ORIGINAL ARTICLE

A Casemix: Congestive Heart Failure Readmission Rate and its Associated Factors in a Tertiary Teaching Hospital in Kuala Lumpur

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ABSTRAK

Penyakit lemah jantung merupakan antara lima punca utama kematian penyakit kronik tidak berjangkit berdasarkan rujukan World Health Organization. Sekitar 20% pesakit kegagalan jantung di seluruh dunia memasuki wad semula dalam jangka masa 30 hari selepas discaj. Hal ini demikian biasanya akibat daripada tidak mematuhi penyekatan sukatan air diminum atau pun perkembangan penyakit. Kajian ini bertujuan untuk mengenalpasti kadar masuk wad dalam 30 hari selepas discaj daripada kegagalan jantung dan faktor berkaitan di Pusat Perubatan Universiti Kebangsaan Malaysia (PPUKM) pada tahun 2016-2017 dengan menggunakan data casemix. Berdasarkan data kod, perbelanjaan digunakan untuk masuk wad semula dalam 30 hari diambilkira. Kadar masuk wad untuk kegagalan jantung dalam 30 hari selepas discaj bagi punca yang sama adalah 53.5% dan 43.5% bagi tahun 2016 dan 2017, sama kadar dengan hospital mengajar yang lain tetapi lebih tinggi daripada kadar di negara maju. Selepas diselaraskan, hanya faktor umur pesakit dan tahap keterukan penyakit menunjukkan kaitan yang bermakna dengan kemasukan wad dalam 30 hari selepas discaj bagi kegagalan jantung. Jangka masa berada dalam wad dan perbelanjaan untuk kemasukkan wad adalah lebih rendah

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daripada yang sepatutnya dicapai. Sebanyak RM80,329.73 telah dijimatkan pada tahun 2017 atas rawatan yang pantas dan rancangan penjagaan yang komprehensif diberi kepada 19.3% pesakit gagal jantung tahap keterukan tiga. Penurunan kadar kemasukan wad semula dalam 30 hari selepas discaj juga menjimatkan kos pesakit dan menunjukkan penjagaan klinikal yang mantap dan strategi rawatan yang rapi. Kajian casemix ini boleh digunakan sebagai rujukan untuk penentuan bajet bagi unit kardiologi di PPUKM.

Kata kunci: *casemix, ekonomi kesihatan, kegagalan jantung, kemasukan wad, tempoh kemasukan wad*

ABSTRACT

Cardiovascular mortality is within the top five causes of death from non-communicable disease based on World Health Organization profile. Around 20% of heart failure patients are readmitted within 30 days worldwide. Readmission within 30 days for congestive heart failure often related to non-compliant to fluid restriction, natural progression of the disease or pre-mature discharge. The study aims to evaluate the 30 days readmission rate of congestive heart failure in Universiti Kebangsaan Malaysia Medical Centre (UKMMC) from the year 2016-2017 using casemix data and to determine the associated factors related to it. Based on the data coding, cost of readmission incurred was calculated. The 30-days readmission rate of heart failure to UKMMC in the year 2016-2017 was 53.5% & 43.5%, higher than the developed countries standard but similar to that of local teaching hospitals. After adjustment, age and level of severity are the only significant associated factors for the 30-days readmission rate. Shorter average length of stay (ALOS) & lower extra-tariff were achieved for readmission of heart failure. Total of RM80,329.73 was saved in the year 2017 from prompt treatment and comprehensive care plan of treating 19.3% level 3 severity patients at level 1 ALOS and tariff-cost. The 30-days readmission rate for heart failure in UKMMC was comparable to local teaching hospitals. The reduction of 30-days readmission rate in 2017 saved much cost, shows good clinical governance and advanced treatment strategy. Casemix can be used to guide budget allocation for the cardiology department of UKMMC.

