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Studying impact of home health care on hospital readmission rate in prince sultan military medical city, Riyadh, Saudi Arabia

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Abstract

Introduction: Every patient leaving hospital should have a system in place for post discharge follow up. Unsafe conditions in the home can lead to unnecessary or avoidable hospital readmission. Home Health Care (HHC) in Prince Sultan Military Medical City (PSMMC) is a crucial component on serving to reduce readmissions during the first 30-days post discharge from the hospital. The significance of discharge summaries with a care plan in place is a critical element to give positive outcomes for patients and peace of mind.

Objectives: This study aimed to measure PSMMC readmission rate among patient discharged to HHC division; and to compare it with readmission rate among patient discharged to their home; also; to identify factors affecting readmission at PSMMC after discharge to HHC division.

Methodology: Retrospective Cohort study design was conducted to study all discharged patient from PSMMC with the top three diseases (cardiovascular, Dementia and diabetes) and were followed for 30 days to measure the readmission rate among patient discharged to their home and those patient discharged to HHC division and a sample size of 414 patient was selected to study the related factors affecting the readmission rate.

Results: Home health care patient visits were associated with a significant reduction in PSMMC readmission rate by 50%. The most important related factors were developing multidisciplinary care plan, educating patient\ caregiver. There was no multidisciplinary patient care plan for (82.1%) of the patients discharged to HHC and readmitted to hospital, compared to (9.1%) of those who were not readmitted, ($P<0.001$). Regarding the other group who were discharged to their houses, there was no multidisciplinary patient care plan for (78.6%) of the patient discharged to patient house and readmitted compared to (15.9%) of the patient who were not readmitted, ($P<0.001$). Educating patients/care giver about diagnosis, care plan, medication plan and discharge plan was significant protective action against readmission in both groups of patients discharged to HHC or to their houses. Multiple regression analysis showed that; sharing assessment with HHC team is the only independent variable significantly reducing hospital readmission among patients discharged to HHC.

Conclusion: Home healthcare visits significantly reduce the PSMMC readmission rate by 50% with clear important factors that directly affect the rate which was mainly related to development of multidisciplinary care plan and educate the patient about this plan.

Recommendation: Planed and scheduled home visits according to patient need through multidisciplinary HHC team play an important role in reduction of the hospital readmission rate.

Keywords: Readmission rate, home health care, multidisciplinary care plan

Introduction

A hospital readmission is an episode when a patient who had been discharged from a hospital is admitted again within a specified time interval. Readmission rates have increasingly been used as an outcome measure in health services research and as a quality benchmark for health systems [1, 2].

Hospital readmissions first appeared in the medical literature in 1953 in work by Moya Woodside examining outcomes in psychiatric patients in London [3, 4]. Gradually, health services research increasingly examined hospital readmissions, in part as a response to rising health care costs and a recognition that certain groups of patients were high consumers of health care resources. These patients often had multiple chronic conditions and were repeatedly hospitalized to manage them. Over time, hospital readmission rates have become a common outcome measure in health services research, with a large body of literature describing them, including their frequency, their causes, which patients and which hospitals are more likely to have high rates of readmissions, and various methods to prevent them [5, 6, 7].

Preventing avoidable readmissions has the potential to profoundly improve both the quality of life for patients and the financial wellbeing of health care systems. According to Eric and his colleagues in 2017 there are over 35 million hospital discharges annually in the United States [13]. Among Medicare patients, which is a national health insurance program in the United States, almost 20 % who are discharged from a hospital to Medicare were readmitted within 30 days, and the cost of unplanned readmissions is 15 to 20 billion dollars annually [14)].

Different government agencies have applied many programs like discharging the patient to a different observation status such as Home Health Care (HHC), and Medicare setting. Instead of staying as an inpatient that will help to control the

rate of readmission and financial penalties for excess readmissions of patients [15].

In general, a definition for Home health care is clinical medical care provided by registered nurse, occupational therapists, physical therapist or other skilled medical professionals at the home of the patient which are linked to the care plan following the patients discharge after hospitalization [8]

In Saudi Arabia the Ministry of Health (MOH) [9] defined HHC as "The Service provides complete health care, as well as a continuous and comprehensive follow-up to those patients, who are not able to access any health facilities, at their places of residence, through a qualified medical team in constant coordination with the treating physician". This is the same as the role for Home health care undertaken by Prince Sultan Military Medical City Hospital, Family Community Medicine for which this study took place.

