

## ORIGINAL ARTICLE

# The MalaysianDRG Casemix System: Financial Implications of Inaccurate Clinical Documentation and Coding Error

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## ABSTRACT

**Introduction:** A casemix system measures costs of health service provision that is crucial in the planning and hospital budgeting. The MalaysianDRG casemix system has been implemented since 2010, yet many health professionals were unaware of its importance. To highlight this problem, we estimated the miscalculation of costs in providing treatment, that occurred due to inaccurate clinical documentation and coding error in the MalaysianDRG casemix system. **Methods:** Using a cross-sectional study design, 226 coded case notes from two healthcare institutions in Malaysia were selected and re-coded. If a difference between codes was observed, the new code would be chosen as the final code. The cases were then re-grouped using the MalaysianDRG casemix system. The cost per case derived from the new and original codes was compared. Then, the outcomes were verified by a casemix expert from the Ministry of Health. **Results:** Results indicated 61.9% inaccurate clinical documentation and 25.2% coding error. The difference in costs of treatment provision, due to inaccurate clinical documentation was RM227,657 and RM 68,216 for coding error. Using paired t-test analysis, differences between mean (SD) cost per case of the original vs. new codes due to inaccurate clinical documentation [RM10,208.19(12273) vs. RM11,244.53(13785.27),  $p < 0.05$ ], and coding error [RM10,208.19(12273.04) vs. RM11,215.52(13798.03)  $p < 0.05$ ] were statistically significant. These results raised important questions regarding costly financial implications arising from inaccurate clinical documentation and coding error in the MalaysianDRG casemix system. **Conclusion:** To achieve the full benefit of the MalaysianDRG casemix system, the quality and accuracy of its data must first be established.

**Keywords:** Casemix, Coding error, Malaysia, Health financing, Health economics

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## INTRODUCTION

Malaysia has an efficient health care structure; operating a two-tier health care system consisting of government-based universal healthcare and a co-existing private healthcare. The government heavily subsidizes public health services in Malaysia, as user fees collected only constituted between 2%-5% of the healthcare expenditures (1). The 11th Malaysia Plan raised concerns about the sustainability of public healthcare provision due to the rising cost of care, increased longevity, medical inflation, along with the country's financial indebtedness. To maintain the agenda for universal coverage in the Sustainable Development Goal 3.8, therefore, the challenge is to develop a more effective

health financing management (2).

Casemix is a term referring to a system that combines information about patients (for example age and race), and the associated medical procedures carried out during their hospitalization, into groups, based on the type and mix of patients (4-6). It is a tool used to improve efficiency and quality of care in health services. Healthcare providers in more than 40 countries, including Australia (7), England (8), Thailand, China, South Korea, Japan (9), Chile, Vietnam, Mongolia, Philippines, Uruguay, and the United Arab Emirates (3) implement the casemix system as a funding and reimbursement tool.

As for Malaysia, a teaching hospital in the Klang Valley implemented the first casemix system. Known as the MyDRG, it was developed as a costing tool (10, 11). In October 2010, the Ministry of Health (MOH) introduced the MalaysianDRG casemix system and gradually expanded its implementation to the whole

nation (12). However, to date, the MalaysianDRG casemix system in MOH hospitals has not been fully utilized as its intended purpose. It is neither being used as a costing nor budgeting tool as practiced by other countries. Instead, MOH hospitals continues its annual hospital budget application using historical budgeting. Historical budgeting is a time consuming process; it involves budget preparation for the next year based on the audit or review of the previous year budget allocation (13). Data generated by the casemix system is a better alternative to those of historical budgeting. Clinical coding data supplied by the casemix system, records patients' admissions and surgical procedures performed each year. This information is useful in estimating health service provision, its associated costs and ultimately, a more accurate allocation of healthcare funding. Therefore, the accuracy of clinical coding is crucial because resources allocated must consider specific patient loads that health providers endure, reflecting a true picture of the type of morbidity and its needed resources (9, 14).

High coding error in casemix system is perilous to the management of a hospital, as it will ultimately lead to the loss of reimbursement a hospital receives from the fund provider. Inadequate hospital funding will pose many problems not only affecting the functioning of the hospital but also patients. Hospitals will face shortages of medical supplies and patients may have to pay out-of-pocket. Patients may also have to seek treatment at private healthcare institutions due to the long queues arising from damaged medical equipment that hospitals did not have enough funds to fix. As shown in a study by Jameson and Reed in an orthopaedic department, coding error has led to the reduction of orthopaedic surgeons' salaries (15). Additionally coding error also resulted in the increase of waiting time and complaints submitted by unsatisfied patients (8). Ultimately all these problems will interfere with the quality of care and health status of the populations (16).