Keywords: casemix, congestive heart failure, health economic, length of stay, patient readmission

INTRODUCTION

As the world is modernizing, the burden of diseases has been shifted to non-communicable diseases both worldwide and locally. Non-communicable diseases contributed to 73% of the mortality rate in Malaysia (Institute for Public Health 2015), has become the new endemic of

the country. Cardiovascular diseases contributed to 31% of the global mortality (World Health Organization 2016), which is the top principal cause of death globally (World Health Organization 2016). Cardiovascular diseases (CVDs) include the disorders of the heart and blood vessels, such as coronary heart disease, cerebrovascular disease, rheumatic heart disease and other conditions (World Health Organization 2016). Malaysia health indicators 2017 detailed out the groups into hypertensive diseases (I10-I16); cardiovascular diseases (I60-I69); diseases of arteries, veins, lymphatics and lymph nodes (I70-I79); ischaemic heart diseases; rheumatic fever and rheumatic heart disease (I00-I09) and pulmonary heart diseases and diseases of pulmonary circulation & other forms of heart diseases (I26-I52), which heart failure, I50 is grouped under (Ministry of Health Malaysia 2016). Cardiovascular diseases posed high mortality risk, 80% of the cardiovascular mortality is caused by myocardial infarction and cerebrovascular accident (World Health Organization 2016). The disability-adjusted life years (DALYs) was 1500,000, which is the highest in the country (World Health Organization 2015). Diseases of the circulatory system ranked number six (7.50%) among the top ten causes of admission to both Ministry of Health hospitals and private hospitals; but rated as the first principal cause of death in MOH hospitals (22.62%) and ranked second in non-Ministry of Health hospitals 26.43% in the year 2016 (Ministry of Health Malaysia 2017), the trend hasn't changed since the

year 2012 (World Health Organization 2015). The statistics showed that healthcare capacity for the treatment of cardiovascular disease in Malaysia is still suboptimal, but the burden of disease is inversely accelerating; in line with the report of WHO where 82% of the non-communicable diseases occurred in low-middle income countries, with 37% of it due to cardiovascular causes (World Health Organization 2016). The Clinical Research Center and Ministry of Health Malaysia reported that there were 51 hospitals which equipped with cardiac services and coronary care units (CCU) in the year 2009, only 20% of the cardiologists are working in Ministry of Health hospitals (Indra 2016; Lim et al. 2010). Despite the advancement in healthcare system delivery, the healthcare cost imply to treat chronic diseases is far more burdensome to the country and healthcare facility (World Health Organization 2012, 2014). There were 2,510,438 hospital admissions in Malaysia in year the 2016, in which 159,699 admissions went to non-ministry of health hospitals (Ministry of Health Malaysia 2017). As congestive heart failure is one of the late presentations of ischaemic heart disease / pulmonary heart diseases, the accessibility, availability, affordability and effectiveness of treatment greatly affect the morbidity and mortality endpoints (World Health Organization 2016). However, early intervention and risk factors screening is universal and economic, but largely dependent on the government financial policy such as the gross domestic product given to the Ministry of Health and the

awareness of the society (Ministry of Health Malaysia 2017).

As congestive heart failure is chronic and incurable in nature unless cardiac transplantation takes place, hence readmission is common, but the duration before a heart failure readmit indicates the adequacy of treatment received during the last admission, and not solely based on the recurrent attack of the disease. More than 20% of heart failure patients are readmitted within 30 days, and estimate 50% would readmit by 6 months (O'connor 2017), America Heart Association reported a similar prevalence of 19.0% in year 2012 (Bergethon et al. 2016). O'Connor (2017) laid out the reasons of readmission of heart failure patients into (1) the organizational factor whereby it is largely determined by the health system's criteria / guideline for admission, further compliment by the competency of the emergency team; (2) the intervention given during the duration of stay are vital components to determine the rate of readmission, a pre-mature discharge for the reason of reducing degree of ward congestion (length of stay) may result in a higher rate of 30-days readmission; (3) the continuation / transition of care when patients are discharged back into their community, lesser care received / no communication between healthcare facilities to continue community-based intervention can result in higher rate of readmission; and 4) the social support of a patient (O'connor 2017). As a semi-government tertiary and university hospital, Universiti Kebangsaan Malaysia Medical Centre, henceforth to be referred to as UKMMC is a referral centre from all over the states in Malaysia. Hence, the quality of care is indeed paramount. Therefore, in line with quality assurance, outcome indicator should be monitored and one of it is the readmission rate that shall reflect the quality of care in the hospital.

