Improvement in Documentation of Intake and Output Chart

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ABSTRACT

Intake and Output (I/O) records in hospitals were often found to be incomplete and illegible. The form used to record I/O is not user-friendly — i.e., they feature miniscule boxes, 'total' lines that do not correspond with shift changes and lack of instructions. Complaints often received from Specialists & Doctors regarding calculation errors or no totalling of I/O. Moreover, Nursing Sisters objective rounds often saw incompleteness of I/O chart. This study aims to identify the types of mistakes in recording the existing I/O chart. The second aim is to find out whether shift totalling of I/O chart helps in reducing mistakes. We try to determine whether the identified mistakes were repeated in the new I/O Chart. This study was conducted from October till December 2010 in 9 selected wards in Sibu Hospital. Data collection was divided into 3 phases. A pre-implementation audit using a checklist was carried out. The compliance rate of completeness of documentation of I/O Chart was 63%. A one month trial of new I/O chart was being done in the selected 9 wards. Post implementation audit showed a significant improvement of compliance rate (88%). Feedback from health care workers (N=110) showed that, 89% of doctors (n=17) and 60% of nurses (n=93) in the sample prefer to use the new format as more practical and relevant to the changing shift of nurses and doctors' ward round. It is suggested to implement the new format to increase compliance rate of documentation of I/O charting. Briefing should be given to nurses periodically and the new format should be introduced to nursing students in nursing colleges.

Keywords: Intake and Output Chart-Incompleteness-Documentation-Shift Totalling Intake and Output Chart-Nurse.

INTRODUCTION

Problem Statement

During the recent visit of the Director of Nursing to Sarawak General Hospital, it was found that 8 out of 10 intake and output charts of patients that were picked randomly were found to have mistakes. The mistakes included wrong totalling; wrong recording in the column, and no concurrent updates were done in the shift. Moreover, the intake and output chart that was used were based on 12 hours totalling. Recommendations made by Director of Nursing included changing the existing 12 hourly totalling to shift totalling. Furthermore, the existing intake and output chart was wholly inadequate for determining fluid balance. The 12 hourly totalling is from 7am till 6 pm and 7 pm to 6 am (Appendix 1). There was lack of charting that result in flawed reports of information. In Semenanjung Malaysia, the intake and output chart was developed based on the nurses' shift duty. In Sarawak, documentation of intake and output chart was focused to 12 hours totalling. Therefore, this study was undertaken to determine the common mistakes by the nurses and how to improve the existing intake and output chart.

Objectives of the Study

The objectives of this study are as follow:

a) To identify types of mistakes that has been done in recording the existing Intake and Output Chart.

b) To determine whether Shift Totalling I/O Chart helps in reducing mistakes that has been identified.

c) To determine perception of staff regarding the Shift Totalling of I/O Chart.

Research Questions

From the studies that have been found and reviewed, most of the researchers from United Kingdom, United States of America, and others had conducted numbers of research on the Intake and Output chart. However, there was limited documentation or published studies done in Malaysian. Thus, there was limited information about the perceptions and preferences of Intake and Output Chart.

To address this knowledge gap, this study planned to identify nurses' perception and preferences of Intake and Output Chart in the hospital setting. Therefore, the research questions of this study are as listed below:

1. What are the type of mistakes that occurred in recording in existing Intake and Output Chart?
2. Do Shift Totalling I/O Chart helps in reducing occurrence of existing mistakes?
3. Do identified mistakes were repeated in the new intake and output chart?
4. What the perception on the new intake and Output Chart?

Hypothesis
1. Mistakes that were detected in the existing Intake and Output chart is more compared to the new Intake and Output chart.
2. The new chart had decreased the mistakes that been made in existing Intake and Output chart.
3. The staff prefers to use the new Intake and Output chart compared to the existing one.

Significance of the Study
This study aims to find out what are the common problems and errors in recording in the existing I/O Chart. From the mistakes and common problems that had been identified, a new format of I/O Chart would be developed and used. After a trial of usage, an audit will be carried out to determine whether the chart is useful in reducing mistakes that have been identified in previous existing chart. Then, if the new format is applicable in the current clinical setting, the new format would be proposed to be implemented throughout Sarawak state.

