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A CROSS-SECTIONAL STUDY ON THE FREQUENCY OF VITAL SIGNS MEASUREMENT AND MISSED OPPORTUNITIES AMONG IN-PATIENTS IN MEDICAL AND SURGICAL WARDS AT MBARARA REGIONAL REFERRAL HOSPITAL IN UGANDA.

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Abstract

Background

Monitoring and recording vital signs is part of routine clinical care and a fundamental nursing procedure in hospitals. Repeated measurement provides early warning scores that assist in noticing a patient who is at risk of deterioration and hence prevent morbidity and mortality in hospitals. This study assessed the frequency of vital signs measurement and missed measurements among in-patients on medical and surgical wards at MRRH.

Method

A quantitative retrospective study using files of patients who were admitted and discharged between May 2020 and October 2020 in the medical and surgical wards of MRRH was conducted. 243 patient files were used in this study. Information on vital signs (Temp, PR, RR, BP, and SpO2) in patient files was collected.

Results

131(53.9%) were files of male, 76(31.3%) had gastrointestinal conditions as their diagnosis on the ward, and 2573(66.2%) of the patients' vital signs were not recorded from admission to discharge on both medical and surgical wards. Most patients 7(47%) died at night than during day or evening time. The majority of patients with prolonged hospital stays 13, 81.3%) and deaths 2, 50%) had respiratory conditions on a medical ward. In the surgical ward, the majority of patients with prolonged hospital stays 14, 87.5%) were patients with musculoskeletal conditions, and more deaths 5, 45.5%) occurred in patients with gastrointestinal conditions. Missed opportunities were seen in all conditions, and they were all more than >50%.

Conclusion

Most of the patient files reviewed had missed vital signs from admission to discharge on both medical and surgical wards. Missed opportunities were seen in patients with life-threatening conditions.

Recommendation

Nurse staffing levels should be paid attention to, and vital sign equipment should be availed to these wards to ensure that vital signs are monitored and the quality of care to patients is improved.

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Background

Globally, studies indicate that vital signs are not constantly observed, reported, and documented (Cardona et al., 2016), and this could have an impact on patients' clinical outcomes. Pulse rate, respiratory rate, temperature, oxygen saturation, and blood pressure abnormalities have a huge association with patient outcomes in the hospital (Leuvan et al., 2008) since the morbidity and mortality of patients depend a lot on detecting abnormal vital signs (Ogero et al., 2018). Changes in vital signs before clinical deterioration are well documented, and early detection of preventable outcomes is key to timely intervention (Brekke et al., 2019). Similarly, Inadequate recording of vital signs or inappropriate response to abnormal values results in missed chances of noticing clinical deterioration until it's too late to treat or give appropriate interventions (Leuvan et al., 2008). Factors including nurses' knowledge and attitudes towards vital signs monitoring, workload issues, equipment availability, and presence or absence of standard vital signs policy are among the issues that influence compliance to vital signs monitoring in hospitals (Mok et al., 2015), and hence this study will assess their importance as well.

In a study done in Southampton on nurse staffing levels, missed vital sign observations, and mortality in hospitals,

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increased mortality in the different hospital wards was linked to low levels of nurse staffing which directly affects nursing care delivery including missed recording of vital signs which in turn affects patient's clinical outcomes (Griffiths & Saucedo, 2014). Other studies, (Ludikhuize et al., 2014, Mitchell et al., 2010, DeMeester et al., 2013, Petersen et al., 2016) done in the Netherlands, Australia, Belgium, and Denmark, showed that when vital signs are checked wholly, early identification of physiological instability occurs and reduction in unexpected hospital deaths results. These findings could apply to the study area, too.

In Africa, studies (Keene et al., 2017; Smith et al., 2017; Ogero et al., 2018) show that regular patient assessment through frequent and optimal monitoring of vital signs improves patient safety and may also reduce morbidity and mortality. In Uganda, little is documented, with most of the studies done in the study area not focused on missed opportunities to detect deterioration when vital sign observations are not frequently monitored. Therefore, this study assessed the frequency of vital signs measurement and missed opportunities among in-patients in medical and surgical wards at MRRH.

Methodology

Study design

A quantitative retrospective study design was used in this study. According to Hess (2004), a retrospective study design involves the collection of data using already existing data recorded in the past for reasons other than research, and therefore, the phenomena under study was observed from the past medical records.