To authors' best knowledge, there is no previous study that investigated less than 30 days-readmission rates due to congestive heart failure in UKMMC utilising casemix data. The significance of this study is that the study could be used as a platform to evaluate the criteria of admission of congestive heart disease, criteria of discharge, standard of procedures/treatment, adequacy of treatment given, efficiency of treatment and the management of in patient in relation to length of stay independent of the stage of cardiac failure. Also, this study could be used as a baseline data for the future re-evaluation of clinical pathway in congestive heart failure management. There was no prior knowledge on the demographic of patients admitted to UKMMC due to congestive heart failure, the 30-days readmission rate of congestive cardiac failure in UKMMC, was there any reduction of 30-days readmission rates as compared to the previous year and the associated factors of readmission due to congestive heart failure in UKMMC. Therefore, this study aims to find out the readmission rate and the associated factors among patients with congestive heart failure in UKMMC in the year 2016 and 2017. With this, to further describe the demographic of the patient admitted to UKMMC due to congestive heart failure. By this,

Table 1: ICD-10 Coding

ICD-10 Coding	Categorization of cardiovascular disease
I10-I16	1) Hypertensive diseases
I60-I69	2) Cardiovascular diseases
I70-I79	3) Diseases of arteries, veins, lymphatics and lymph nodes
I25.9	4) Ischaemic heart diseases
I00-I09	5) Rheumatic fever and rheumatic heart disease
I26-I52	6) Pulmonary heart diseases and diseases of pulmonary circulation & other forms of heart diseases (including) congestive heart failure

to enable comparison of the 30-days readmission rates and trend for year 2016 and year 2017 and then to identify the associating factors of 30-days readmission due to congestive heart failure in UKMMC. The researchers hypothesised that male gender, advanced age, a higher number of co-morbidities, a longer average length of stay and greater severity of the disease are associated with a higher rate of 30-days readmission for heart failure.

MATERIALS AND METHODS

This is a cross-sectional study carried out from September-December year 2018, analyzing casemix data obtained from Department of Health Information, UKMMC for the year 2016 and 2017 (24 months). Study population was all congestive cardiac failure patients registered with UKMMC, target population was patients who

Table 2: Casemix Standard

I50 severity level	ALOS	Tariff
1	4.1 days	RM 1698
2	5.8 days	RM 2383
3	7.5 days	RM 3084

admitted to UKMMC from year 2016-2017, sampling population was all patients who admitted to medical ward in UKMMC. Sampling frame was a list of 812 patients (after 2 duplicates removed) admitted to UKMMC in the year 2016 and 2017 with the primary diagnosis / principal diagnosis of congestive heart failure were included in the study. Sampling unit was those patients admitted to UKMMC with the primary diagnosis of congestive heart failure (I11.0, I13.0, I50) during the study period; 2016-2017, Table 1 listed the ICD-10 coding while Table 2 displayed the casemix standard coding. Universal sampling was done where all patients with complete data were selected into this study.

The inclusion criteria for congestive heart failure were patients with primary diagnosis with ICD-10 i.e. (1) I11.0-hypertensive heart disease with (congestive) heart failure; (2) I13.0-hypertensive heart and renal disease with (congestive) heart failure; (3) I50.0-congestive heart failure. The independent variables included in this study were the patient's demography, primary diagnosis, severity of the disease, length of stay (LOS) and days to readmission. Length of stay was defined

as number of days the patient stayed in the ward. Whilst, days to readmission were being calculated by subtracting the discharge date from readmission date. The initial data of 814 cases were cleaned prior to analysis. Two cases were removed due to data duplication rendering 812 cases to be included as final data for analysis. Analysis was done by using IBM SPSS version 22.0. Descriptive analysis, Chi-square, and Binary Logistic Regression. Finally, the Hosmer-Lemeshow test (expected value p>0.05), and classification table overall percentage (expected value of >70%) was analyzed to assess the goodness of fit.

