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An Overview of the Accuracy of Injury Coding, External Causes of Traffic Accident Patients, and "SI CALAKAN" Reporting at Advent Hospital Bandung

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Abstract. Traffic accidents are the leading cause of death for children and young adults. The accuracy of injury and external causes coding in hospitals plays an important role in building databases needed for epidemiologic analysis, risk management, and improving the quality of health services. The purpose of this study was to determine the accuracy of injury coding, external causes of traffic accident patients, and "SI CALAKAN" reporting at Advent Hospital Bandung. This research used a quantitative study approach and was studied from the point of view of the research reference period with a retrospective research design. The results showed that there were 62 (59%) incorrect medical records, 44 (41%) correct medical records of injury and external cause codefication.
Keywords: Coding, Injury, External Causes, Si Calakan

I. BACKGROUND

Road traffic accidents are the leading cause of death for children and young adults. The WHO Mortality Database portal found that 796,745 people died from injuries in 58 countries in 2020 [1]. The number of motorists killed by traffic accidents on the world's roads is still very high. It is estimated that more than half of the world's road traffic fatalities are pedestrians, people using bicycles, and two-wheelers or motorcyclists, who are still often ignored in the design of road traffic systems in some countries.

While progress has been made in the development of road traffic systems, it is far from evenly distributed across all countries. The Sustainable Development Goals (SDGs) target is an international and national agreement agreed by 193 heads of state at the UN headquarters, New York City in 2015 that aims to improve the welfare of society, at point 3.6 aims to reduce deaths and injuries on roads by half by 2020 has not been achieved [2]. The global death rate due to traffic accidents decreased by 8.3% from 18.1 deaths per 100,000 population in 2010 to 16.7 in 2019, yet traffic accidents killed an estimated 1.3 million people worldwide in 2019 with 75% of them occurring in boys and men. The fatality rate is more than 3.5 times higher in low-income countries compared to high-income countries despite lower vehicle ownership rates in low-income countries [3].

The Ministry of Transportation recorded 204,447 cases of road transportation accidents in Indonesia in 2022, with details of victims who suffered minor injuries as much as 80%, serious injuries 6%, and victims who died as much as 14% [4]. In Indonesia, the number of two-wheeled and three-wheeled vehicle ownership continues to increase, with POLRI recording 152.51 million units as of December 31, 2022 [5]. This can serve as a guide for medical facilities to ensure that they have the best care available in the event of a traffic accident-related emergency. West Java Province has 186,809 cases, according to Riskesdas data. West Java road injury cases ranked first in terms of place of occurrence, accounting for 186,809 out of 1,017,290 cases, or 18.36% of all injury cases due to traffic accidents sorted by province [6].

Healthcare facilities are increasingly needed as the demand for services increases. These facilities seek to provide optimal care, especially in emergency situations such as traffic accidents, where first aid is essential. The Bandung City Health Office built a system named "SI CALAKAN" for data on traffic accidents. The system collects and monitors accident data, using IRSMS to address data gaps between police and hospitals. Collaborating with 21 hospitals, the system helps in policy making to anticipate and mitigate traffic accidents [7]. One of the accident-prone areas in West Java is Cihampelas road [8]. Advent Hospital Bandung, which is close to this location, handles an average of 29 traffic accident cases per month and 1117 emergency room visits. Accurate recording of injuries and external causes is important for health services, planning, and policy evaluation. Proper coding assists in epidemiologic analysis, risk management, and service quality improvement. High-quality external reporting supports effective decision-making and prevention programs.

However, in practice, the accuracy of Injury and external causes coding often faces various challenges. Research by Wulandari & Wahyuni on the accuracy of the external causes code for traffic accident cases at RSUD dr. Soekardjo Tasikmalaya City found that the four-digit external cause code was 24.5% correct and 75.5% incorrect, then the five-digit external cause code was incorrect [9]. Research by Oktamianiza at Dr. M. Djamil Padang General Hospital found 27 (71.1%) inappropriate diagnoses, 19 (50.0%) inappropriate diagnoses for the suitability of primary and secondary diagnoses, and 29 (76.3%) incorrect codes for each accurate diagnosis [10]. Furthermore, a study by Manalu at the Gatot Soebroto Army Central Hospital on the accuracy of injury codes and external causes found the accuracy of injury codes was 66%, the accuracy of external cause codes was 13% [11].