LITERATURE REVIEW
Intake and Output Chart
In the hospital, intake and output (I/O) chart are used to record all fluids of a patient's intake and output in a certain period of time, usually in 24 hours. Although there are various types of I/O chart that have been developed, most had the basic information. Intake refers to all fluids that go into the patient's body. These comprise oral intake and intravenous intake. Oral intake includes water, milk, tea, gelatine, ice creams, soups, and other fluids where as intravenous intake refers to fluids that were given into the bloodstream such as plasma, bloods and other intravenous solutions. Output refers to all fluids that eliminated by the patients such as the urine, drainage from the tubes or irrigations. The types and colour of drainage noted often recorded in the "Remark" column. Vomitus fluids, faeces, or other liquid bowel movement also measured and recorded. The fluids for I/O chart are recorded in metric measurements, often in millimetres (ml) or cubic centimetres (cc). Most charts contain 1 hour time periods to record information. Depending on the hospital policy agency, a total is calculated for each column. To some hospitals, a total is calculated every 8 hours. These may vary to other hospitals whereby 12 hours totalling may used, depending to

their working shift. However, at the end of the 24 hours period, these totals are added to obtain the 24 hour total for each column. According to Sullivan (2005), all sources of fluid gain and losses need to be included when determining the patient's fluid intake requirements. These losses need to include the insensible loss whereby these losses were from the respiration, perspiration, and bowel evacuation.

In the earlier days, patient's intake and output were recorded in a single sheet (Johnson, 1924). For example, if a patient had a bowel movement, the nurse will record the time, amount and the initial of the person who recorded the output under the patient's name in the chart. The amount is either total at 12 midnight or at 7 in the morning and the chart was placed on the bulletin board in the utility room which is accessible to the Ward Sisters or Head Nurses. On the other hand, the intake chart was put in the bulletin board at the Diet Kitchen and the night nurse will totals the chart of the day and writes the name of the patients on the chart for the new day.

A few years later, McCrea (1927) had devised a chart which records the intake and output of the patient in Long Island College Hospital, Brooklyn. The chart was arranged that the recording of the intake column was on the left side and the output column was on the right side. Both intake and output begin at 7 a.m., continuing throughout the day until 7 p.m., and from 7 p.m. till 7 a.m. the next day. The accurate amount of fluid taken or eliminated may be hourly noted depending on the patient's intake and output. Based from the survey that was conducted by McCrea (1927), the I/O chart were widely accepted by the health care workers and has been used since as practice and part of the permanent hospital record.

Van Pelt (1961) believed that it is nurses' responsibility in ensuring the accuracy of patient's intake and output over 24 hours period. Based on multiple forms of intake and output chart, Van Pelt (1961) had modified and devised a standardized form that to be used in the selected hospital. The staff need to records any input or output from the patient. The chart was subdivided to 3 parts of totalling which reflect to the nurses' changing shift. The shift started at 0800 hours for morning shift, 1600 hours for afternoon shift and 2400 hours for night shift.

Since then, the intake and output chart had taken a few modifications, where each of the modifications were based to the hospital agency's policy and nurses' working shift hours (Perelman, 1966, and Horsey, 1970). To date, no other publication had been found in the revision of the intake and output chart. Most of the charts were modified and devised according to the hospital's policy and the healthcare professionals' preferences. Those changes were up to the health institutions discretion.

For example, St. Joseph Medical Centre in United States practiced the measurement and recording of intake and output chart every 12 hours (Carondelet Nursing, 2010). According to the Carondelet Health Nursing Division, the nurse will need to document and update their intake and output chart before handing over their shift to another nurse. Their I/O chart was based on the nurses' shift duty whereby they start their shift from 0600 hours and 1800 hours. On the other hand, in another medical centre in United States, Detroit Medical Centre totalled their intake and output at 0700 hours and 1900 hours which also reflected their changing shift hours (Detroit Medical Centre Care Policy Committee, 2006).

Common Problems in Documentation of Intake and Output Chart
In the most recent study that was conducted by Tang and Lee (2010), they found that inaccurate of intake and output calculation is due to lack of education and inconsistency of poor documentation in the chart. They conducted the survey on 25 surgical trainees including 12 at Specialty Training level and 13 at Foundation Year level, to calculate the total input and output of 13 fluid balance charts. From the study, they concluded that clinical experience does not influence the correct calculation of the total input and output values.

