, P= 0.033) at risk of readmission, and those with surgical interventions have 6.91 folds increased risk of readmission. Besides, patients on NGT and those treated with a multidisciplinary team have OR of 3.09, and 3.41 to be readmitted with a significant P-value (<0.05). HHC patients with a distance of 25 km\(^2\) from the central region have more than 17 fold risk of readmission (P 17.31 and P 0.006). After multivariate adjustment, only male gender, multiple team treated patients and distance 25 km from central Riyadh were the factors that showed a significant (P< 0.05) increased risk of HHC patients readmission, with OR of 2.243, 3.206, and 15.336.

**Keywords:** Home care patients, home health care rehospitalization, home care readmission, home care risk factors

Introduction

Worldwide the home health care (HHC) has many benefits. It improves countries health systems and clinical outcomes of patients, it is good solution for bed occupancy in hospitals. Home Health care (HHC) provides nursing services supported with Medicare for patients with chronic medical issues that prevent them from leaving the home.

"In Saudi Arabia, an HHC Program was developed at King Faisal Specialized Hospital and Research Center in 1991 for patients with terminal cancer (Gray & Ezzat, 1997)" [1]. At PSMMC the Program was established in May 1999, and accredited by JCI twice, the first time was in 2014 and the second in 2018. "In 2009, the program was established by the Saudi Ministry of Health, the main goal of this program is to "provide health services for all those who are in need of them, wherever they may be; in an endeavor to alleviate the suffering of waiting in hospitals or moving to get the service". HHC services are provided according to the international standards and within the framework of Islamic values and traditions of the society (Saudi Ministry of Health, 2011)" [1].
Methods
This is a cross-sectional study conducted on all patients, active file, who is listed in HHC program at PSMMC, readmission within 30 days of discharge. A self-administered chart review were distributed to total number of the current study participants was 213 around (83%), we excluded the uncompleted chart and it was 238. chart developed depending on national rate of acute care hospitalization for HHC, consists items of: socio demographic characteristic, clinical data, environmental data, clinical risk factors and rate of readmission, chart was divided by using non probability convenient sampling technique on all patients file, who is listed in HHC program at PSMMC Data were analyzed by using Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA). Continuous variables were expressed as mean ± standard deviation and categorical variables were expressed as percentages. Chi square test and Fisher exact test were used for categorical variables. Univariate and multivariate logistic regression were used to assess the association factors with non-elective readmission of HHC patients. A p-value <0.05 was considered statistically significant.

Results
We set out this cross-sectional survey study to assess the risk factors for hospital readmission among home health care (HCC) patients at PSMMC, Riyadh, Saudi Arabia, 2019. The socio-demographic data of the participants are shown in table (1). A total of 213 Saudi health care patients participated in the current study, most of them were in the age group of 75-85 years old, and more than half of them were females at 59.6% and married at 51.6%.

The frequency and rate of readmission to hospital by HHC patients are shown in table (2). The results showed that the overall prevalence of readmission was 43.66%, and it was significantly higher among males at 55.81% compared to females at 35.43%, with a P-value of 0.003. The readmission frequency did not differ significantly by age or marital status. The readmission was the highest among the age group of 35-44 years old at 60%, and absent among those aged 26-34, with a P-value of 0.938. For marital status, married participants showed the highest readmission frequency at 49.09%, while it was the lowest among divorced at 33.33%, with a P-value of 0.416.

The mean of times and duration of admission is shown in table (3). The mean (±SD) of times of readmission in the current study was 2.12(±2.40), and the mean (±SD) duration of admission was 7.80(±22.27) days.

Poly-pharmacy and diabetes mellitus were the highest frequent causes of readmission at 75.27% and 65.59%, respectively. There were statistically significant differences (all P values <0.05) between readmission and not readmitted patients in the current study in terms of urinary tract infection, patients on NGT, and functional disability severity. Since a significantly higher percentage of readmitted subjects have urinary tract infection and on NGT at 8.60% and 13.89% vs. 1.67% and 5% on the not readmitted group, respectively. On the other hand, the functional disability severity frequency and hypothyroidism were higher in the not readmitted groups compared to the readmitted one at 46.67%, and 27.5% vs. 32.26 and 12.9%, respectively. There was a significant difference between the two groups in terms of the number of home care days, surgical interventions being the highest in the readmitted group, multidisciplinary treatment team, and the distance 25Km from central Riyadh, where all P values were <0.05. For the remaining clinical characteristic, the differences between the two groups were statistically non-significant. Data is shown in table (4)