Previous studies have shown variations in code interpretation, lack of understanding of code criteria by health workers, and lack of adequate training in Injury and external causes coding. Therefore, a study is needed at Adventist Hospital Bandung to ensure that the data generated is reliable and useful in supporting hospital activities. Competencies of Medical and Health Information Recorder (PMIK) include clinical classification skills, codification of diseases and health problems, and clinical procedures [12]. This study aims to help evaluate the competence of PMIK at Adventist Hospital Bandung and improve the quality of health services.

Based on this background, the researcher is interested in conducting a study entitled "Overview of the Accuracy of Injury Coding, External Causes of Traffic Accident Patients, and Reporting "SI CALAKAN" Bandung Adventist Hospital".

II. METHOD

The research method used was descriptive research with a quantitative study approach and studied from the perspective of the reference period of the study with a retrospective research design.

Data collection was carried out by reviewing medical records of traffic accident patients in the 4th quarter of 2023, namely October, November and December. The population of this study was the emergency room medical record files of Traffic Accident patients in the 4th quarter of 2023 totaling 106 medical records. The study used a saturated sampling technique, namely all populations used as research samples. Data collection techniques and instruments by observation using observation tables, interviews with officers, ICD-10 volumes 1, 2, and 3 of the 2010 edition, Dorland's pocket medical dictionary. Data analysis technique is descriptive analysis.

III. RESULTS AND DISCUSSION

A. Standard Operating Procedure for Injury and External Causes Codification at Adventist Hospital Bandung

Bandung Adventist Hospital has a Standard Operating Procedure (SPO) that is used to standardize the implementation of coding. This SPO is listed in document number 015/2.12/VIII/2022, published on August 09, 2022 with revision number 2, and contains definitions, objectives, policies, procedures, and related units established by the Director of Adventist Hospital Bandung. Based on the results of the interview, there are several things that need to be considered in the implementation of disease coding in this hospital:

1. Legality: The logo and name of the hospital stated in the SPO indicate ownership by Adventist Hospital Bandung. The document number, revision number, and date of publication are clearly recorded. The signature and clear name of the director indicate that the SPO has been established and authorized by the hospital leadership.
2. Substance: The disease and action codification SPO contains the title, hospital name and logo, document number, revision number, number of pages, date of publication, clear name and signature of the person in charge, definition, objectives, policies, procedures, and related units. However, this SPO does not specifically explain the coding of injuries and external causes. The procedures recorded in the SPO for disease coding are:
   a. The coder receives the medical record from the scanning officer.
   b. The coder looks at the doctor's diagnosis on the medical record.
   c. The coder uses the 2010 edition of the ICD-10 Volume 3 book to view the disease code.
   d. The coder ensures the disease code is correct and looks at the subcategories with ICD-10 Volume 1 2010 edition.
   e. If there is a problem in determining the disease classification, the coder uses ICD-10 Volume 2 edition 2010.
   f. If the writing of the diagnosis is illegible or unclear, the coder contacts the DPJP.

g.If they found the correct code, the coder wrote the disease code in the medical record column.

3. Language: The language used in the SPO is easy to understand and comprehend by the coder, and is short and concise.
4. Procedure: The procedure for coding injuries and external causes has not been specifically explained in the existing SPO.

The results of interviews with coding officers show that SPOs have not been specifically established for the coding of injuries and external causes, so officers still refer to SPO number 015/2.12/VIII/2022. The assistant head of the medical records installation also said that the SPO related to the coding of injuries and external causes was in the process of being determined. In addition, the researchers found that in the case of injuries such as fractures that require the fifth digit and activity codes for external causes have not been inputted because the Bandung Adventist Hospital Information System has not facilitated up to the fifth digit. As a result, coders can only code up to the fourth digit.

Standard Operating Procedures (SPOs) are documents that detail methods of implementing policies to ensure routine tasks are performed effectively and efficiently. SPOs aim to avoid variations or deviations that can affect organizational performance, so they must be made carefully, in detail, and easy to understand.

Adventist Hospital Bandung has SPOs related to coding, but does not yet have specific ones for injury and external causes coding. The study showed three classifications of injury coding inaccuracies: blocks, no fifth digit in the main, secondary, and tertiary diagnosis codes. This inaccuracy is believed to be because there is no SPO that regulates the selection of blocks. Therefore, the establishment of special SPOs for injury and external causes coding is needed.