From the literature reviewed, each health institutions had their on policy regarding intake and output chart and the subdivision of totalling was based on the nurses' tour of duty. In conclusion, the existing intake and output chart that was currently in used will be revised and modified in response to nurses' shift duty.

METHODS
Research Design
A descriptive and correlation research design was used in this study. This design is chosen because cross-sectional designs involve the data collection at one point of the time.

Sample and Setting
The sampling design will be non-probability, convenience sampling. This sampling design is chosen because the samples that will be selected are currently working in hospital. Moreover, the sample size is very large and it is very useful as this is an early stage of the exploratory study in identifying inaccurateness of documenting and recording of intake and output chart.

Sample setting of the study is divided into 2 categories. In the first category, sample of the existing I/O Chart will be audited for its percentages of compliance according a checklist (Appendix 2). The sample size was calculated using statistical calculation (Epi Info, Version 6). The minimum sample size was 156.9. The sample size was rounded to 160 to take into account non response and the sample were collected within 9 selected wards; Male Medical Ward, Female Medical Ward, Paediatric Medical Ward, Male Surgical Ward, Female Surgical Ward, Paediatric Surgical Ward, Male Orthopaedic Ward, Female Orthopaedic Ward, and Gynaecology Ward.

Size of sample:

$$\frac{\text{Total Admission within 9 wards}}{9 \text{ (No. of months)}} \times 10\% = \frac{14119}{9} \times 10\%$$

$$= 156.9 \text{ (round up to 160)}$$

For the second sample category, the sample was collected from the health care workers' feedback on the new I/O Chart. Again, by using the same statistical calculation size of the nurses and doctors sample was calculated as shown below.

Size of nurses' sample:

Total nurses within 9 wards X 10% = 198 X 10%
= 19.8 or 20 nurses

Size of doctors' sample:

Total doctors (Specialist & MO) within 9 wards X 10% = 41 X 10%
= 4.1 or 4 doctors

To increase the number of responses from the feedback, size of the sample of nurses and doctors was increased to 93 respondents and 17 respondents respectively. To be eligible to participate in this feedback, respondents had to be Malaysian registered nurses or doctors, able to give consent independently, free from physical and mental any defects.

Instrument

Instrument 1 (Appendix 3):
The checklist that was used for auditing of pre and post implementation of new I/O Chart was developed by authors. There were 4 criteria in the checklist; Criteria 1: Solution Infused, Criteria 2: Oral Intake, Criteria 3: Output and Criteria 4:

Calculation, whereby each criteria was further subdivided into more details. If a sub criteria was not met during an audit of an I/O chart, the author will put a mark on the 'NO' column and vice versa. If the sub criteria was non-related with the audited I/O Chart, the author will mark at 'N/A' for non applicable. Then, the criteria will be calculated for its percentages of completeness of the audited I/O Chart.

Instrument 2 (Appendix 4):
The feedback from the nurses and doctors was collected using a self-administered questionnaire which was developed by the author. The questionnaire was written in English and Bahasa Melayu which is divided into 2 sections:

a)   Demographic Data Questionnaire
b)   Perception of Staffs Regarding the Shift Totalling Intake and Output Chart

The remaining items will require the respondents to fill in the blanks. Back to back translation was done to the whole set of questionnaire in order to maintain the original meaning of each statements.

a)   Demographic Data Questionnaire
The demographic data questionnaire was developed by the author to get information regarding the respondent's age, race, marital status, highest level of nursing education, number of years worked as a nurse, number of years working on current clinical unit, and whether they have any post basic course or not. The questionnaire will take about 3 minutes to complete.

b)   Perception of Staffs Regarding the Shift Totalling Intake and Output Chart
Respondents also will be evaluated on their perception regarding using Shift Totalling of Intake and Output Chart. This section was modified from the study that was done by Bennett (2009). A total of 8 items of forced-choice response options using a five point Likert Scale was selected for the attitudes subscale. The respondents will be asked to indicate on their perception which the scale is classified into 0=strongly disagree, 1=disagree, 2=no opinion, 3=agree, and 4=strongly agree. This section will take about 4 minutes to complete.

Data Collection Procedures
Data was collected from 11th October 2010 till 10th December 2010 in Hospital Sibu. Once a ward was selected, the Ward Sister approached with the details of the study and discussed with the researcher before the project started. Although in theory Ward Sisters could have refused to have their wards participating in the study, the research was endorsed by the State Matron and it was probable that it would have been difficult to opt out. Similarly, once a Ward Sister had

agreed to participate, it would have been difficult for the staff to refuse. To reassure the anonymity and confidentiality, all the data that will be collected will be kept in a stamped envelope. The data and the questionnaires will be kept in locked cabinet and only the researchers have the access to this information.