The objectives of this study were twofold. This first objective was to determine the proportion of inaccurate clinical documentation and coding error in the MalaysianDRG casemix System at two MOH hospitals. Second, to determine the financial implications, defined as miscalculation of costs spent in providing treatment, due to inaccurate clinical documentation and coding error. If the MOH decides to implement the MalaysianDRG casemix system as a budgeting tool in the future, miscalculation of costs spent in providing treatment accentuate the urgency for accurate clinical documentation and coding, as it will affect the annual funding a hospital receives from the Ministry of Finance. Hence, it is hoped that findings from this study may assist in the effort towards improving the accuracy of clinical documentation and reducing coding error, create awareness among health professionals and further convince policymakers towards future application of the

MalaysianDRG casemix system as a budgeting tool.

## MATERIALS AND METHODS

This study focused on measuring the proportion of inaccurate clinical documentation and coding error which resulted in the miscalculation of costs spent in providing treatment at two MOH hospitals.

### Study design and population

Malaysia has 145 government hospitals, but to date, only 60% of these hospitals implemented the casemix system. The researcher conducted a cross-sectional study between January to February 2019 at two MOH hospitals: a medical institution and a state hospital. The researcher purposely chose these two hospitals because these hospitals were audited by the MOH Casemix Unit in 2017. During these audits, for every selected case, senior coders from the MOH Casemix Unit reviewed and re-coded the diagnosis of selected patients' medical records. After completing the re-coding process, the researcher compared new codes assigned by these senior coders and original codes by the hospital coders. If the codes vary, the researcher chose the new codes assigned by the senior coders as the new correct codes. New codes assigned by these senior coders were later reviewed and verified by an expert coders from the MOH Casemix Unit who had certification in the ICD-10 and ICD-9 CM coding. Once these new coded cases were verified, they were entered in the MalaysianDRG casemix system to create new Diagnosis Related Groups (DRG).

To illustrate how cost per case is derived, each coded case inserted in the MalaysianDRG casemix system produces a specific DRG with its own allocated Cost Group Weight (CGW) that relies on the average cost of inputs for medical procedures and diagnostic services required to achieve the appropriate patient outcome. By multiplying all CGWs with the latest National Base Rate 2016, and the price per cost (PPC) for each DRG will be obtained.

For the purpose of this study, we collected our data from the 2017 Casemix Unit audit report, which provided the two sets of old and new coded cases from both hospitals. Using these two sets of coded cases, we first calculated the proportion of inaccurate clinical documentation and coding error. Next, we produced the respective DRGs and CGWs to derive the PPCs. Finally, we compared the PPCs for both sets of coded cases to observe any miscalculation of costs. The PPCs for all the DRGs were summed up to derive the actual cost of providing treatment.

This research was approved by Medical Research and Ethics Committee NMRR-18-2915-44339 (Investigator Initiated Research, IIR) and by Human Research Ethics Committee USM USM/JEPeM/18100575.

## Data analysis

A descriptive analysis was conducted to determine the proportion of inaccurate clinical documentation and coding error. The researcher conducted a similar analysis to measure the actual cost of providing treatment before (pre-audit) and after the re-coding (post-audit) process. The statistical significance of the differences in the total costs of providing treatment before and after the re-coding process was measured using a paired sample t-test. A study done by Kevin Mani (17) suggested that, 'to predict the overall cost, the most relevant value is the arithmetic mean and cost comparison studies should present the distribution of the data as thoroughly as possible, for example, with means and confidence intervals or with an indication of the difference in cost as a percentage of the total cost' (p.153)

Despite the non-normality of data, we used parametric test as it has more statistical power compared to non-parametric test, and can perform well with skewed, non-normal distributions data. Parametric test also enables comparisons with other studies (4, 5, 7, 10).

## RESULTS

### Inaccurate clinical documentation and Coding Error

The total samples were 226 sets of coded cases. The results of the casemix audits from the two hospitals revealed that there were higher proportion for inaccurate clinical documentation but lower coding error. The proportion for inaccurate clinical documentation was 61.9%, whilst coding error was 25.2% (Table I).

**Table I: Results Audit Documentation and Coding for two selected hospitals (n= 226)**

Variable		n (%)
Clinical Documentation	Accurate	86 (38.1)
	Inaccurate	140 (61.9)
Coding Error	No	169 (74.8)
	Yes	57 (25.2)

### Comparison between Price Per Cost Pre and Post Audit

The difference between mean (SD) cost per case pre-audit and post-audit in documentation accuracy was statistically significant [RM10,208.19(12273) vs RM11,244.53(13785.27), p<0.05] as shown in Table II.