B. Accuracy of Injury and External Causes Codification of Traffic Accident Patients at Advent Hospital Bandung

From the results of research on patient medical records on (RM 02.1.01) triage sheets that have been coded by officers and then processed by re-coding by researchers based on ICD-10, the results of the calculation of the accuracy of injury coding are as follows:

Table 1. Accuracy of Injury Codefication of Traffic Accident Patients at Advent Hospital Bandung Quarter 4 Year 2023

∑ Exact sample		∑ Improper sample		Total	
N	**%**	**N**	**%**	**∑ Sample**	**%**
44	41%	62	59%	106	100%

Of the 106 emergency room medical record files of traffic accident patients in the 4th quarter of 2023 which were sampled by researchers, the results were 41% or 44 medical records that had the same code as the researcher or appropriate, while 59% or 62 medical records were inappropriate based on ICD-10. It is said to be inappropriate when the main diagnosis or secondary diagnosis does not match the researcher.

Furthermore, the researchers processed the data and obtained the results of the accuracy of the external causes coding as follows:

Table 2. Accuracy of External Causes Coding for Traffic Accident Patients at Advent Hospital Bandung Quarter 4 Year 2023

∑ Exact sample		∑ Improper sample		Total	
N	**%**	**N**	**%**	**∑ Sample**	**%**
0	0%	106	100%	106	100%

Of the 106 emergency room medical record files of traffic accident patients in the 4th quarter of 2023 which were sampled by researchers, the results were 100% or 106 medical records that were not appropriate based on ICD-10. It is said to be inappropriate when the codification of external causes does not match the researcher up to the fifth digit. Of the 62 inappropriate medical record files, the researchers divided the classification of inaccuracy as follows:

Table 3. Classification of Types of Inaccurate Injury Codification of Traffic Accident Patients at Advent Hospital Bandung Quarter 4 Year 2023

No	* Inaccuracy	Total
1	Code **DU Wrong Block	24

2	DU code No fifth digit	12
3	Wrong third and fourth digits	12
4	Concatenation of DU and DS Code	6
5	Wrong ***DS code Block	3
6	DU code Wrong fourth digit	3
7	Less DS Code	3
8	DS code missing fifth digit	2
9	DS code No fourth digit	1
10	Code ****DT No fifth digit	1

*urutan sesuai dengan jumlah (*ranking*)
**diagnosa utama
***diagnosa sekunder
****diagnosa tersier

Source: data processed by researchers, 2024

The most common types of inaccuracy based on the order of the 3 largest are DU codes with wrong blocks as many as 24 medical records, DU codes with no fifth digit as many as 12 medical records, and DU codes with wrong third and fourth digits as many as 12 medical records.

The following is a detailed comparison of inaccurate blocks in the main diagnosis:

Table 4. Main Diagnosis Codefication Details Wrong Blocks

Table No.	Blocks		N	%
	Staff	**Researcher**		
16, 67, 72, 74	*S00-S09 Injuries to the head*	*T00-T07 Injuries Involving multiple body regions*	4	4%
82	*S00-S09 Injuries to the head*	*S40-S49 Injuries to the shoulder and upper arm*	1	1%
87	*S20-S29 Injuries to the thorax*	*S40-S49 Injuries to the shoulder and upper arm*	1	1%
30	*S30-S39 Injuries to the abdomen, lower back, lumbar spine and pelvis*	*S90-S99 Injuries to the ankle and foot*	1	1%
2	*S40-S49 Injuries to the shoulder and upper arm*	*T00-T07 Injuries Involving multiple body regions*	1	1%
6, 43, 45	*S50-S59 Injuries to the elbow and forearm*	*T00-T07 Injuries Involving multiple body regions*	3	3%
7, 108	*S60-S69 Injuries to the wrist and hand*	*T00-T07 Injuries Involving multiple body regions*	2	2%
101	*S70-S79 Injuries to the hip and thigh*	*T08-T14 Injuries to unspecified part of trunk, limb or body region*	1	1%
4, 8, 33, 34, 53, 65, 69, 99	*S80-S89 Injuries to the knee and lower leg*	*T00-T07 Injuries Involving multiple body regions*	8	8%
73	*T08-T14 Injuries to unspecified part of trunk, limb or body region*	*S80-S89 Injuries to the knee and lower leg*	1	1%
88	*S80-S89 Injuries to the knee and lower leg*	*S90-S99 Injuries to the ankle and foot*	1	1%
TOTAL			24	23%