Area of Study

The study was carried out in Mbarara Regional Referral Hospital on surgical and medical wards. Therefore, vital signs measurement is a fundamental aspect in this hospital. It was also easily accessible for the researcher due to its close proximity to the university.

Study population

The study population included all medical records of patients who were admitted and discharged six months ago on the selected wards of MRRH, that is, medical and surgical wards that met the eligibility criteria for the study. This included a patient chart bearing an Inpatient number, patient's name, age, sex, date of admission, and discharge. According to Gearing et al. (2006), Hess (2004), and Worster & Haines (2004), reviewing charts offers an inexpensive capability to research the rich, readily accessible existing data.

Sampling method

In this study, the Purposive sampling method was used as the sampling method. A purposive sampling method was used to sample patients' files that met the inclusion criteria until the required sample size was reached. This sampling method enables the researcher to identify only files that meet the criteria and collect data in the shortest time possible (Grove et al., 2014).

Sample size determination.

The sample size was estimated by the Yamane formula (1967:886). According to Yamane,

$$n = \frac{N}{1 + N(e)2}$$

Where; n = sample size,

N= population size of patients' files who were admitted six months ago.

e = level of error expected, which is 0.05

According to inpatient records at MRRH (2019), the medical ward, on average, discharges 60 patients per month, and the surgical ward discharges, on average, 80 patients per month, making a total of 140 patients. Therefore, N = 140×6,

Hence, the sample size (n) was estimated as follows;

Inclusion criteria

Files of patients who were admitted and then discharged between the months of May, 2020 and October, 2020 (last six months).

Exclusion criteria

Files of patients who were admitted and then discharged between the months of May 2020 and October 2020 (last six months) but with missing or incomplete information.

Access

After receiving an introductory letter from the Nursing department, the researcher then proceeded to seek administrative clearance from the Hospital Director, MRRH, and then to the person in charge of medical and surgical wards for carrying out the study.

Pilot study

A pilot study is a small-scale version of a planned study designed to test the practice and assess the effectiveness of the researcher's planned methods and data collection tool (Doody et al.,2015). A pilot study was conducted on the emergency medical and surgical wards of MRRH, and the findings are not included in the main study. The pilot study helped the researcher gain skills in data collection using a checklist before the main study.

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Data collection tool

A checklist was used as the data collection tool in the selection of eligible patient files in this study. According to Polit & Beck (2012), a checklist is easy to use, and it's useful when collecting data is based on a specific frequency of an event.

Data collection procedure.

This study used secondary data from already existing medical records of patients who were admitted six months ago and were discharged from the ward. All available charts were collected and selected using a purposive sampling method to get a representative sample size. The selected charts were checked for Basic biodata, diagnosis on the ward, initial vital signs measured on admission, change of medication, the length of hospital stay, condition of the patient on discharge, if death, the cause and at what time, guidelines for taking vital sign observations, availability of equipment, Vital signs measurements recorded in the patient's chart and these included respiratory rate, temperature, pulse rate, oxygen saturation, and blood pressure.

Data management and quality control.

Data quality control refers to the efforts and procedures a survey researcher puts in place to ensure the quality and accuracy of data being collected using the chosen methodologies for a particular study (Lavrakas 2008). This was achieved by ensuring Validity, reliability and generalizability.

Validity

This refers to the degree to which a method measures what it is intended to measure (Middleton 2019). The researcher ensured this by developing a checklist with the help of the supervisor that covered the most appropriate information for the study.

Reliability

Refers to how consistently and accurately a method measures what it is supposed to measure (Middleton 2019). This was ensured by conducting a pilot study which was done on emergency wards and involved pretesting of the checklist to ensure that it generates what it is intended to do. Also, the pilot study allowed the researcher to acquaint herself more with the tool before the main study. The tool was administered the same way each time to increase reliability.

Data Analysis

According to Polit and Beck (2012), statistical analysis of quantitative data helps to make sense of the information rather than just a chaotic mass of numbers. Therefore, data was analyzed using Statistical Package for Social Scientists (SPSS) version 20.0, and the findings of the study are presented in the form of tables, graphs, and pie charts.

Ethical approval.

An introductory letter from the Department of Nursing introducing the researcher to the Hospital Director, MRRH, for administrative clearance was obtained. The researcher ensured the safety of the medical records during and after the research. The researcher also ensured confidentiality; the data collected was kept on a personal laptop with a security code, the patient's records were not accessed by another person except the researcher, and none of the patient's name was disclosed in the research findings.