Data collection procedure were divided into 3 phases:

Phase 1: Retrospective Study
In order to detect common mistakes that nurses made, a checklist was used (Appendix 1) which was developed by authors. After discussion with the Hospital Matron and Nursing Sisters, a consensus was made and the checklist was used as a tool for this audit. The Pre Implementation audit started from 11th -18th October 2010 in 9 selected wards; Male and Female Medical Ward, Paediatric Medical Ward, Male and Female Surgical Ward, Paediatric Surgical Ward, Male and Female Orthopaedic Ward, and Gynaecology Ward.

Phase 2: Implementation of Shift Totalling I/O Chart:
To elicit a higher compliance rate of documentation in I/O Chart, it was proposed to use the new chart as a trial (Appendix 2). The chart was developed based from common mistakes that were found in Pre Implementation audit. Before implementation of the new chart, a short briefing was conducted among all the Area Matrons, Ward Sisters, and KUP nurses. Briefing includes what are changes that been made, proper way of documentation, and calculation technique for each shift totalling, grand total and cumulative balance column. After the briefing, each ward sisters and KUP nurses were expected to give a short in-house training for all their staffs in respective ward. A trial of using the new chart started from 1st November 2010 and continued for one month. Adequate number of shift totalling intake and output chart were provided to selected wards. On the start day, existing intake and output chart will be replaced by the new chart and the new chart will be used for the next 30 days.

Phase 3: Retrospective Study
After 1 month of utilizing the new intake and output chart (1st November 2010 till 1st December 2010), a post implementation audit was carried out on 2nd -7th December 2010 for the new format. After the Post Implementation Audit, a feedback questionnaire was also circulated to nurses and doctors to examine their views on the usefulness and practicability of the chart.

Data Analysis
All collected data was analysed using the Microsoft Excel 2007 and Statistical Package for the Social

Sciences (SPSS) software version 15. Descriptive statistics such as frequency, percentage, mean and standard deviation were used to analyze the demographic characteristic of the sample and to determine the nurses' perceptions and preferences of 12 hourly totalling Intake and Output Chart and Shift totalling intake and output chart.

RESULTS

Table 1 displays the percentage of compliance of Intake and Output Charting on the existing chart before implementation of the new format.

Table 1   Compliance of Intake and Output Charting (Pre-Implementation), Sibu Hospital, 2010

NO	CRITERIA / ITEMS		TOTAL RESPONDENTS	YES	NO
1	Solution infused				
	• Correct solution		160	154	6
	• Recorded		160	112	48
	• Time frame for infusion		160	114	46
	• Additives added being documented		74	68	6
	• Presence of IV regime		157	151	6
		TOTAL	**711**	**599**	**112**
2	Oral intake:		0		
	• Types of feed		159	142	17
	• Routes of feeding		159	141	18
	• Amount of feed		159	135	24
	• Evidence of correct measurement		159	80	79
		TOTAL	**636**	**498**	**138**
3	Output:				
	Urine:				
	• Evidence of measurement (amount)		160	105	55
	• Nature of urine		160	33	127
	Faeces:				
	• Nature		107	22	85
	Nasogastric aspiration :				
	• Evidence of measurement (amount)		18	15	3
	• Nature		19	4	15
	Drains:				
	• Evidence of measurement (amount)		5	1	4
	• Nature of drainage		5	0	5
		TOTAL	**472**	**180**	**292**
4	Calculation :				
	Intake:				
	• Evidence of 12 hourly totalling		160	136	24
	• Evidence of 24 hours totalling		160	134	26
	• Accuracy of calculation		160	43	117
	Output:				
	• Evidence of 12 hourly totalling		160	131	29
	• Evidence of 24 hours totalling		166	133	33

• Accuracy of calculation	160	76	84
Cumulative balance	160	0	160
Accuracy of calculation	160	0	160
TOTAL	**1286**	**653**	**633**
GRAND TOTAL (3105)	**3105**	**1930**	**1175**
%	**100**	**62**	**38**

From the pre implementation audit, a few common mistakes were identified which were displayed in the Figure 1.