In Britain Home care [10] is sometimes referred to 'Domiciliary care' or 'in-home care' which is under the services of Social Services. However, the medical care is given by licensed health professionals or/and professional caregivers are there to make certain the activities of daily living are carried out. These can be provided by the state free by means testing through social services or paid for privately. Home care has been around from 1834 when the government brought into force "the New Poor Law of 1834" through workhouses to give medical care and then in 1905 the government then decided it was not suitable to continue with workhouses and they change over to elderly care homes as hospital institutions. In 1859 care was provided by community district nurses at the homes of patients with the support of Florence Nightingale and William Rathbone. Then in 1887 a self-funded 'Queen Victoria jubilee institute' was founded for nurses until the development of the National Health Service (NHS) which lead to a national training for nurses which was established in 1968.

In the United States of America Governmental agency for Medicare term "Home health care [11], is a wide range of health care services that can be given in home for an illness or injury. Home health care is usually less expensive, more convenient, and just as effective as care you get in a hospital or skilled nursing facility (SNF)" The earliest known home care was given in 1813 at the homes of wealthy people by the ladies from Charleston. In the 1870s America took on the roles for nursing based on Florence Nightingale. Then in 1892 Lillian Wald started to work with immigrants and poor communities to introduce public health nurses.

The Joint commission international defined the home healthcare as services generally provided in the home or in the community to aid recovering certain type of patient with disability, or chronically ill persons. These services may include some combination of personal care and supportive services with allied and professional health care services JCI.HHC standard 2011 [12]

The Prince Sultan Military Medical City (PSMMC) also known as Riyadh Military Hospital is located in Riyadh City, introduced a few years ago the Home Health Care (HHC) program to reduce hospital admission duration and to improve the quality of care provided to chronic illness and disability.

The services provided through the HHC especially for patient with medical condition like permanent physical or neurological disabilities for bedridden patients. For instance patients who have any of the following post stroke, Parkinson's, motor neuron disease, multiple sclerosis, chronic cardiac failure, patient with other cardiac problem, dementia, traumatic brain injury, spinal cord injury with hemiplegia, paraplegia, quadriplegia, In addition to covering patients who require palliative care for advanced malignancy and pain management.

HHC provides medical equipment (Oxygen, BI-PAP, C-PAP) for patient with Chronic Obstructive Pulmonary Disease (COPD) that need home care supports. Aside from this HHC provides medication according to patient situation and the patient plan of care. Children with permanent physical or neurological disabilities such as cerebral palsy or other disabling genetic syndromes.

This work goal was to address how to reduce the readmission rate in PSMMC. And specifically aimed to measure PSMMC readmission rate among patient discharged to HHC division; and to compare it with readmission rate among patient discharged to their home; and to identify factors affecting readmission at PSMMC after discharge to HHC division.

Methods

Type of research

This is a Retrospective Cohort study designed and conducted to measure the readmission rate for all discharged patient from PSMMC with the top three diagnosis (cardiovascular, dementia and diabetes) in 2018**.** The discharged patients then were divided into two groups those discharged to Home Health Care division and those discharged to their homes. A sample was taken from each group and followed up for 30 days post PSMMC discharge to calculate the readmission rate in both groups, (figure 1).

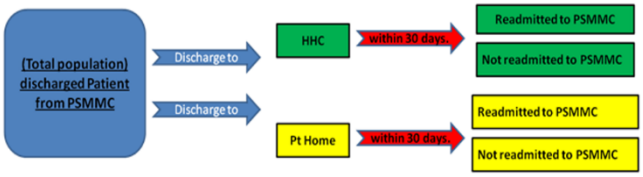

Fig 1

Research setting

Prince Sultan Military Medical City, Riyadh, Saudi Arabia, which is 1400 beds capacity, provide primary, secondary and tertiary healthcare services to all military soldiers and their families In addition, home health care division delivers comprehensive integrated care provided to the patient through well trained team from physicians, nurses, physiotherapist, dietitian and other subspecialties this service provided through multidisciplinary team visits to the patient House.

Study population: all discharged patient during 2018 with the top three diseases cardiovascular, Dementia and diabetes from Prince Sultan Military Medical were legible to be included in the study.

Case definition: Patient readmitted to PSMMC with same diseases or related complication and significant co-morbidities within 30 days of discharge to HHC division or patient home.

Inclusion criteria

- Patient diagnosed with the top three diseases (cardiovascular, Dementia and diabetes)
- All age group patient

- Readmitted patient with the same diseases or related complication within 30 days of discharge.

Exclusion criteria
- Referred patient to other to another care facility.
- Patient Discharge against medical advice
- Patient referred to HHC not admitted in PSMMC.