RESULTS AND DISCUSSION

Sociodemographic Characteristics

The sociodemographic characteristics of the heart failure patients (with or without chronic kidney diseases) readmitted to UKMMC within 30 days for the year of 2016-2017 is described in Table 3. Majority of the heart failure patients are elderly, with a mean age of 63.25 years; clients were from both genders evenly, with female patients slightly over the male. Almost half of the patients are diagnosed with primary diagnosis of Congestive heart failure (I11), quarter with hypertensive heart disease as the pathogenesis leading to heart failure (I50), quarter with hypertensive heart disease and complicated with renal diseases (I13). Congestive heart failure without hypertensive heart disease may also be coded as so when heart failure patients presented at late stage of the illness,

whereby decompensation happened, and there is a failure of sustaining cardiac output, causing reversal in blood pressure. This correlates with the casemix coding for the level of severity of heart failure, where 58.9% of the heart failure patients readmitted with severe heart failure within 30 days of discharge.

Despite more heart failure patients with severity level 3 were readmitted, the average length of stay majority fell at 4.1 days, which was an expected discharge duration for mild heart failure instead of severe heart failure. There is an earlier-than-expected day of discharge of heart failure patients (shorter duration compared to casemix standard year). Less ALOS can occur with competent treatment, with the evidence of reduced rate of 30-days readmission comparing the year 2016 with the year 2017. Good and prompt management means all heart failure symptoms including overload and underfilled symptoms are resolved. Treating severity level 3 heart failure cases with the severity level 1 treatment may indicate capability of the cardiology team, financial concern is taken into consideration for cost-effectiveness, where lower extra tariff is incurred for admission while bed occupancy rate (BOR) is maintained at an acceptable level with early discharge (at ALOS 4.1 days casemix standard for severity 1 heart failure). The casemix charge for a patient coded as severity level 3 heart failure incurred tariff cost of RM3,084.00 as compared to RM1,698.00 charged for the mild (severity level 1) heart failure. Hence, every readmission of heart

Table 3: Sociodemographic characteristics of congestive heart failure patients with readmission due to congestive heart failure within 30 days of discharge in UKMMC, Kuala Lumpur, Malaysia

Variables	N	%
Age		
< 60 years		39.7
> 60 years		60.3
Mean	63.25 years old	
Gender		
Male	34	46.6
Female	39	53.4
	73	100%
Primary Diagnosis		
Hypertensive heart disease with (congestive) heart failure (I50)	19	26.0
Hypertensive heart and renal disease with (congestive) heart failure (I13)	18	24.7
Congestive heart failure (I11)	36	49.3
Severity of Heart failure		
Mild	22	30.1
Moderate	8	11.0
Severe	43	58.9
Average Length of Stay (ALOS) (only for 2017)		
4.1 days	19	26.0
5.8 days	4	1.4
7.5 days	10	13.7
Median (IQR 25th Centile & IQR 75th Centile)	6 days IQR 25th centile = 0.427 days, IQR 75th centile 11.573 days	

Days to readmission	2016	2017	2016	2017
Less than 7 days (early)	17	10	63.0%	37.0%
30 days or less	26	20	56.5%	43.5%
Mean	12.74 days (p = 0.589)			

	2016	2017
Readmission CCF within 30 days / all CCF	3.69%	2.74%
Duration before 30-days readmission Max = 29 days (2.7%) for both years	mean = 8 days (0-22 days)	mean = 8 days (3-25 days)
Mean of days before next readmission	196.96 days	95.35 days

No. of Co-morbids

Mean	6.15 (min = 2, max = 10)

	2016	2017
Prevalence of Diabetes Mellitus and Hypertension among 30-days readmission of CCF 38 / 69 = 55.1%	20/37 = 54.1%	18/32 = 56.3%

Extra Cost Incurred (Tariff) due to Readmission		
RM1698	19	63.3
RM2383	1	3.3
RM3084	10	33.3
Median + 2SD	RM 1697.69 IQR 25th centile = RM 1037.35 IQR 75th centile RM 2537.63	

Table 4: Prevalence rate of 30 days readmission for congestive heart failure in UKMMC, Kuala Lumpur, Malaysia