As shown in Table III, the difference between mean (SD) cost per case pre-audit and cost per case post audit in coding accuracy was statistically significant

**Table II: Comparison of price per case pre and post audit in documentation accuracy**

Variables	Price Per Case <sup>a</sup>		Mean difference (95% CI)	t-statistics (df)	p value*
	Pre	Post			
<b>Price per case (RM)</b>	10208.19 (12273)	11244.53 (13785.27)	1036.34 (98.47, 1974.22)	2.177 (225)	<0.05

<sup>a</sup>Mean (SD) \*paired sample t-test

**Table III: Comparison of price per case pre and post-audit in coding accuracy**

Variables	Price Per Case <sup>a</sup>		Mean difference (95% CI)	t-statistics (df)	p value*
	Pre	Post			
<b>Price per case (RM)</b>	10208.19 (12273.04)	11215.52 (13798.03)	1007.33 (72.43, 1942.23)	2.123 (225)	<0.05

<sup>a</sup>Mean (SD) \*paired sample t-test

[RM10,208.19(12273.04) vs RM11,215.52 (13798.03), p<0.05].

### Changes in DRG and Coding Interpretation

Of the 226 cases reviewed, changes in DRGs were made in 83 cases (36.9%) due to inaccurate clinical documentation and 31 cases (13.3%) due to coding error. The miscalculations in cost of providing treatment at the two hospitals was RM 227,656.64 due to documentation inaccuracy and RM 68,216.47 for coding error. Changes in DRG codes due to severity of illness resulted in the most cost miscalculations

## DISCUSSION

Inaccurate clinical documentation and coding error are closely connected, and many studies proved that poor clinical documentation is a major source of coding inaccuracy (18, 19). The current study discovered 62% of cases had inaccurate clinical documentation, whilst only 25% cases had coding error. It may be possible that coders assigned accurate codes to inaccurate diagnosis written by medical officers. A study done by Nouraei, Virk (19) at an emergency department in the United Kingdom found most junior doctors refused to write proper diagnosis. Instead, they prefer to write patients' symptoms, allowing coders to assign accurate codes based on the symptoms, but not the diagnosis. In this instance the clinical documentation is inaccurate, but the coding is correct.

Inaccurate clinical documentation and coding error also led to changes in DRG codes produced by the Malaysian DRG casemix system. Around 40% of DRGs from the 226 coded cases, changed due to inaccuracy in the documentation, and another 13% transpired because of coding error. It was postulated that most of these changes occur because of the adjustments on patients' severity of illness. An audit done by Medical Development Division (20) showed that medical doctors did not write the complete diagnosis with patients' comorbidities and complications. Similar to a study done in the United States by McNutt et al., among 184,932 cases with at least one hospital-acquired condition or complication during a hospital stay, 27.6% (n=52,272) experienced a modification in the MS-DRG assignment without the hospital-acquired condition factored into the assignment (21). In the Malaysian DRG casemix system, if a medical doctor did not complete a clinical documentation with comorbidities and complication for a particular episode of care, the DRG will automatically assign the case as

'severity level I' or mild case, even though in actuality it is in fact, 'severity level III'. As complications of disease worsened, patient will stay longer in the hospital thus acquiring more extensive care and use more resources compared to a simple case of severity level I. Results had shown that, 64% of the cases' DRG changed when auditors completed those clinical documentations with comorbidities and complications during hospital stay, and the severity level changed from I to II/III. These changes caused miscalculation of RM227,656.64 for documentation inaccuracy and another RM68,216.47 for coding error.

Furthermore, our study results revealed that the cost per case in these two hospitals was significantly different pre and post audit. With inaccurate clinical documentation, hospitals used around RM10,208 per case; however, post-audit revealed that the hospitals used an additional RM1036 per case. This can be translated into an estimated total financial loss of around RM145,087 due to 140 cases of inaccurate clinical documentation. On the other hand, when coders assigned inaccurate codes, the hospitals stand to lose around RM1007 per case and a total of RM57,418 for 57 coding error cases. This scenario is similar with other findings in the United Kingdom (8), Australia (22), China, Thailand, South Korea, Malaysia, Taiwan, and Japan (9). All these studies revealed that inaccurate clinical documentation and coding errors would cause significant potential loss of revenue or funds for healthcare providers.

Limitation of this study include the use of secondary data from the audit performed by the MOH Casemix Unit, prevented data analysis according to clinical discipline. Further analysis on the associated factors of the miscalculated costs cannot be carried out as there was limited information available in the audit report.

## CONCLUSION

Unless accuracy in clinical documentation and coding is established, MOH hospitals in Malaysia may not be able to reap the full benefit of the MalaysianDRG casemix system. Based on the study, clinical documentation and coding of cases need to be improved to produce accurate data that is more meaningful. However, to realize this goal requires acceptance from health professionals working in these hospitals. Hospital directors, specialists and clinicians must be made aware of the importance of the MalaysianDRG casemix system, embrace it and lend their cooperation towards improving this initiative. On the contrary, what is possibly required to make this a success, is to mandate the MalaysianDRG casemix system as budgeting tool in all MOH hospitals, as a substitute for the historical budgeting process. Once the benefit is presented in the form of increased annual funding only then improvement will be made more aggressively by hospitals in Malaysia.

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