Table 1: Demographic characteristics of the patients

| Marital Status | Number (n=213) | % |
|----------------|---------------|---|
| Single         | 12            | 5.6|
| Married        | 110           | 51.6|
| Divorced       | 6             | 2.8|
| Widowed        | 85            | 39.9|

Table 2: Frequency and rate of readmission to hospital by HHC patients

| Gender     | Number | %   | P value |
|------------|--------|-----|---------|
| Overall    | 93     | 43.66|         |
| Male       | 48     | 55.81| 0.003*  |
| Female     | 45     | 35.43|         |
| Age        |        |      | 0.938   |
| 18-25      | 3      | 50.00|         |
| 26-34      | 0      | 0.00 |         |
| 35-44      | 3      | 60.00|         |
| 45-55      | 2      | 33.33|         |
| 56-64      | 8      | 50.00|         |
| 65-74      | 13     | 41.94|         |
| 75-85      | 64     | 43.54|         |
| Marital Status |     |      | 0.416   |
| Single     | 5     | 41.67|         |
| Married    | 54    | 49.09|         |
| Divorced   | 2     | 33.33|         |
| Widowed    | 32    | 37.65|         |

* Significant p value

Table 3: Mean of times and duration of admission

| How many times | Mean | SD |
|----------------|------|----|
|                | 2.12 | 2.40|
| Duration of admission | 7.80 | 22.27|

Table 4: Clinical and Environmental Characteristics of the patients

|                  | ALL (n=213) | Readmission (n=93) | Not readmission (n=120) | P value |
|------------------|-------------|--------------------|------------------------|---------|
| **Congestive heart failure** | Yes 36 | 16.90 | 19.35 | 18 | 15.00 | 0.400 |
|                  | No 177     | 83.10             | 80.65                  | 102     | 85.00 |         |
| **Peripheral vascular disease** | Yes 4     | 1.88             | 1.08                   | 3       | 2.50  | 0.447  |
Table 4: Cont…..

|                                      | ALL (n=213) | Readmission (n=93) | Not readmission (n=120) | P value |
|--------------------------------------|-------------|--------------------|-------------------------|---------|
|                                      | Number      | %                  | Number                  | %       |
|                                       |             |                    |                         |         |
|                                    |            | Number            | %                        |         |
|                                       |             | Number            | %                        |         |
| On o2                                | Yes 5      | 2.35              | 4                       | 4.30    | 1  | 0.83  | 0.079 |
|                                      | No 208      | 97.65             | 92                      | 98.92   | 117| 97.50 | 0.413 |
| Others                               | Yes 213     | 100.00            | 93                      | 100.00  | 120| 100.00| 0.782 |
|                                      | No 164      | 77.00             | 75                      | 80.60   | 89  | 72.50 | 0.018*|
| HTN                                  | Yes 69      | 32.4              | 25                      | 26.90   | 44  | 36.70 | 0.13  |
|                                      | No 144      | 67.6              | 68                      | 73.10   | 76  | 63.30 | 0.001*|
| Dyslipidemia                         | Yes 45      | 21.1              | 12                      | 12.90   | 33  | 27.50 | 0.13  |
|                                      | No 168      | 78.9              | 81                      | 87.10   | 87  | 72.50 | 0.107 |
| Hypothyroidism                       | Yes 24      | 11.3              | 14                      | 15.10   | 10  | 8.30  | 0.127 |
|                                      | No 189      | 88.7              | 79                      | 84.90   | 110 | 91.70 | 0.265 |
| IHD                                  | Yes 212     | 99.53             | 92                      | 98.92   | 120 | 100.00| 0.00  |
|                                      | No 1 0.47   | 1                 | 1.08                    | 0       | 0.00 |       |       |
| Lives alone                          | Yes 211     | 99.06             | 92                      | 98.92   | 119 | 99.17 | 0.684 |
|                                      | No 20 9.1   | 1                 | 1.08                    | 19      | 15.83 |       |       |
| Availability of Care giver          | Yes 193     | 90.61             | 92                      | 98.92   | 101 | 84.17 | <0.001*|
|                                      | No 211      | 99.06             | 91                      | 97.85   | 120 | 100.00| 0.016*|
|                                     | 1 week      | 18                | 8.5                     | 9.70    | 9   | 7.50  |       |
|                                     | 2 week      | 16                | 7.5                     | 5.40    | 11  | 9.20  |       |
|                                     | 2-4 week    | 54                | 25.4                    | 32.44   | 22  | 18.30 |       |
|                                     | 4-6 week    | 48                | 22.5                    | 19.04   | 29  | 24.20 |       |
|                                     | 1 month     | 56                | 26.3                    | 19.04   | 37  | 30.80 |       |
|                                     | 3 month     | 17                | 8.0                     | 5.40    | 12  | 10.00 |       |
|                                     | 6 month     | 4                 | 1.9                     | 4.30    | 0   | 0.00  |       |
|                                     | Hospital acquired infection | Yes 2 | 0.94 | 2 | 2.15 | 0 | 0.00 | 0.107 |
|                                      | No 211      | 99.06             | 91                      | 97.85   | 120 | 100.00|       |
|                                     | Surgical intervention | Yes 17 | 7.98 | 14 | 15.05 | 3 | 2.50 | 0.001*|
|                                      | No 196      | 92.02             | 79                      | 84.95   | 117 | 97.50 |       |
Table 5: Univariate logistic regression for the associated factors with non-elective, readmission of HHC patients