Year		Readmission		Total
		No	Yes	
2016	N	353	43	396
	% within a Year	89.1%	10.9%	100.0%
2017	N	386	30	416
	% within a Year	92.8%	7.2%	100.0%
Total	N	739	73	812
	% within a Year	91.0%	9.0%	100.0%

failure case will incur extra charges of at least estimated RM1,700.00 to the patients, with mean $\pm$2SD of RM1,697.69$\pm$659.939 (estimated RM1,867.38-RM2,357.63). With the capability to treat severity level 3 cases at level 1 severity, every readmission of severe heart failure case has saved RM 1,386.00; with 33% (n = 10) of heart failure cases presented as severity level 3 in the year 2017, minus patients who having ALOS for severity 2 & 3 (33-13.7% = 19.3%), 19.3% patients of severity level 3 heart failure received cost saved of RM1,386.00, mounted to a total of RM80,329.73 was saved. From the heart failure patients with history of readmission in year 2016 and 2017, 63.3% experienced extra RM1,698.00 incurred due to readmission, 3.3% experienced extra RM2,383.00 incurred due to readmission, 33.3% experienced extra RM3,084.00 incurred due to readmission.

The data may also reflect more severe heart failure patients tend to readmit to UKMMC, despite only treatment for a mild stage is required. Readmission can be confounded by other factors such as care taker's tendency of readmitting patients with severe heart failure, due to poor coping capability, ill presentation clinically, dependent of Activity Daily Living, more disability, trust towards UKMMC medical management, and good medical care provided, reasonable charges applied. The early readmission (within less than 7 days) rate dropped almost half, from 63-37% from the year 2016 to the year 2017; late readmission (within 30 days of last discharge) also has a drop of 13% from 56.5-43.5%; showing a trend of improvement in the management of heart failure. Therefore, the heart failure management of UKMMC is good, in which a lower rate of readmission from inadequate management is achieved, with a shorter ALOS and saved tariff cost of almost RM2,000.00 for severe heart failure patients who should be incurred charges of RM3,084.00 to only RM1,698.00.

Table 4 showed the prevalence for rate of 30-days readmission for congestive heart failure. Heart failure patients with readmission within 30 days only contribute to 2.628% and 2.995% of total inpatient discharge for year 2016 and 2017, respectively. There is 3.69% (n = 37) and 2.74% (n = 32) of heart failure patients resulted

Table 5. Relationship between factors and readmission (n =812)

Characteristic	No Readmission n (%)	Readmission n (%)	Analysis
Age (years old)			
<60	210 (87.9%)	29 (12.1%)	x^2= 4.091
≥60	529 (92.3%)	44 (7.7%)	p= 0.043*
Gender			
Male	392 (92.0%)	34 (8.0%)	x^2= 1.115
Female	347 (89.9%)	39 (10.1%)	p= 0.291
Average length of stay			
≤30 d	731 (91%)	72 (9.0%)	x^2= 0.050
>30 d	8 (88.9%)	1 (11.1%)	p= 0.823
Severity			
Mild	279 (92.7%)	22 (7.3%)	
Moderate	136 (94.4%)	8 (5.6%)	x^2= 6.450
Severe	324 (88.3%)	43 (11.7%)	p= 0.040*

in readmission within 30 days for heart failure in year 2016 and 2017 respectively (n=69). Prevalence of diabetes mellitus (E11-ICD 10 classification) and chronic essential hypertension (I10) among CCF patients with 30 days readmission is 55.1%, with 54.1% for the year 2016 and 56.3% for the year 2017 (taking only the first three principal diagnoses).

Overall, the minimum duration before readmission within 30 days is 0 days (1.4%) and maximum duration before readmission is 29 days (2.7%) for both years, (mean = 13.06 days, normality satisfied, kurtosis: -1.128, skewness = 0.367). For year 2016, heart failure patients readmitted within 30 days was readmitted within a minimum of 0 days and maximum 22 days (mean = 8 days); for the year 2017, heart failure patients who readmitted within 30 days were readmitted within a minimum of three days and maximum of 25 days. All who discharged were discharged home but not discharged to the mortuary. However, the casemix data analysis grouped the number of readmission and death as one variable, which may serve as a bias to the average length of stay, which should be qualitatively appreciated by comparing to individual case note, which is beyond the scope of this study. Casemix only coded Endovascular Aneurysm Repair or Endovascular Aortic Repair (EVAR) as a procedural related cause of heart failure modality, which is not discussed here as the coding was excluded in the exclusion criteria (as not the first three principal diagnoses). In a larger picture, heart failure patients presented to UKMMC has a mean of 196.96 days before next readmission for year 2016 (normality satisfied, kurtosis -0.354, skewness 0.8); and mean of 95.35 days before next readmission for the year 2017 (normality satisfied, kurtosis -0.438, skewness 0.837). Rate of readmission due to congestive heart failure for the year 2016 and the year 2017

