ORIGINAL ARTICLE

INCIDENCE OF CLINICAL CODING ERRORS AND IMPLICATIONS ON CASEMIX REIMBURSEMENT IN A TEACHING HOSPITAL IN MALAYSIA

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ABSTRACT

Clinical coding creates a rich database that can be used for administrative functions including planning for health service programmes and preparing budget of hospitals with appropriate use of disease and procedure classification system. Clinical coding errors may occur in the diagnoses or procedure codes. The errors can be happen at any of the digits use in the classification codes. Errors in clinical coding can give a huge implication on hospital's income if the coding system is used for reimbursement. This study aims to determine incidence of clinical coding errors among 464 patient's medical records (PMR). An independent senior coder was appointed to review the selected PMRs and the clinical codes. Post-audit evaluation shows that 89.4%(415/464) of the records contained at least one coding error in the assignment of diagnosis or procedure codes. Error in secondary diagnosis code was the highest comprising 81.3% (377/464) of the records. Coding errors were particularly found in O&G discipline comprising 94.8% (110/116) of the selected records. These errors caused a potential loss of RM 666,461 for the hospital. The highest pre-and post audit variance of potential income was RM 568,403 for paediatric discipline. The hospital should carry out regular monitoring of quality of clinical coding in order to prevent loss of income in the future when the reimbursement of services is linked to coding of diagnosis and procedures.

Keywords: *Clinical Coding, Diagnosis, Procedures, Casemix System, Coding Errors*

INTRODUCTION

As the healthcare expenditure accelerates yearly, hospital's efficiency is pivotal in the process of delivering an excellent healthcare service to the people. Payment by Results (PbR) is a significant incentive to drive hospital's efficiency, as hospital's reimbursement is associated with the hospital's daily activities instead of receiving a regular annual budget from the government. One of the well-known tools to implement PbR is casemix system. Casemix systems is a patient classification system in which a "costing group" called Diagnostic Related Groups (DRGs) is developed to classify patients based on their clinical characteristic[1]. DRGs is made up based on information extracted from clinical coding.

Clinical coding is a process of translating written medical terms into alphanumeric and numeric codes. Coding process contains two important components, namely disease or diagnosis coding and procedure coding[2]. International Classification of Disease 10th Revision (ICD-10) is being used to code, patients' diagnosis phrases[3]. Meanwhile, International Classification of Disease – Clinical Modification 9th Revision (ICD-9-CM) is used to code patients' clinical activities throughout their stay at the hospital[4]. Besides these two nosology, American Medical Association Current Procedural Terminology (CPT) Information, Health Care Financing Administration (HCFA), and Healthcare Common Procedural Coding System (HCPCS) are among the common sources for the classification of diseases in the healthcare sector[5-7].

Clinical coders are responsible in extracting relevant information from the patients' medical records and assign relevant diagnosis and procedure codes for the extracted information. Different healthcare system assigns different level of people to provide clinical coding, such as physician, nurse, and medical statistician[4,8]. Usually, the coding process for diagnosis and procedure code is assigned by the similar people, but Iran practices a different approach where procedure coding is assigned by physicians and diagnosis coding by clinical coders[9].

Information abstracted from coding is a rich set of data beneficial for the development of hospitals or health organisations. Besides, it is useful for hospital reimbursement programme and for measuring hospital's efficiency based on daily activities[10, 11]. Data extracted from the coding

process also helps the hospital to identify unnecessary procedure or operation in helping them to increase its efficiency. In addition, clinically coded data are utilised by the management level in designing healthcare programmes based on the epidemiological and statistical data abstracted from clinical coding[12]. However, without accurate clinical codes, accurate information is unable to be retrieved from the coded data.

The accuracy of coding is defined as an agreement between clinical coder and independent reviewer during the assignment of diagnosis or procedure code for one episode of care[13]. One single disagreement during the assignment of the code reflects the entire episode of care. In Britain, the median accuracy was reported as 83.2% with the median procedure accuracy is deemed higher than the median diagnostic accuracy (84.3% vs. 83.2%)[14].