| Factor                        | Yes | No   | Odds ratio | 95% CI       | P value |
|-------------------------------|-----|------|------------|--------------|---------|
| Gender                        | Male| Female** | 2.30       | 1.32 - 4.03  | 0.004* |
| Stroke                        | Yes | No**  | 1.742      | 0.978 - 3.102| 0.059  |
| Urinary Tract infection       | Yes | No**  | 5.55       | 1.15 - 26.81 | 0.033* |
| Functional disability severity| Yes | No**  | 1.84       | 1.05 - 3.23  | 0.034* |
| On NGT                        | Yes | No**  | 3.09       | 1.13 - 8.47  | 0.028* |
| Hypothyroidism                | Yes | No**  | 0.39       | 0.19 - 0.81  | 0.011* |
| Distance 25Km from central Riyadh | Yes | No**  | 17.31      | 2.27 - 131.86| 0.006* |
| Surgical intervention         | Yes | No**  | 6.91       | 1.92 - 24.84 | 0.001* |
| Multiple team treated         | Yes | No**  | 3.41       | 1.52 - 7.62  | 0.002* |
| Home care days                | 1 week** | 1.00 | 1.00       |              |         |
|                               | 2 week | 2.20 | 0.54 - 8.96 | 0.271        |
|                               | 2-4 week| 0.69 | 0.24 - 2.01 | 0.493        |
|                               | 4-6 week| 1.53 | 0.51 - 4.54 | 0.447        |
|                               | 1 month | 1.95 | 0.66 - 5.72 | 0.225        |
|                               | 3 month | 1.33 | 0.38 - 4.72 | 0.656        |  

* Significant P value
** Used as a reference

Table 6: Multivariate logistic regression for the associated factors with non-elective, readmission of HHC patients

| Factor                        | Yes | No   | Odds ratio | 95% CI       | P value |
|-------------------------------|-----|------|------------|--------------|---------|
| Gender                        | Male| Female** | 2.243      | 1.195 - 4.213| 0.012* |
| Urinary Tract infection       | Yes | No**  | 3.224      | .624 - 16.667| 0.163  |
| Functional disability severity| Yes | No**  | .627       | .330 - 1.191 | 0.154  |
| On NGT                        | Yes | No**  | 2.959      | .972 - 9.010 | 0.056  |
| Hypothyroidism                | Yes | No**  | .493       | .220 - 1.104 | 0.086  |
| Distance 25Km from central Riyadh | Yes | No**  | 15.330     | 1.856 - 126.648| 0.011* |
| Surgical intervention         | Yes | No**  | 4.305      | .999 - 18.545| 0.050  |
| Multiple team treated         | Yes | No**  | 3.206      | 1.258 - 8.166| 0.015* |

* Significant P value
** Used as a reference
The univariate logistic regression for the associated factors with non-elective, readmission of HHC patients is shown in table (5). The results showed that the male gender is associated with more than two folds risk of non-elective readmission of HHC compared to females, with OR = 2.30, and a P-value of 0.004. Patients with urinary tract infections were more than five folds (OR = 5.55, P = 0.033) at risk of readmission, and those with surgical interventions have 6.91 folds increased risk of readmission. Besides, patients on NGT and those treated with a multidisciplinary team have OR of 3.09, and 3.41 to be readmitted with a significant P-value (<0.05). Functional disability severity was also significantly associated with increased risk of readmission (OR= 1.84, and P-value of 0.034). HHC patients with a distance of 25 km² from the central region have more than 17 fold risk of readmission (P 17.31 and P 0.006). The results also showed that the risk of readmission increased by increasing the number of home care days to one month, at three months of home care the risk started to decrease. The only factor that did not show a significant association with the risk of readmission in the current study was the history of stroke, where the OR was 1.742, but the P-value was 0.059.