Table 6: Significant Factors for CCF Readmission Among UKMMC Patients in Kuala Lumpur, the Final Model

Characteristic	Unadjusted OR	(95% CI)	x^2 (df)[a]	Adjusted OR[c]	(95% CI)	p value
Age (years old)						
<60	1.00	-	-	-	-	-
≥60	0.602	(0.367;0.988)	3.889 (1)	0.593	(0.360;0.975)	0.04
Severity						
Mild	1.000	-	-	-	-	-
Moderate	0.746	(0.324;1.719)	0.473[b]	0.732	(0.317; 1.691)	0.466
Severe	1.683	(0.983;2.883)	3.596[b]	1.688	(0.984;2.896)	0.057

[a]Likelihood Ratio (LR) test
[b]Wald test
[c]Adjusted for age, gender, number of co-morbidity, length of stay, severity
*p<0.05
There was no multicollinearity (VIF <10) and no interaction problem

was 10.9% and 7.2%, respectively, with a non-significant reduction rate of 3.7% (x^2 = 3.298, p = 0.069). After adjustment of all confounders studied, only age and severity level of condition are significantly associated with the rate of readmission within 30 days. Relationship between factors associated with readmission for congestive heart failure is shown in Table 5, and significant factors post adjustment as found in Table 6.

Epid month comparison for the year 2016 and 2017 showed the highest readmission rate within 30 days of discharge for heart failure per overall inpatient in 2016 and 2017 were the month of May (3.4%) and January (3.8%) respectively, while the epid month showed lowest readmission rate for the 2 years were February (1.6%) and Jun (1.4%). When further compared with the rate of readmission for the same diagnosis - heart failure (codes I50, I11, I13.0, I13.2) within 30 days of discharge for epid month comparison of year 2016 and 2017, epid month

with the highest readmission rate for same diagnosis within 30 days of discharge for heart failure in 2016 and 2017 were the month of January (8.9%) and November (5.0%), respectively, while epid month showed the lowest readmission rate within 30 days of discharge for the same diagnosis were September (0%) and Jun (0%). As heart failure complications always correlate with the off balance of interstitial fluid, cardiac muscle functionality, stress (externally from weather, or internally from metabolite imbalance, malnutrition or infection, which also interplays in a viscous cycle), trend of readmission of heart failure may correlate with the socioeconomy situation, culture and climate of the country, such as the high readmission rate in May 2016 may correlate with the *Hari Raya Puasa* of early July as well as the southwest monsoon season lasted from the month of May to September, and January 2017 with Chinese New Year at the end of January and the northwest monsoon
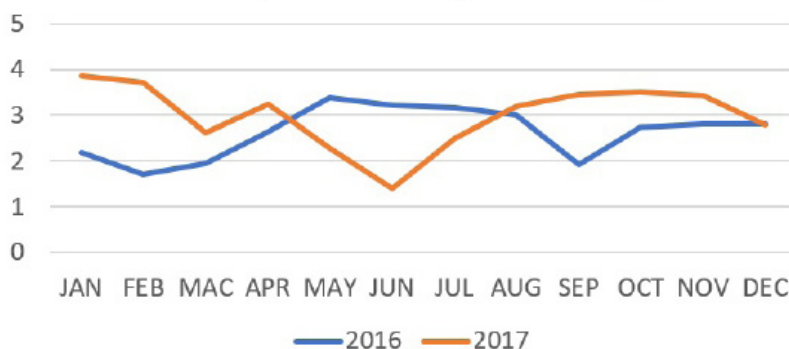
Figure 1: Percentages from total inpatient discharged due to congestive heart failure: readmissions within 30-days of discharge rate (I50) Casemix

season from November to March. The Muslim fasting month always resulted in more fluid restriction, and usually followed by a rebound in the coming month due to rehydration need, while festive seasons such as Hari Raya and Chinese New Year, as well as months with relatively dry weather will lead to fluid overload due to poor restriction of fluid. The readmission trend may also be confounded by the cultural restriction where patients tend not to readmit during festive season, and if do, usually with more severe presentation. The portion of congestive heart failure

readmission from total discharged heart failure patients is described in Figure 1, while its portion from the total case of admission within the same period is described in Figure 2.