The objective of this study is to evaluate the incidence of clinical coding errors in a tertiary hospital in Malaysia, to identify the type of coding errors and its impact towards casemix financial loss of reimbursement.

METHODOLOGY

Study Population and Design

A cross-sectional descriptive study was conducted from January 2013 to December 2013 to investigate the clinical coding error in one of Malaysia's tertiary hospitals.

A total number of 464 patients' medical records were stratified according to different disciplines, namely medical, surgical, obstetrics & gynaecology (O&G), and paediatric. They were then randomly selected based on the sample requirement. The clinical coders based in the medical records unit have coded all the selected patients' medical records.

Audit Process

An independent reviewer who is not working with the hospital was hired to audit the selected patients' medical records. This independent reviewer has more than 30 years of working experience as coders, and has attended and provided coding training and courses at local and international levels. The reviewer studied the entire case notes and all aspects of clinical coding were evaluated.

In the post-audit process, codes assigned by the independent reviewer were verified by the casemix expert teams; deemed to be the "gold standard" in the study. Once the codes were approved, they were compared against those codes assigned by the clinical coders. Codes by the clinical coders were considered as accurate if they were similar with those assigned by the independent reviewer.

Calculation of Coding Errors

This study imputed two level of coding errors. In the first level of calculation, the coding error rate was based on the number of cases with error codes. The numerator was the total number of cases with errors, and the denominator was the total number of reviewed cases by the independent reviewer.

In the second level, the error rate was calculated based on the total number of error codes. The total number of error codes was the numerator, and the total number of codes reviewed by the independent reviewer was used as the denominator. The total number of error codes was inclusive all error codes at the first digit level, second digit level, third digit level, fourth digit level, fifth digit level as well as under-coded code and up-coded code. Each up-coded and under-coded code was counted as one error for each code deleted or added.

Classification of Coding Errors

Coding errors were classified in accordance with the NHS publication "Data Quality Audit Framework for Coded Clinical Data" and had been modified based on the suitability of the organisation[5]. The types of coding error in the present study are as follows;

i. **Error at first digit level**
The code has been coded incorrectly at the first digit level.

ii. **Error at second digit level**
The code has been coded incorrectly at the second digit level.

iii. **Error at third digit level**
The code has been coded incorrectly at the third digit level.

iv. **Error at fourth digit level**
The code has been coded incorrectly at the fourth digit level.

v. **Error at fifth digit level**
The code has been coded incorrectly at the fifth digit level.

vi. **Primary Diagnosis or Primary Procedure code incorrectly sequenced**
The original clinical coder has assigned the accurate primary diagnosis or primary procedure code as secondary diagnosis or secondary procedure code.

vii. Up-coding
The original clinical coder has assigned irrelevant code for the selected episode of care that may lead to higher level of severity or higher reimbursement rate in casemix classification[15].

viii. Under-coding
The original clinical coder has not assigned the accurate code that was identified by the independent reviewer for the selected episode of care that may lead to lower level of severity or lower reimbursement rate in casemix classification[16].

Statistical Analyses
The level of agreement between independent reviewer and clinical coder during the assignment of principal diagnosis and procedure was evaluated using Cohen's Kappa statistic. Kappa values were interpreted as follows[17]:

i. 0.10 to 0.20 = poor agreement
ii. 0.21 to 0.40 = fair agreement
iii. 0.41 to 0.60 = moderate agreement
iv. 0.61 to 0.80 = substantial agreement
v. 0.81 to 1.0 = perfect agreement

For secondary diagnosis and other procedures, the number of diagnosis code and procedure code within each pre-audit and post-audit data was calculated and compared. The mean number of secondary diagnosis code and other procedures code were evaluated and the level of agreement was determined using Kappa values. Chi-square test was used to identify factors influencing coding error. Variance income of pre-audit and post-audit data was also evaluated using a paired sample t-test to determine its statistical significance. All analyses were done using IBM SPSS version 20.0, and for all cases, p-value of $p<0.05$ was considered as statistically significant.