When multivariate logistic regression analysis was done, only male gender, multiple team treated patients and distance 25 km from central Riyadh were the factors that showed a significant (P< 0.05) increased risk of HHC patients readmission, with OR of 2.243, 3.206, and 15.336, respectively, as shown in table (6).

Discussion

Identifying the prevalence, reason, and risk of hospital readmissions in patients receiving HHC is important as it is the first critical step in developing effective readmission reduction interventions specific to HHC. The current study revealed a high rate of all-cause readmission that exceeded 43% and was significantly associated with male gender, patients with UTI, patients on NGT, functional disability patients, hypothyroidism, a far distance from the central region, and the number of home care days. Compared to a recently published local study, the estimated readmission rate is considered far higher at 43.66% vs. 14.3%. However, it should be noted that the other study populations were with the major three chronic diseases (DM, HTN & Dementia), and the readmission was within the first 30 days from discharge, but the current study ones have different comorbid chronic conditions, and the assessed readmission was within 6 months, which could make the difference in the readmission rate. Similarly, a far lower readmission rate was reported by Ness and William Kramer, 2013 at 17.8% in the fourth quarter of 2012. Another study published in 2018 reported a readmission rate of 24% in 2001, which is nearly half of what we reported in our study. Based on these results, the current study finding shed the light on the urgent need for hospital readmission-reducing programs. In accordance with previously published studies, the current study showed that male gender is a risk factor for hospital readmission. On the other hand, there was no significant association between age and readmission rate, a finding which is in contrast to what has been reported in the literature.

Generally, our results are consistent with previous research identifying urinary tract infection as a significantly greater hazard of readmission. Therefore, targeting care and support to HHC patients with UTI is essential to reduce the readmission rate. In our study, 30% of UTI patients have a urinary catheter, a percentage that is higher than what is in the literature at approximately 20%, with the risk of catheter-UTI increasing by 3–7% per day. Therefore, it is recommended that a specialized person go to the
patient's home, insert the catheter, checkup on it, and prescribe the suitable treatment if needed to reduce the readmission rate. Similar findings were reported for patients on NGT, where the highest percentage of them were readmitted, which necessitate the need for a program for follow up and education for HHC patients on NGT to decrease their rate of readmission.

In their study, Greyesn SR et al. reported that functional impairments are associated with higher readmission rates, and the risk of readmission increased in a dose-response fashion as the severity of impairment increased [15]. In addition, small and single-site studies showed a consistent relationship between functional impairment and readmission [16-18]. The current study findings were different from these findings, since, for those with functional disability, the percentage of readmitted was lower than those who were not admitted. Such finding could be explained by the "good post-discharge environment" for patients with functional disability severity, that they might receive more interest, follow up, and care compared to mild cases. Also, there was no enough data for the researcher to assess the severity, therefore, it is recommended to use a functional disability assessment tool for HHC patients.

Previous studies focusing on heart failure (HF) patients reported that cardiac-related diagnosis and respiratory problems were the most common reasons for hospital readmissions [19-21]. Kang Y et al 2017 found that out of 526 HF patients receiving telehomecare, 80% of the hospital readmission was because of HF, other heart diseases, respiratory infection, cardiac dysrhythmia, and other respiratory problems [21]. In the current study, polypharmacy and diabetes mellitus were the most common reasons for readmission. Polypharmacy itself isn’t a direct cause of readmission, but it is well known that most of the HHC patients have different chronic diseases, and therefore, they are taking many drugs. Similarly, for diabetic patients, the readmission might be attributed mainly to the diabetes complications, not diabetes itself. Unfortunately, there was no enough data about diabetes complications in the current study. It is recommended that a detailed assessment about diabetes and its complication should be added and if they have a direct relationship with patients’ readmission. This might help in developing futures plans to decrease the readmission rates due to diabetes complications. Moreover, in contrast to these findings, our results showed no significant association between CHD, peripheral vascular disease, CHF, asthma, or COPD and the risk of readmission. A previous study assessed the Risk factors for 30-day hospital readmission in patients ≥65 years of age showed that patients who lived 50 miles or more from the first hospital were less likely to be readmitted, which could be due to under ascertainment of readmission [22]. This is in contrast to ur finding which showed that patients with a distance 25Km2 from central Riyadh have a significantly increased rate of readmission.

The current study has its limitations that include, the retrospective design that did not allow collecting detailed data, and the small sample size that was taken from HHC following one health care institution in the kingdom, therefore, the results cannot be generalized.

Conclusion

The current study revealed that hospital readmissions are prevalent among home care patients (HHC), and warrant more effort to prevent them. The risk factors for readmissions according to the current study findings are male gender, urinary tract infection, functional disability, on NGT, hypothyroidism, surgical interventions.

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