Sample size and technique
The total number of patients discharged from PSMMC with the targeted three diagnosis in 2018 was 5722 where 4904 patients were discharged to patient house and 818 were discharged to HHC.

Sample size
The sample size was calculated according to the following equation using the general readmission rate in PSMMC (28%) and to detect a difference of 8%.

$$n = \left[\frac{Z_{\alpha/2} + Z_{\beta}}{P_1 - P_2}\right]^2 (p_1 q_1 + p_2 q_2)$$

Where
n= sample size
Z α/2 = 1.96 (The critical value that divides the central 95% of the Z distribution from the 5% in the tail)
Zβ = 0.84 (The critical value that separates the lower 20% of the Z distribution from the upper 80%)
p1 = Proportion of readmission (Control group) =28%
p2 = Proportion of readmission while on HHC (the study group) = 20%
q1 = 1-P1
q2 = 1-P2

$$n = \left[\frac{1.96 + 0.84}{0.28 - 0.20}\right](0.28 \times 0.72 + 0.2 \times 0.8) = 94.1 \cong 95$$

Thus, the sample size was 95 patients per each group and hence the total sample size will be 380 patients for the four groups (see figure 1).

Sample technique
- The sample frame of the study covered all PSMMC discharged patients to HHC or patient house during 2018 including all readmitted cases within 30 days since day of discharged from the PSMMC.
- For group of patients discharged to HHC; the sample included all readmitted cases with the defined top three diseases during 2018, because of the small number of patients readmitted from HHC, and a simple random sample from those who did not readmit to hospital,
- For group discharged to patient house a simple random sample was taken from all readmitted cases with the defined top three diseases during 2018 and all those who did not readmit to hospital.
- Cases proved to have one or more exclusion criteria were excluded from the sample.

Tools
Structured checklist has been used including the following data:
- Demographic data, patient diagnoses, and date of admission and discharge
- Time of readmission for readmitted cases to PSMMC
- For patient discharged to HHC the following data was available:
- Patient diagnoses
- Date of admission and date of discharge to PSMMC for readmission.
- Care plan information.
- Scheduled patient home visits.
- Patient progress information.
- Patient with emergency call out information.
- The case manager filled the checklist from patient electronic medical record and the archiving system, all information related to patient during discharge process from PSMMC and information during readmission and discharge to HHC were completed.
- Data validity done for 5% of the checklist collected by the in-charge nurse for the same patient and the percentage of validity was 95% of the accurate information.

Data management & analysis
Data entry and statistical analysis were done using Microsoft Excel 2016 and SPSS (statistical Package for social sciences) software version 20, and the data from the checklist has been coded, tabulated and statistically analyzed. The data has been presented as means ± standard deviation (SD) and student's t-test or analysis of variance (ANOVA) were used to compare means and test for differences between groups. Categorical data presented as frequencies and percentages and analyzed by using chi-squared test (x2) as a test of difference. The level of p value <0.05 used for all analyses to indicate a statistical significance. Further analysis using multiple logistic regression analysis was used to identify interacting independent variables affecting readmission.

Ethical considerations and consent to participate
The approval for this study was taken from the research ethics committee Ain Shams Faculty of medicine and Prince Sultan Military Medical City. (Registration No.: 1059-14 March 2018) the information wasn't used for other purposes other than this study; the data was secured and in confidentiality during and after the study time. Official approval has been taken from PSMMC before carrying out the study.

Results
The statistics of PSMMC patients with the major three chronic diseases (DM, HTN & Dementia) in 2018 revealed that the total number of patients discharged from PSMMC was 5722. Out of these patients, 818 patients were discharged to Home Health Care (HHC) and 4904 patients were discharged to their houses. Among those discharged to HHC, 117 were readmitted to PSMMC (14.3%), while 1373 of those discharged to their houses were readmitted (28%). The effect of the home healthcare services had a 50% reduction of readmission for the three major diseases under study compared to the standard patient, with relative risk of 0.5 (95%CI 0.429-0.608).