RESULTS

Clinical Coding Error Rate at First Level of Calculation
The audit conducted by the independent reviewer revealed that there was at least one error code in 415(89.4%) of the reviewed medical records. The coding error rates for primary diagnoses and primary procedures was 49.8% (231/464) and 50.9% (236/464), respectively. The audit data showed a higher coding error rate within primary procedure code compared to primary diagnosis code, in which the level of agreement between independent reviewer and clinical coder in primary procedure was poor with a Kappa coefficient of 0.108. Meanwhile, for primary diagnosis, the level of agreement was moderate with a Kappa coefficient of 0.495.

It was found that coding errors in secondary diagnosis was extensive covering 377 (81.3%) of the selected patients' medical records. Descriptive analysis showed that, in the 464 patients' medical records, there were a total of 1,049 codes assigned as secondary diagnoses in the pre-audit process and increased to 1,740 codes in the post-audit. The maximum number of secondary diagnosis code assigned was 10 with the mean of 2.27 (SD: 2.07) and rose to 18 codes with the mean of 3.75 (SD: 2.97) after the audit. The level of agreement between independent reviewer and clinical coder on the number of secondary diagnosis codes assigned per patient was poor with Kappa coefficient of 0.159.

Meanwhile, in the coding of secondary procedures, errors were identified in the 270 (58.2%) of the selected sample. Both data from pre-audit and post-audit showed that there were 235 cases assigned with secondary procedure codes. The total number of the codes assigned to the entire selected cases grossly increased from 361 codes in the pre-audit data to 550 codes in the post-audit data. Pre-audit data showed that the maximum number of secondary procedure codes assigned to one episode of care was 7 with the mean of 0.78 (SD: 1.04) and rose to 10 codes in the post-audit with the mean of 1.19 (SD: 1.66). A Kappa coefficient test showed a fair agreement between the independent reviewer and clinical coders with the value of 0.210.

Clinical Coding Errors at Second Level of Calculation
Finding from the second level of calculation revealed that, even though in the first level of coding error calculation showed a higher coding error rate among secondary diagnosis code, the ratio of error codes at the second level of coding error calculation was higher among the secondary procedure codes. In the 652 of secondary procedure codes reviewed by the independent reviewer, 566 (86.8%) of the codes were considered as error codes. Meanwhile, for the secondary diagnosis codes, there were 1,782 codes reviewed by the independent reviewer and 1,187 (66.6%) of the codes were classified as error codes.

The coding error rate for primary diagnoses calculated at the second level and the first level is the same at 49.8%. However, for primary procedure, the coding error rate was slightly higher at the second level of coding error calculation covering 52.3% of the primary procedure codes. The higher percentage of error at the second level of calculation was due to the decreasing number of the denominator, which was the total number of reviewed codes. Although there were 464 patients' medical records reviewed by the independent auditor, there were only 451 cases assigned with the primary procedure code. Out of these 451 primary

procedure codes, 236 (52.3%) of the codes were an error code. Table 1 below summarised coding errors rate using the first level of calculation and second level of calculation.

Table 1 Clinical Coding Errors Rate

Errors at First level of Calculation			
Item	Total Error Cases	Total Reviewed Cases	%
Primary Diagnosis*	231	464	49.8
Secondary Diagnosis**	377	464	81.3
Primary Procedure ***	236	464	50.9
Secondary Procedures ****	270	464	58.2
Errors at Second Level of Calculation			
Item	Total Error Codes	Total Reviewed Codes	%
Primary Diagnosis Code	231	464	49.8
Secondary Diagnosis Code	1187	1782	66.6
Primary Procedure Code	236	451	52.3
Secondary Procedures Code	566	652	86.8

* κ = 0.495, ** κ = 0.108, *** κ =0.159, **** κ = 0.210

Type of Coding Errors

Data analysis from this study showed that, in the assignment of primary diagnosis code, the most common type of coding error was error at the fourth digit level covering 72 (15.5%) of the error codes. Coding errors in primary diagnosis were less found at the fifth digit level comprising 2 (0.4%) of the error codes.