The 30-days readmission rate of UKMMC is almost double than that of developed country as reported by (O'connor 2017) in the year 2017 (>20%), UKMMC is only at the level of achievement for heart failure 30-days readmission rate for the year 2009 in 70 cardiology centres as analysed by the America Heart Association study (Bergethon et al. 2016). The data from
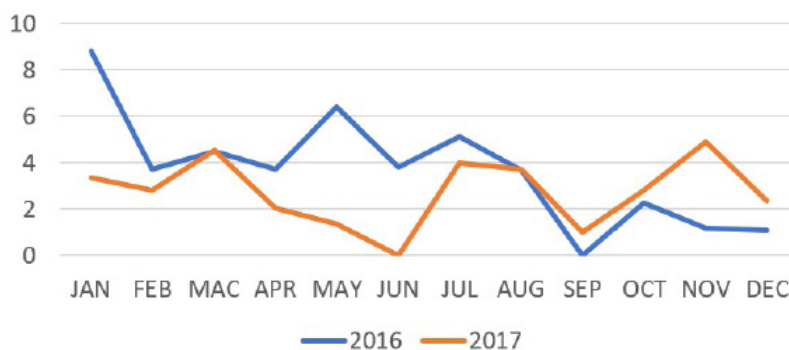

Figure 2: Percentages from total cases (certain diseases) due to congestive heart failure: readmissions within 30-days of discharge rate (I50) Casemix

America Heart Association in year 2009-2012 found that teaching hospitals in America had higher relative risk-adjusted readmission rates than non-teaching hospitals (p = 0.05) (Bergethon et al. 2016). A higher readmission rate means a higher amount of extra tariff incurred upon client and community, which is unacceptable and non-cost effective. Some developed countries implement incentive to hospitals which successfully achieve relative 30-days readmission rate of less than 20%, by providing budget on a zero-based budget concept for the coming year, while at the same time, trim down budget release to hospitals which has a high 30-days or 60-days readmission rate (Bergethon et al. 2016).

There are many factors leading to 30-days readmission rate for heart failure patients, broadly divided into internal and external factors. Internal factors include mismanagement, a form of sub-standard care which reflects deviation from quality of care for the illness / co-morbidities or premature discharge for the decongestion of ward. In the recent study, O'connor (2017) found that the admission pattern and trend of a hospital is largely controlled by their health system criteria for admission, which is determined by the local practice guideline on heart failure management, the bed occupancy rate, open-door policy, availability and competency of cardiologist and the cardiology team in the hospital (Bergethon et al. 2016; O'connor 2017). Hospital which has a higher admission rate will also usually having a higher readmission rate for the disease, which is affected by the emergency

medicine team who triage the patients. Health system also includes the structure of continuous patient care in the course of in the hospital stay up to the point of continuous care upon discharge back into the community, whether the patients and their caretakers are being educated on shared responsibility in patient care, increase competency and confidence in home patient care including home-based cardiac rehabilitation exercise and modification of activity of daily living. The health gap presents in UKMMC is the lack of continuation/integration of care for patients who discharged from hospital, as this is a semi-government hospital, which is not under the Ministry of Health like other government hospitals or community clinics, with no extended community service, there may be a lack of continuation of care upon discharge. UKMMC should evaluate the flow of discharge and the flow of share care between teaching hospital, government hospital, private and government clinics, non-government organization, nursing home and rehabilitation centre to improve patient outcome and thus reducing the rate of readmission.