Source: data processed by researchers, 2024

Furthermore, researchers also obtained the classification of blocks in the injury codefication according to chapter XIX Injury, poisoning and certain other consequences of external causes as follows:

Table 5. Classification of Blocks Injury of Traffic Accident Patients at Advent Hospital Bandung Quarter 4 Year 2023

Blocks	Σ	%
S00-S09 Injuries to the head	30	28%
S20-S29 Injuries to the thorax	8	8%
S30-S39 Injuries to the abdomen, lower back, lumbar spine and pelvis	6	6%
S40-S49 Injuries to the shoulder and upper arm	6	6%
S50-S59 Injuries to the elbow and forearm	7	7%
S60-S69 Injuries to the wrist and hand	9	8%
S70-S79 Injuries to the hip and thigh	1	1%
S80-S89 Injuries to the knee and lower leg	22	21%
S90-S99 Injuries to the ankle and foot	6	6%
T00-T07 Injuries Involving multiple body regions	6	6%

Source: data processed by researchers, 2024

Table 5 shows the CRF (Case fatality Rate) of dengue fever cases based on the distribution of health facilities and gender. Of the 5 health facilities that reported the cases, the highest CFR rate was in RSUD Kartini with a total of 19%, with 12.9% in male patients and 7.24% in female patients. The CFR rate is an important concern for the Indonesian government to reduce patient mortality due to dengue fever. [4][14]Therefore, there is a need for an expert system that can predict spikes in dengue fever rates that result in death.[6][9][15].

From table 5, it can be concluded that the most traffic accident patient injuries are in the head block S00-S09 Injuries to the head as much as 28% of the total 106 cases of traffic accident patient injuries. Injury coding must be accompanied by external causes coding found in chapter XX external causes of morbidity and mortality. Furthermore, the researcher presents data on the accuracy of the external causes codefication which is the external cause of an injury as follows:

Table 6. Inaccuracy of External Cause Codification of Traffic Accident Patients at Advent Hospital Bandung Quarter 4 Year 2023

No	Error	Total
1	Activity code does not exist	106

Source: data processed by researchers, 2024

Of the 106 medical records that did not have a fifth digit activity code, the researcher also provided details of the inaccuracy of external cause coding as follows:

Table 7. Classification of Inaccurate External Cause Codification of Adventist Hospital Bandung Quarter 4 Year 2023
Year 2023

No	Inaccuracy	Total
1	The external causes code has incorrect blocks	14
2	The external causes code has the wrong fourth digit	1
3	Wrong external causes code third digit	5
Total		20

Source: data processed by researchers, 2024

Table 7 shows that in the codification of external causes, the dominating inaccuracy is caused by block errors. This is also the case in table 3 that the injury codefication also has many errors in blocks.

Of the 10 classifications of injury coding inaccuracies in table 3, 24 medical records were incorrect due to block errors. The errors occurred because multiple codings did not follow the ICD-10 guidelines that injuries to different body locations should be coded T00-T07. For example, injuries to the hands and feet, which are different regions, were not coded correctly. Case example:

- RM no: 4006287
- Accident Status: Traumatic KLL, pain and abrasion injuries to the knee and ankle.
- Diagnosis: Multiple VE post KLL
- DU ICD-10: S80.7
- Treatment: Wound Toilet, As Mef, Enervon C

The correct code should be T00 for superficial wounds in different body regions. This inaccuracy requires special attention, especially for injuries in different regions. Although the coding is not correct according to ICD-10, the report will require specific data to generate accurate information about the injury so that the coding can still be enforced according to the injury.

C. Problems and Constraints in Injury and External Causes Coding at Adventist Hospital Bandung

Based on interviews with the medical record installation coding officer at Advent Bandung Hospital, there are several main obstacles:

1. The use of SIMRS has not been facilitated: SIMRS is not fully integrated, requiring staff to switch between multiple tabs or systems, which is time-consuming and increases the risk of errors due to different interfaces. Required data was not always available in real-time, causing delays in coding.
2. Inappropriate Doctor Abbreviations: The mismatch of abbreviations used by doctors with the system requires staff to perform additional checks to ensure the accuracy of the information. This adds to the workload and extends the coding time.
3. Internet loading issues: Slow or unstable internet connections hindered the coding process. Long loading times and connection interruptions can lead to data loss or system access failure, disrupting team coordination. Improving the technology infrastructure is crucial for a smooth work process.