Meanwhile, in the assignment of secondary diagnosis code, most of the error codes were due to the under-coded codes by the clinical coders covering 746 (41.9%) of the error codes. Less error were found in the assignment of fifth digit level of secondary diagnosis code covering 2 (0.1%) of the error codes.

Similar with secondary diagnosis code, in the assignment of primary procedure code, the highest error was due to the under-coded primary procedure code by the clinical coders, involving 80 (17.7 %) of the error codes, and the lowest error was due to the incorrect sequence of primary procedure code involving 17 (3.8%) of the error codes.

Lastly, in the assignment of secondary procedure code, most of the errors were due to the under-coded secondary procedure code by the clinical coder covering 297 (45.6%) of the error codes. Less error was found at the fourth digit level of the secondary procedure code, covering 10 (1.5%) of the error codes. Table 2 illustrates further details on the types of coding errors in the present study.

Factors Influencing Coding Errors

This study showed that the highest coding error rate is in the O&G discipline, covering 110 cases (94.8%) from the total cases, followed by medical discipline 107 cases (92.2%), paediatric discipline 102 cases (87.9%) (102/116), and surgical discipline 90 cases (77.6%), respectively. The difference of coding error rate was proven to be statistically significant (X^2 (3) = 11.52, p = 0.009). The study also revealed that, in the O&G cases, the coding errors were mostly found in the assignment of its secondary diagnosis codes (108/116, 93.1%) and secondary procedure codes (98/116, 84.5%). The independent auditor particularly found error codes in the assignment of secondary procedure code where out of 222 of secondary procedure codes reviewed, 212 (95.5%) were identified as error codes. Most of the errors identified in the secondary procedure codes were due to the under-coding procedure code by the clinical coders covering 109 (49.1%) cases.

In this study's observation during the coding audit, it was discovered that the clinical coders in this hospital were mainly referring to the discharge summary not the entire patient medical record during the coding process. Thus, the completeness of discharge summary was analysed to investigate its association with the coding error. This study recorded only 28 (6.0%) of the discharge summary from the selected patients' medical records were completely and accurately filled. Out of these 28 cases with complete discharge summary, the clinical coders have coded 2 of the cases inaccurately. Data analysis from this present study also revealed that in the 436 of patient medical records with incomplete discharge summary, the clinical coders have coded 413 (89.0%) of the cases inaccurately. The association between completeness of discharge summary and coding error was proven to be statistically significant (X^2 (1) = 213.67, p ≤ 0.000).

Together with the discharge summary, completeness of admission form was also reviewed as the clinical coders also are referring

to the admission form during the coding process to capture the patients' demographic information. The post-reviewed process, there were only 27 records with admission form that was filled accurately. From these 27 records with complete admission form, the clinical coders have coded 2 of the cases inaccurately. On the other hand, out of 437 cases with incomplete admission form, the clinical coders have coded 413 (89.0) of the cases inaccurately. Chi-square level of association between completeness of admission form and coding error was proven statistically significant (X^2 (1) = 204.25, p ≤ 0.000).

Table 2 Types of Coding Errors

Primary Diagnosis Codes		
Type of Errors	**No of Error Cases**	**%**
Error at First Digit Level	40	8.6
Error at Second Digit Level	47	10.1
Error at Third Digit Level	44	9.5
Error at Fourth Digit Level	72	15.5
Error at Fifth digit level	2	0.4
Primary Diagnosis Code Incorrectly Sequenced	26	5.6
Secondary Diagnosis Codes		
Type of Errors	**No of Error Cases**	**%**
Error at First Digit Level	93	5.2
Error at Second Digit Level	105	5.9
Error at Third Digit Level	87	4.9
Error at Fourth Digit Level	104	5.8
Error at Fifth Digit Level	2	0.1
Upcoding	50	2.8
Undercoding	746	41.9
Primary Procedure Codes		
Type of Errors	**No of Error Cases**	**%**
Error at First Digit Level	75	16.6
Error at Second Digit Level	30	6.7
Error at Third Digit Level	19	4.2
Error at Fourth Digit Level	20	4.4
Principal Procedure Code Incorrectly Sequenced	17	3.8
Upcoding	33	7.3
Undercoding	80	17.7
Secondary Procedures Codes		
Type of Errors	**No of Error Cases**	**%**
Error at First Digit Level	111	17
Error at Second Digit Level	32	4.9
Error at Third Digit Level	21	3.2
Error at Fourth Digit Level	10	1.5
Upcoding	95	14.6
Undercoding	297	45.6