Table 1: Readmission rate among patient discharged to their houses and those discharged to HHC

Group	Number	Readmitted within 30 days N (%)	95% Confidence interval
Patient discharged to HHC	818	117 (14.3%)	[0.429, 0.608]
Patient discharged to their houses	4904	1373 (28%)	
P value		0.001	

Table 2: Demographic characteristics of the study sample

Characteristic		Number (n=419)	%
Gender	Male	177	42.25%
	Female	242	57.75%
Marital Status	Single	12	2.8%
	Married	253	60.2%
	Divorced	24	6.0%
	Widowed	130	31.0%
Educational level	Illiterate	133	31.70%
	Read/write	157	37.50%
	Primary/Preparatory	27	6.4%
	Intermediate	92	22%
	University/Higher	10	2.4%
	Did not Work	192	45.8%
	Housewife	122	29.1%
	Retired	101	24.1%
	Student 1(0.2%)	4	1%
Patient with Spouse	Yes	145	34.6%
	No	274	65.4%
Nationality	Saudi	409	97.6%
	Non-Saudi	10	2.4%
Age (Mean±SD)	73.24±8.8		

Table (1) illustrates the demographic characteristics of the total study sample. It shows that 409 (97.6%) of the patients were Saudi and 10 (2.4%) were non- Saudi. the sample included 177 males (42.25%) and 242 females 57.75%), with mean age of 73.24±8.8 years. Regarding their marital status, 235 patients (60.2%) were married, 130 (31.0%) were widows, 12 (2.8 %) were single and 24 (6.0%) patients were divorced. And 133 (31.70%) of the patients were Illiterate, and 101 (24.1%) had work history. Also, 145 (34.4%) of the patients were living with spouse and 274(65.4%) were living without spouse.

Table 3: Comparison of hospital discharge procedures among the four studied groups

Variable	Patient discharged to HCC				p-value	Patient discharged to their houses				p-value
	Readmitted (n=117)		Not Readmitted (n=88)			Readmitted (n=131)		Not Readmitted (n=83)		
	No.	%	No.	%		No.	%	No.	%	
Developing Care plan										
Yes	21	20.80%	80	79.20%	<0.001	28	28.50%	70	71.50%	
No	96	92.30%	8	7.70%		103	88.80%	13	11.20%	<0.001
Care plan was multidisciplinary										
Yes	21	20.80%	80	79.20%	<0.001	26	27.00%	70	73.00%	<0.001
No	96	92.30%	8	7.70%		105	89.00%	13	11.00%	
Developing discharge plan										
Yes	12	13.00%	80	87.00%	<0.001	28	28.50%	70	71.50%	<0.001
No	105	93.00%	8	7.00%		103	88.80%	13	11.20%	
Educating patient\ caregiver regarding										
▪ Diagnosis										
Yes	21	20.80%	80	79.20%	<0.001	28	27.80%	73	72.20%	<0.001
No	96	92.30%	8	7.70%		103	91.00%	10	9.00%	
▪ Care plan										
Yes	19	19.20%	80	80.80%	<0.001	28	26.20%	79	73.80%	<0.001
No	98	92.60%	8	7.40%		103	96.30%	4	3.70%	
▪ Medication plan										
Yes	20	20.00%	80	80.00%	<0.001	28	25.70%	81	74.30%	<0.001
No	97	92.40%	8	7.60%		103	98.00%	2	2.00%	
▪ Discharge plan										
Yes	18	18.40%	80	81.60%	<0.001	28	25.70%	81	74.70%	<0.001
No	99	92.50%	8	7.50%		103	98.00%	2	2.00%	
Pt. received follow up schedule										
Yes	4	4.50%	86	95.50%	<0.001	36	34.00%	70	66.00%	<0.001
No	113	98.30%	2	1.70%		95	88.00%	13	12.00%	

Table 3 shows differences between readmissions proportions among patients discharged to HHC or house care regarding. Care plan was developed or not; the care plan was multidisciplinary or not; Educating patients/care givers about diagnosis, care plan, medication plan and discharge plan and percent of patients received follow up schedule.

Discussion

In this retrospective cohort study, all discharged patients from PSMMC with the top three diseases (cardiovascular, dementia and diabetes) were followed for 30 days to measure the readmission rate among patients discharged to their house and those patients discharged to HHC division. The current study has revealed that patients who discharged to HHC have a hospital readmission rate of 14.3% compared to 28% for those patients readmitted from their house, which indicated that HHC services decreased the rate of readmission by around 50%.

This hospital readmission rate was investigated by Debra Ness and William Kramer, 2013 [17] regarding reducing hospital readmissions to improving patient care program that included home visits. The study conducted to see the effect of program in reducing the readmission rate. The result rate is estimated to have dropped to 17.8 percent in the fourth quarter of 2012 after averaging 19 percent for the past five years, which is about 1.2 % impact on the reduction of readmission rate. It may be due to fragmentation of the healthcare system and the incentive at time of the study, but they found that the rate of the readmission significantly decreased for those group of patients with common three diseases than all the other patients. Overall results showed that there was significant improvement in patient outcome and reduce unnecessary costs to the system which agrees with the results of the current study, however less percentage.