Figure 1 Types of Common Mistakes Identified in Pre Implementation & Post Implementation Audit of New I/O Chart, Sibu Hospital, 2010
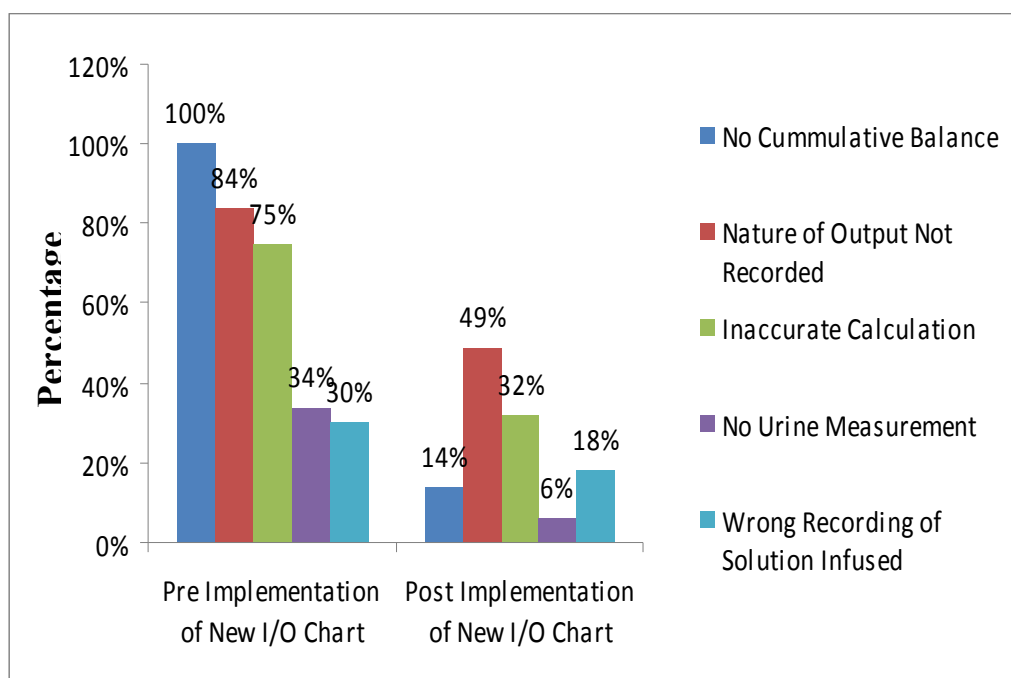
Shockingly, cumulative balance (Sub Criteria 4) in the entire audited sample of existing I/O Chart (N=160, 100%) was not been calculated. 84% (n = 135) of the existing I/O Chart were found do not have a record of the nature of the output even though there were evidence of measurement. Besides that, it was also revealed that accuracy of calculation of both intake and output column were found to be poor (75%, n=101). Other common mistakes that were seen in the sample includes; no urine measurement (n=54, 34%), and wrong recording of solution infused (n=48, 30%).

After implementation of Shift Totalling I/O Chart for 30 days, a second audit was carried out. Improvement was seen in all the common mistakes that were identified in pre implementation audit after the implementation of the new format (Please refer Figure 1).

Table 2 Compliance of Shift Totalling Intake and Output Charting, Sibu Hospital, 2010

NO	CRITERIA / ITEMS	TOTAL RESPONDENTS	YES	NO
1	Solution infused			
	• Correct solution	160	160	0
	• Recorded	170	121	49
	• Time frame for infusion	160	154	6

	•Additives added being documented		79	79	0
	•Presence of IV regime		160	160	0
		TOTAL	**729**	**674**	**55**
2	Oral intake:				
	•Types of feed		159	159	0
	•Routes of feeding		159	159	0
	•Amount of feed		159	159	0
	•Evidence of correct measurement		159	158	1
		TOTAL	**636**	**635**	**1**
3	Output:				
	Urine:				
	•Evidence of measurement (amount)		160	151	9
	•Nature of urine		160	83	77
	Faeces:				
	•Nature		79	43	36
	Nasogastric aspiration :				
	•Evidence of measurement (amount)		3	0	3
	•Nature		3	0	3
	Drains:				
	•Evidence of measurement (amount)		3	3	0
	•Nature of drainage		3	3	0
		TOTAL	**411**	**283**	**128**
4	Calculation :				
	Intake:				
	•Evidence of Shift totalling		160	154	6
	•Evidence of 24 hours totalling		160	156	4
	•Accuracy of calculation		159	115	44
	Output:				
	•Evidence of Shift totalling		160	156	4
	•Evidence of 24 hours totalling		160	156	4
	•Accuracy of calculation		160	127	33
	Cumulative balance		160	137	23
	Accuracy of calculation		160	83	77
		TOTAL	**1279**	**1084**	**195**
	GRAND TOTAL (3055)		**3055**	**2676**	**379**
		%	**100**	**88**	**12**