Coder's demographic has been believed to influence the accuracy of coding. Demographics of the clinical coders involving the coder's length of service, the number of training attended and educational level were examined to evaluate its association with the coding error. However in this study, chi-square level of association between coder's demographic and coding error was statistically insignificant. Table 3 below illustrates further details on factor influencing coding error in this present study.

Table 3 Factors Influencing Coding Error

Variables	Nos of Cases With Coding Errors (%)	x^2 value	p value
Type of Discipline		11.52	0.009
Medical	107 (92.2)		
Surgical	90 (77.6)		
O&G	110 (94.8)		
Paediatric	102 (87.9)		
Discharge Summary		213.67	0.000
Complete Discharge Summary	2 (0.4)		
Incomplete Discharge Summary	413(89.0)		
Admission Form		204.25	0.000
Complete Admission Form	2 (0.4)		
Incomplete Admisison Form	413(89.0)		
Coder's Length of Service		0.636	0.425
Less than 10 years	88 (19.0)		
More and equal than 10 Years	327 (70.5)		
Coder's Number of Training Attended		2.489	0.115
Less than 5	299(64.4)		
More and equal than 5	116 (25.0)		
Coder's Educational Level		0.636	0.425
Degree Holder	88(19.0)		
Non-Degree Holder	327(70.5)		

Implication on Casemix Reimbursement

From the 415 records with coding errors, 305 (73.5%) of the cases resulted in changes in the assignment of MY-DRG® that affects the hospital tariff. Pre-audit process, the potential income for this hospital was RM 1, 627,922.00 and grossly increased to RM 2, 294,383.00 post-audit process. The audit process resulted in an income variance of RM666,461.00 (+40.9%) in a year of 2013 with a minimum potential income per patient on that year rose from RM1,020.00 to RM1,160.00. Paired simple t-test showed a statistically significant difference between pre-potential and post-potential total income with t (457) = -2.61, p = 0.009.

Even though the coding error rate was the highest among the O&G cases, the income variance in this discipline was the lowest among the other discipline which only RM6,026.00 (+1.5%). The highest income variance was within paediatric discipline with the variance of RM568,403.00 (+217.0%). Table 4 provides more details about the potential income due to the audit process.

DISCUSSION

The present results indicate that the coding error rate was 89.4%, deemed higher than six past studies reviewed in this study where the average of coding error was only 49.0% [13, 18-22]. The high percentage of coding error could be linked to the type of cases audited in the study. At present, the incidence of coding errors is rarely debated involving all four disciplines namely, medical, surgical, O&G and paediatric in one research. Previous studies reported a coding error rate of 55.0% and 51.0% within a surgical department at the hospitals in the United Kingdom[18,20]. In addition to these two studies conducted in the United Kingdom, a study carried out by Farhan et al. in Saudi Arabia also showed a better coding error rate among surgical cases compared to other disciplines[19]. Consistent with the previous findings, it was also apparent in the present study that the percentage of coding error is slightly lower among surgical discipline compared to other disciplines. The high coding error rate may be improved if this study was conducted within surgical department only.