Also, in Du Bois, *et al*., 2014 [19] study, the home health improves readmission rate. They found that the hospital readmission rate was decreased from 17% to 15% after implementation of home healthcare services. Also in trial of Ruth Elkan, *et al*., 2001 [20] home visiting was associated with a significant reduction in admissions to long term care in members of the general elderly population [0.65; (95%CI 0.46 to 0.91)].

On the other hands, other studies found minimal impact of home visits on readmission care. Birmingham and Oglesby 2018(18) have studied how the hospital readmission rate affected by the implementation of reduction program including home visits. The reduction was from 16.16 to 15.29%, which is less than 1% impact on the readmission rate without statistical significance after implementation of hospital readmission reduction program. Metanalysis of six studies of home visiting to members of the general elderly population showed no significant reduction in admissions to hospital [odds ratio 0.95; (95% CI 0.80 to 1.09]).

Factors affecting the readmission rate

The current study investigating factors associated with readmission rate and found that (93.0%) and (88.80%) of the patients readmitted from (HHC) and (Pt House), respectively, did not have patient discharge plan. This was highly significant than patient who did not admitted in both groups. Epstein,*et al*., 2011 [21] studied the relationship between hospital admission rates and rehospitalizations for heart failure or pneumonia and found that factor like discharge planning, hospital size, number of primary care or specialist physicians affecting the initial admission rates and contributed more to the regional variation in readmission rates. However Epstein, *et al*., 2011 [21] utilized the primary care services as alternative system to reduce the hospital readmission rate which is different than the current study which HHC as alternative services to reduce readmission rate.

Kuo and Goodwin, 2011 [22] studied the association of hospitalist care with medical utilization after discharge in relation to readmission rate and concluded that lack of a suitable alternative setting which provides necessary care or other social factors after patient discharge contributing in prolonged stay in the hospital, premature discharge or discharge to an environment not suitable for the patient condition that will directly affecting the readmission rate.

Kane and Finding Kane 2011 [23] studied the right level of posthospital care he found that the health care team must determine the most appropriate setting for ongoing care before discharged from the hospital and involve the medical, functional, and social aspects of the patient's illness in the plan, which it is different in this study the availability of caregiver is one of accepting criteria for admission to HHC services.

Also, Kane and Finding Kane 2011 [23] determine the most suitable discharge plan which involving the patient, family, case manager, nurse, physician, physical and occupational therapist, social worker, and insurer will increase the safe discharged patient to be ready for discharge to home. This is agrees with the results of the current study as most of the patients who did not readmitted were educated about the discharge plan through a multidisciplinary team at hospital sitting while most of the readmitted patients did not enjoy such a service and the difference was statistically significant. In this study the patients, patient family and caregiver educated about medication reconciliation at hospital sitting and before discharged, the result was found that (80.00%); (74.30%) of the patients not readmitted from (HHC) (Pt House) respectively received education about medication reconciliation. The percentage, however, was very low in readmitted patients

Mueller *et al*., 2012 [24] conducted systematic review to study the hospital-based medication reconciliation practices and found that medication reconciliation before discharge was associated with a decrease in actual and potential adverse drug events.

The study conducted by Ziaeian, *et al*., 2012 [25] discussed the medication reconciliation accuracy and patient understanding of intended medication changes on hospital discharge it showed majority of patients aged 64 or older who were discharged to home after hospitalization did not understand the reasons for medication changes or the new dosing of medications they were taking.

On the contrary, Gillespie, *et al*. 2009 [27] conducted a comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older using a randomized controlled trial and found that readmission rate will not be affected by Medication reconciliation but it has an important impact on reducing adverse drug events.

In this study we found that receiving follow up schedule on discharge is a significant factor affecting readmission rate as (95.50%); (66.00%) of the patients not readmitted from (HHC)(Pt House) respectively were received follow up schedule with statistically significant difference than readmitted patients. On the contrary, Grafft, *et al*., 2010 [29]

studied the effect of hospital follow-up appointment on clinical event outcomes and mortality and found no difference in 30-day hospital re-admission, emergency department visits, or mortality comparing patients who had documentation of a scheduled follow-up appointment. The difference may be due to different sitting and research methodology

Conclusions

Home healthcare visits significantly reduce the PSMMC readmission rate by 50% with clear important related factor that directly affect the rate which was mainly related to proper communication with the discharge team at the hospital in developing the multidisciplinary care plan and educate the patient about this plan. Planned and scheduled home visits according to patient need through multidisciplinary HHC team play an important role in reduction of the hospital readmission rate.

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