Comparative analysis between pre and post implementation audit in this study revealed that there was significant improvements of compliance in documenting intake and output when using the new format. Please refer to Figure 2 for the comparison.

Figure 2   Comparisons between Compliance of Documentation during Pre and Post Implementation of Shift Totalling Intake and Output Chart, Sibu Hospital, 2010
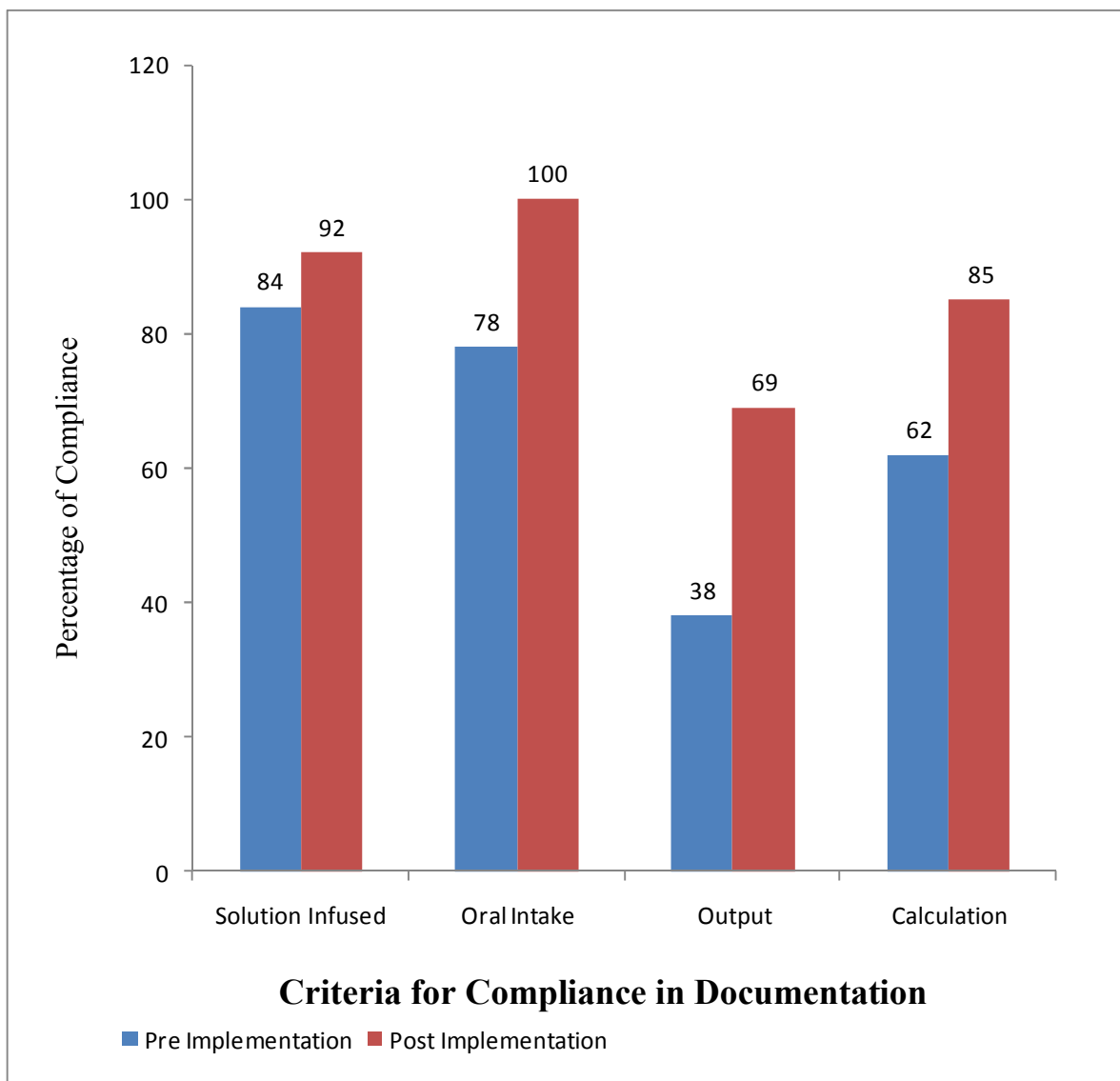
After post implementation audit, it was found that there was a significant of improvement of compliance in recording the I/O Chart. Percentage of mistakes for Criteria 3 reduced to 31% & for Criteria 4 reduced to 23% respectively. In fact, there was improvement for each criterion that had been audited. For 'Oral Intake' criteria,