Table 4 Overview of Casemix Reimbursement due to Coding Error

Total Income				
Discipline	**Medical**	**Surgical**	**O&G**	**Paediatric**
Pre Audit	351,450.00	619,472.00	395,988.00	261,010.00
Post Audit	437,255.00	625,701.00	402,014.00	829,413.00
Variance	85,805.00	6,229.00	6,026.00	568,403.00
Minimum Income Per Patient				
Discipline	**Medical**	**Surgical**	**O&G**	**Paediatric**
Pre Audit	1,020.00	1,530.00	2,614.00	1,412.00
Post Audit	1,160.00	1,524.00	2,614.00	1,343.00
Variance	140.00	(6.00)	-	(69.00)
Maximum Income Per Patient				
Discipline	**Medical**	**Surgical**	**O&G**	**Paediatric**
Pre Audit	15,836.00	39,993.00	14,767.32	4,752.00
Post Audit	30,723.00	24,547.00	5,261.00	233,319.00
Variance	14,887.00	(15,446.00)	(9,506.32)	228,567.00

**All amount shown are in Malaysia Ringgit (RM)*

Another factor that can be linked to the higher coding error rate is a higher standard of coding accuracy during the audit process. The acceptance of coding error varies depending on the study, where some studies accepted error at the fourth and fifth digit level while in the present study, the error at the fifth digit level was still considered as error code[14]. The acceptance of error at fourth and fifth digit level is believed could improve the coding error rate. For the present study, acceptance of the errors at the fourth and fifth digit level of the code is only significance among primary diagnosis code as the commonest type of error found in primary diagnosis code was error at the fourth digit level of the code. If the coding errors at the fourth and fifth digit level are accepted in this study, the coding error rate among primary diagnosis code could be reduced from 49.8% to 33.8%. However, it is strongly believed, acceptance of error at fourth and fifth digit level to improve the coding error rate is insignificant for other items of coding; secondary diagnosis, primary procedure, secondary procedure as the majority of the errors were due to the under-coded codes by the original clinical coder.

Findings from the present study also revealed that in the first level of coding error calculation, the coding error rate is higher among secondary diagnosis code, comprising 377 (81.3%) of the selected patients' medical records. According to the coding compliance, physicians could assign a maximum number of 20 secondary diagnosis phrases per patient for one episode of care. This makes the assignment of secondary diagnosis code as an arduous task compared to the primary diagnosis code. A higher number of secondary diagnosis phrases might relate to a higher percentage of the coding error, as the episode of care becomes far more complicated to be coded. The present data echoed the findings of past studies conducted by Farhan et al. in Saudi Arabia and Pongpirul et al. in Thailand, but contradict with the finding by Nouraei et al. conducted in United Kingdom, where a higher coding error rate among procedure code was reported[4, 19,20]. The potential explanation for the disparity between the finding by Nouraei et al. is that his research was conducted across surgery cases where more complicated procedure might be assigned to the selected cases in his study compared to the present study.

It is apparent in this study that the lowest percentage of clinical coding error was under primary diagnosis code, comprising 49.8% of the selected cases. This is similar to a report by Mersey Internal Audit Agency in the United Kingdom, where the lowest coding error rate in the selected hospitals was also reported under primary diagnosis code with an average of error rate of 7.14%[5]. Although the present finding is parallel with the previous report by Mersey Internal Audit Agency, the percentage of coding error rate among principal diagnosis code detected in this study is still considered as high. Bajaj reported in his study conducted in United Kingdom that the coding error rate for primary diagnosis was only 16.0%[23].The present study population is larger compared to the study conducted by Bajaj (464 samples vs. 50 samples) – explaining the occurrence of a higher coding error rate. In the same study by Bajaj, it was

reported that the commonest type of error in primary diagnosis was error at the fourth digit level involving 6.0% of the error codes. The finding from this study also echoed the previous study where the commonest type of error in the present study under primary diagnosis code was error at the fourth digit level of the code involving 15.5% of the error codes.