D. Reporting of "SI CALAKAN" Adventist Hospital Bandung

After the accuracy of injury coding has been analyzed, the researchers then calculate the quality of "SI CALAKAN" reporting. The calculation is done by reducing the number of samples with the accuracy of injury codification so that the number of reporting inaccuracies is obtained. The following table presents the inaccuracy of "SI CALAKAN" reporting:

Table 8. Inaccuracy of "SI CALAKAN" Reporting Adventist Hospital Bandung Quarter 4 Year 2023

∑ Sample	∑ Improper sample	%
106	62	59%

Source: data processed by researchers, 2024

From table 8, we know that the picture of the inaccuracy of "SI CALAKAN" reporting caused by the inaccuracy of injury coding for traffic accident patients is 59%. Furthermore, the researchers obtained the following description of the location of traffic accidents:

Table 9. Traffic Accident Cases at Bandung Adventist Hospital by location Quarter 4 Year 2023

No	Location	Total
1	TIDAK DIKETAHUI	51
2	JL. SETIABUDHI	8
3	CIWARUGA	4
4	JALAN RAYA	3
5	JL. CIHAMPELAS	3
6	JL. DAGO	3

7	PASAR SEDERHANA	3
8	SEKITAR RUMAH	1
9	JL. SARIWANGI	2
10	SETIABUDI KE CIHAMPELAS	1
11	DAERAH SABUGA	1
12	DAGO ASRI	1
13	DEPAN IPH CIMINDI	1
14	DEPAN RM AYAM SUHARTI	1
15	DEPAN RS PINDAD	1
16	GASIBU	1
17	JL. CIHIDEUNG	1
18	JL. CILEUNYI	1
19	JL. CIPAGANTI	1
20	JL. CIPEDES	1
21	JL. DINAS PETERNAKAN	1
22	JL. H. ISMAIL	1
23	JL. KOL. MASTURI	1
24	JL. PASTEUR	1
25	JL. PHH. MUSTOPHA	1
26	JL. PRAMUKA	1
27	JL. RAYA LEMBANG	1
28	JL. SEKELOA	1
29	JL. SUKAGALIH	1
30	JL. TAMAN SARI	1
31	JL. TANIMULYA	1
32	JL. TIRTASARI	1
33	PANGALENGAN	1
34	PARONGPONG	1
35	SUMEDANG	1
36	TOL KM 125	1
37	JL. SOEKARNO HATTA	1
TOTAL		**106**

Source: data processed by researchers, 2024

From table 9 above, unknown accident locations were the most common. Followed by Setiabudhi Road. Traced from the completeness of the medical record file, this happened because the examination history was not written completely by the officer in the emergency room.

The following is a table containing the Accuracy of Injury Coding, External Causes, and Reporting of "The Calakan":

Injury	Appropriate		In appropriate		External Cause	Appropriate		In appropriate		Reporting SI CALAKAN	Appropriate		In appropriate	
	N	%	N	%		N	%	N	%		N	%	N	%
DU	55	52%	51	48%	Fifth Digit	0	0%	106	100%	DU	55	52%	51	48%
										External Cause	0	0%	106	100%

Source: data processed by researchers, 2024

From table 8, there were 62 medical records with inaccurate injury coding in the "SI CALAKAN" report, indicating inadequate data quality. According to Kroenke & Boyle (2017), high-quality data must be accurate. Complete and correct data is important for informed decisions, so data accuracy is important for the "SI CALAKAN" report.

Table 6 shows all external causes codes (106 medical records) were incorrect, as the "SI CALAKAN" reporting format requires up to the fifth digit, which is not supported by SIMRS for fifth digit code input.

Table 9 shows 51 traffic accident medical records did not include the location of the incident. The location of the accident is important for the "SI CALAKAN" report to generate accurate information.

IV.CONCLUSIONS AND SUGGESTIONS

Standard Operating Procedures (SPO) for injury and external causes coding at Adventist Hospital Bandung have not been established, leading to inaccuracies in coding with 59% errors in injuries and 100% in external causes. Major obstacles include information systems that do not support fifth digit input, mismatches in doctor abbreviations, and internet loading issues, which impact the accuracy of "SI CALAKAN" reporting.

For improvement, it is recommended that SPO be immediately made in accordance with ICD-10, complete coding guidelines be developed, SIMRS integration be improved, doctor abbreviations be standardized, and SIMRS be improved to support fifth digit codes and location of events. In addition, training for coding and reporting staff should be conducted to ensure data accuracy and improve report quality.

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