percentage of compliance had achieved 100% after post implementation of the new format.

For the feedback from the health care workers, Table 3 displays positive and Table 4 displays negative experience of respondents in this sample.

Table 3   Positive experience of respondents in the sample (N=110)

		Strongly Disagree (0)	Disagree (1)	No Opinion (2)	Agree (3)	Strongly Agree (4)
1	The new intake and output chart is catching my eye	3 (2.7%)	18 (16.4%)	10 (9.1%)	66 (60%)	13 (11.8%)
2	I have found the new chart easy to understand	6 (5.5%)	18 (16.4%)	6 (5.5%)	68 (61.8%)	12 (10.9%)
4	The new chart is helpful in reminding me about the	3	10	17	63	12

	importance of keeping an eye on a patient's fluid balance status	(2.7%)	(9.1%)	(15.5%)	(57.3%)	(10.9%)
7	I would like to keep using the new chart	14 (12.7%)	8 (7.3%)	17 (15.5%)	57 (51.8%)	14 (12.7%)
	Total	26 (5.9%)	54 (12.3%)	50 (11.4%)	254 (57.7%)	51 (12.7%)

Table 4   Negative experience of respondents in the sample.

		Strongly Disagree (0)	Disagree (1)	No Opinion (2)	Agree (3)	Strongly Agree (4)
3	The new chart has interfered with the way i do my work	10 (9.1%)	48 (43.6%)	21 (19.1%)	21 (19.1%)	10 (9.1%)
5	I would like to get rid of the new chart altogether	21 (19.1%)	37 (33.6%)	34 (30.9%)	15 (13.6%)	3 (2.7%)
6	I think the new chart is irrelevant to the work I do	23 (20.9%)	59 (53.6%)	18 (16.4%)	7 (6.4%)	3 (2.7%)
	Total	54 (16.4%)	144 (43.6%)	73 (22.1%)	43 (13%)	16 (4.8%)

DISCUSSION

From the pre implementation audit, it was found that all charts did not have cumulative balance calculation. When explored further for this sub criteria, one of the respondent commented "dalam chart tak ada suruh buat, mengapa saya perlu buat?" Surprisingly, when other respondents were also asked about these sub criteria, many of them did not know that it was one of the requirements of documentation in Intake and Output Chart. Others responded that it was the doctors' job in calculating the cumulative balance. Moreover, there is no instruction or columns in the old I/O Chart to remind nurses to do the cumulative balance. This might be one of the reasons for the poor compliance for these sub criteria. However, in the new format, the cumulative balance column was introduced and number of compliance had improved drastically to 86% (n=160).

Similarly, for sub criteria accuracy of calculation, it was believed that inaccuracy of calculation was due to long hours of totalling e.g. 7am till 6pm. Therefore, to minimize the error of calculation, the 24 hours columns were divided into 3 parts which coincided with the nurses' shift changes. Each of the shift duty nurses need to make sure they had updated documented and totalled up patients' intake and output chart of their shift before they handed over to the nurse of the next shift. After this intervention, the mistakes had decreased from 75% to 32%.