The findings from this study revealed that excluding the primary diagnosis code, the commonest types of errors in all other coding items; secondary diagnosis, primary procedure and secondary procedure was due to the under-coded code by the original coder. A plausible explanation for a higher type of coding error due to the under-coded code was due to the high percentage of incomplete discharge summaries, comprising 93.1% of the selected patients' medical records. Data analysis from this present study revealed that the lowest frequency of incomplete discharge summary was detected within surgical discipline. Parallel to this finding, the coding error rate was also the lowest within surgical discipline compared to other disciplines. Statistical analysis using a Chi-square test has indicated a statistically significant association between completeness of discharge summary and coding error. This finding is supported by a previous study conducted by Adeleke et al. in Nigeria where it was highlighted in the study that the incomplete discharge summary could impede the coding accuracy, thus a monitoring on completeness of discharge summary is pivotal in ensuring a good quality of coding[24]. Although it is time-consuming, instead of just using the discharge summary, it is crucial for the coders to examine the entire case note thoroughly before assigning codes for an episode of care.

Although previous study indicated a significant association between coders' demographic and coding error, interestingly these association was proven to be statistically insignificant in the current study [7,24-26]. In this study setting, in total eight clinical coders are serving the clinical coding unit, but none of the coders was with a clinical background. Out of these eight coders, three coders have embarked specialised training on coding conducted by the Casemix expert during the early implementation of Casemix System in this hospital. The remaining five coders were trained through training conducted within the hospital tertiary as well as through monitoring by the senior coders. Although there were senior coders among the clinical coders, the coding error was still high among both senior and junior coders. This has led to the assumption of the importance of outside training. As medical knowledge and diagnostic tools are an evolving nature, coding rules and guideline also are evolving gradually. Thus it is imperative to expose coders with an adequate coding training not only within the hospital tertiary but also at the outside of the hospital.

In situation where casemix is used in reimbursement, the accuracy of coding is crucial in calculating hospital income and budgeting[8, 27]. It was proven in this study that coding errors resulted in changes in the assignment of hospital tariff. The present study revealed a total potential loss of RM666,461.00 due to the coding errors. This is similar to the findings in past studies conducted in United Kingdom and Australia, where it was revealed that coding errors were more likely to cause hospitals to lost their incomes[17, 28,29]. The minimum potential income per patient during the pre-audit process was RM1,020.00 per patient, and this amount increased to RM1,160.00 in the post-audit process. With the current coding quality, this entity could face a loss of 13.7% from its minimum potential income per patient, leading to difficulties in managing the organisational budget in future.

Another interesting finding in the present study is, although the coding error rate was high among O&G discipline, the income variance within this discipline was the lowest compared to other disciplines. The high coding error rate within this discipline was due to the omission of secondary diagnosis code and other procedure code. In the second level of error calculation, it was revealed that the error codes were higher among secondary procedure code where 98.3% of the codes were being omitted by the clinical coder. However, even though the total number of error codes within secondary procedure code in O&G discipline was high, most of the under-coded codes were among codes that unaffected the assignment of MY-DRG® codes and also the assignment of the tariff.

LIMITATION OF THE STUDY

The audit conducted in the present study took place in the year 2013. The findings might not reflect the current quality of coding in this hospital as coder becomes more experienced from year to year.

CONCLUSION

This study revealed a high percentage of coding errors in this teaching hospital. In the first level of calculation of coding error, secondary diagnosis code recorded the highest percentage of errors compared to others. The high percentage of coding errors is believed due to the incomplete documentation of discharge summary. Complete documentation is pivotal to avoid any erroneous assumption during the coding process. The hospital could do prevention of massive loss of income in future by embarking awareness on the importance of complete documentation.

Coders' knowledge and skills on the coding system need to be regularly improved to reduce the percentage of errors in this hospital. The hospital needs to institute a training programme for coders not only conducted by the in-house trainer but also by the outside trainer. Another plausible way to improve the coding errors rate is instead of having coders that need to code for various specialities, each coder may be trained according to one speciality. By focusing on one speciality, the coder can acquire all coding guidelines and skills in that particular assigned speciality.

The accuracy of clinical coding is an important subject especially when the hospital is employing payment by result system such as Casemix system in their health financing. Every level of staff needs to be exposed towards the importance of coding error and its consequences towards hospital income. This study only illustrates the quality of coding in one tertiary hospital in Malaysia. Thus further research at different health institutions in Malaysia should be carried out to measure the real quality of coding in Malaysia.

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