External factors leading to 30-days readmission rate for heart failure patients include: (i) patients' factor, such as non-compliant to fluid restriction and poor self-care, self-awareness to restrict fluid properly upon discharge; ii) disease factor referring to the natural progression of disease at severity level 3 which has lower cardiac reserve and a faulty feedback mechanism which result in a low cardiac return and

more frequent relapse; iii) community factor such as care-taker not free to provide social support, this is true particularly for urban population where most caretakers are in the working population; iv) family factor: when care-taker is not confident or not competent to care for heart failure at a more severe level, with the sicker outlook and poorer quality of life of the patients, such as having shortness of breath, poor quality sleep due to orthopnoea, poor nutrition or dependent activity of daily living can cause a higher tendency of readmitting patient despite their condition can be managed with basic fluid management in-patiently; v) health system factor: when there is a lack of continuation of care upon discharging patients back to the community, such as no community service for UKMMC referred to the community health clinics front-liners for home visit and domiciliary care for a more practical onsite evaluation of behaviour modification and treatment adherence, a higher readmission rate may result; vi) Environmental factor such as climate variation, rainfall, air quality index, socio-cultural variation play important roles in changing the trend and rate of readmission due to heart failure.

The America Heart Association found that teaching hospitals tend to have a higher readmission rate compared to the government hospital due to the inherent nature of the hospital care system; where teaching hospitals are capable to provide prompt cardiology services, cardiothoracic services such as cardiac catheterization and cardiac transplant procedures, or able to provide anti-failure medication that is more effective in preventing the progression of the disease (Bergethon et al. 2016). Therefore, patients who are presented or referred to the teaching hospital such as UKMMC is inherently sicker, as the centre served as a referral centre for the worse cases due to expertise available, in which sicker patients resulted in higher rate and risk of readmission. Our study did not proceed to risk-related 30-days readmission rate, including those cardiac failure patients who admit for a cardiac-related procedure. The American Heart Association study found that hospitals which enrolled their patients into the heart failure disease management programs had lower relative readmission rates ($p = 0.03$) (Bergethon et al. 2016). Under the Ministry of Health Malaysia Plan of Action 2016-2020, the government aim to establish a Clinical Governance Department in the Hospital, with the target indicator of having 144 hospitals with a Clinical Governance Department, to look into the quality based medicine by improving quality care for heart failure patients, in which the department may consider implementing heart failure disease management programme, proper utilization of bed occupancy rate, casemix system to reduce variety of cost and patient care, develop a more vigilant budgeting system, benchmarking the hospital by cardiology facility and competency, as well as audit and evaluation (Ministry of Health Malaysia 2016).

The limitations of this study include limited number of variables are found

in the casemix data, which cannot possibly infer the contributing factors of the readmission. Due to time constraint, the casemix data were not compared with patient's record to achieve better evaluation. Confounding factors such as underlying pneumonia and ischaemic heart disease that may contribute to the 30 days readmission for congestive heart failure are not discussed or analysed in this study, as these diseases are coded under different ICD-10 codes classification, while the study adopted the coding of primary diagnosis as the operational definition of disease classification. The study did not review the medical illness clinically/medication used/standard intervention for heart failure patient. The data were also not compared with other data such as local daily temperature, rainfall, air quality index to properly infer for the vary of trend of readmission. The input of casemix data may be confounded by systematic bias such as technical error due to the competency of coder as well as the competency of diagnosis commitment of treating doctor – less moderate (level 2) heart failure. The policy of admission was also not sought for reference upon the conduct of study.

CONCLUSION

In conclusion, the 30-days readmission rate of UKMMC is higher than those of developed countries, similar trend as other teaching hospitals. The young-old (<60 yrs), female patients with a higher severity level of congestive heart failure have a higher rate of 30 days admission, regardless of ALOS and number of co-morbidities. Estimated half of the CCF patient with 30-days readmission are having either diabetes mellitus or hypertension. Only age and severity level of congestive heart failure are significantly associated with 30 days readmission. Both early and late 30 days admission trend improved from the year 2016-2017. A shorter ALOS & lower extra-tariff were achieved for congestive heart failure within 30-days re-admission, indicate good management of the illness. Clinical governance, audit, benchmarking on admission policy & shared-care with government facility in community can reduce 30-days readmission rate in UKMMC. Awarding zero-based budget in upcoming year can be applied as an incentive for departments which achieved reduction rate of 30 days readmission rate compared to the previous year.

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