In another perspectives, the second most common mistakes that were found during pre implementation audit were 'nature of output not recorded' (84%, n=160). Likewise, some of the audited I/O chart were found did not have urine measurement in the 'urine' column (34%, n=160). Even though these setbacks were non-related with I/O format, it is one of problems that we needed to

look into. It is believed that nurses tend to overlook at this criteria whereby they did not perceived it as important as other criteria. This explained why there was a high percentage of non compliance for both sub criteria. To compensate the weakness, 'Patient's I/O Chart' (Appendix 5) was developed whereby each patient or care giver who is literate and able to write were asked to record their own oral fluid intake, urine output, and the nature of their urine and faeces. For urine measurement, a single use of disposable measurement jug that was modified from discarded intravenous bottles was created which was given to each patient individually. Indirectly, this step would give the patient or care giver a self empowerment which would facilitate them to improve their own well being. Besides that, it would help patient to feel that they are still in control of their lives and motivated to communicate with nurses and other health care workers.

However, if a patient did not know how to record with no care taker was around, or the patient was too ill, nurses have to make sure that these measurements and recording are done appropriately by themselves. Following to these steps, the compliance rate for both sub criteria had improved from 16% to 52% and from 66% to 94% respectively. Although number of compliance for sub criteria 'nature of output not recorded' merely achieved 52%, there are other factors that needed to explore further. Howse and Bailey (1992) remarked that there are other extrinsic and intrinsic factors that contribute to resistance to charting. Further qualitative research approach on nurses' attitudes on documenting patients' intake and output would determine root cause of these problems.

Generally, all the criteria in the checklist had shown an improvement in terms of the compliance rate. Therefore, the result of study

showed that the new format had helped to decrease the mistakes that had been before implementation of the new format. Moreover, findings from the study also support Hypothesis 1 and Hypothesis 2 whereby mistakes detected in the old format is more compared to the new format.

In terms of health care workers' feedback, 70% of staff had positive experiences when using the Shift Totalling I/O Chart and only 18% had encountered negative experiences when documenting patients' I/O into the new format. When explored further on nurses' negative experiences some of the respondents commented that they were still confused with cumulative balance calculations. For this reason, it seems that these nurses were still not used to the new format. A recommendation was made in response to this issue. In addition, findings from the study also revealed that health care workers would like to continue to use the new format as evidenced by high percentage of positive response from respondents. 89% (n=17) of doctors and 60% (n=93) of nurses prefer to use Shift Totalling I/O Chart which prove that Hypothesis 3 is valid.

CONCLUSIONS

As conclusion, types of mistakes that have been identified before implementation are: no cumulative balance being calculated, poor accuracy of calculation & nature of urine, stool, NG aspiration and drain not recorded ('Output' sub criteria and 'Calculation' sub criteria). After implementation of new format, there is a significant improvement of compliance in terms of calculation and nature of recording ('Output' sub criteria and 'Calculation' sub criteria). Percentage of mistakes for 'Output' criteria reduced to 31% & for 'Calculation' criteria reduced to 23%. Generally, health care workers in the sample found that the new format is more practical and relevant to the changing shift of nurses and doctors' ward round. Majority of doctors (89%) and nurses (60%) prefer to use the new format of Intake & Output chart. The new format was been presented in 'Nursing Technical Meeting 1/2011' in Kuching Sarawak and after thorough discussions between Hospital Matrons, Ward Sisters, and other nurses, a slight revision was made on the new format and it is now in the process of implementation throughout Sarawak State.

RECOMMENDATIONS

Based from the findings in the pre and post implementation of Shift Totalling Intake and Output Chart, it is suggested that we implement the new form in order to increase compliance of documentation of I/O charting. Besides that, it is also suggested that a continuous refresher courses and echo training should be given to all staff on the new format as some of them were still not used to

the changes. It is also recommend that we need to teach the new format to the nursing students in the nursing colleges and to continue to do I/O audit using the consensus checklist twice per year in order to make sure that staff understand the importance of documentation of intake and output of the patient.

Limitations of the Study
As with any study, this research has limitations. First, the checklist that was used for pre and post implementation auditing of I/O Chart was not tested for its validity and reliability. Secondly, it is possible that nurses in the sample were aware that there will be a post implementation of auditing been carried out. Thirdly, when we asked respondents' perceptions and preferences of the chart, a self reported survey design was used. Thus, the assumptions made are that the respondents are truthful and understand the questions being asked. The result of the study is not an endorsement of the nurses' opinion throughout Malaysia; rather they are a snapshot of the affiliates who responded. These results only reflect the responses and attitudes that are given in a certain period of time. Thus, findings from the study may not be generalized to the entire population of nurses in Malaysia. It must also be noted that this is solely a descriptive survey and caution is required in interpreting these results outside the parameters of the survey itself.

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