Results.

Demographic characteristics.

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Table 1: Demographic characteristics.

Demographic characteristics	Category	Frequency (n=243)	Percentage (%)
Ward	Medical ward	127	52.3
	Surgical ward	116	47.7
Sex	Male	131	53.9
	Female	112	46.1
Age	20-39	111	45.7
	40-59	68	28.0
	60-79	53	21.8
	80-99	11	4.5
Survival status	Discharged	227	93.4
	Death	15	6.2
	Referral	1	0.4
Diagnosis on ward	Gastro intestinal	76	31.3
	Central Nervous	37	15.2
	Cardiovascular	32	13.2
	Musculoskeletal	22	9.1
	Respiratory	18	7.4
	Integumentary	17	7.0
	Malignancy	16	6.6
	Renal	13	5.3
	Genital urinary	9	3.7
	Sepsis	3	1.2

Table 1 shows that, out of the 243 patient files, 127(52.3%) were from the medical ward, and 116(47.7%) were from the surgical ward. Most 131, 53.9%) were files of male patients. The majority, 227(93.4%), of patient files were discharged from the hospital after recovery, and most patients, 76(31.3%), had gastrointestinal conditions as their diagnosis on ward.

Vital signs (Temperature, Pulse rate, Respiratory rate, Blood pressure, and oxygen saturation) measurement frequency.

Table 2: Vital signs (Temp, PR, RR, BP, SpO2) measurement frequency from admission.

Vital sign Frequency (Percentage)		Temp N (%)	PR N (%)	RR N (%)	BP N (%)	SpO2 N (%)
Admission	Not recorded	108(44.4)	12(4.9)	95(39.1)	23(9.5)	154(63.8)
	Recorded	135(55.6)	231(95.1)	148(60.9)	220(90.5)	88(36.2)
1st day	Not recorded	96(39.5)	11(4.5)	75(30.9)	23(9.5)	133(54.7)
	Recorded once	116(47.7)	162(66.7)	138(56.8)	149(61.3)	91(37.4)
	Recorded twice	31(12.8)	70(28.8)	30(12.3)	71(29.2)	19(7.8)
2nd day	Not recorded	140(57.6)	62(25.5)	141(58.0)	70(28.8)	192(79.0)
	Recorded once	94(338.7)	169(69.5)	99(40.7)	158(65.0)	47(19.3)
	Recorded twice	9(3.7)	12(4.9)	3(1.2)	15(6.2)	4(1.6)
3rd day	Not recorded	146(60.1)	53(21.8)	139(57.2)	61(25.1)	197(81.1)
	Recorded once	95(39.1)	183(75.3)	100(41.2)	173(71.2)	45(18.5)
	Recorded twice	2(0.8)	7(2.9)	4(1.6)	9(3.7)	1(0.4)
Beyond	Not recorded	148(60.9)	73(30.0)	153(63.0)	80(32.9)	211(86.8)
	Recorded	95(39.1)	170(70.0)	90(37.0)	163(67.1)	32(13.2)

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Table 2: shows that, Pulse rate and Blood pressure as the most frequently recorded vital signs (>50% from admission throughout hospitalization), followed by Respiratory rate and Temperature and Oxygen saturation was the least recorded vital sign (number of not recorded are all <50%) on both medical and surgical wards.

Table 3: Vital signs (Temp, PR, RR, BP, SpO2) measurement frequency on each ward.

Vital sign	Ward Frequency(percentage)	Medical ward n (%)	Surgical ward n (%)	Combined n (%)
Temp	Recorded Not recorded	473(74.7) 218(34.2)	160(25.3) 420(65.8)	633(100) 638(100)
PR	Recorded Not recorded	577(57.5) 58(27.5)	427(42.5) 153(72.5)	1004(100) 211(100)
RR	Recorded Not recorded	386(63.1) 249(41.3)	226(36.9) 354(58.7)	612(100) 603(100)
BP	Recorded Not recorded	573(59.8) 63(24.4)	385(40.2) 195(75.6)	958(100) 258(100)
SpO2	Recorded Not recorded	238(72.8) 397(44.7)	89(27.2) 491(55.3)	327(100) 888(100)

Table 3 indicates that vital signs were monitored and recorded more frequently on the medical ward (>50% for all individual vital signs) than on the surgical ward.

Patient's Length of stay in the hospital

Figure 1: Showing Number of patients and their Length of stay in the hospital.

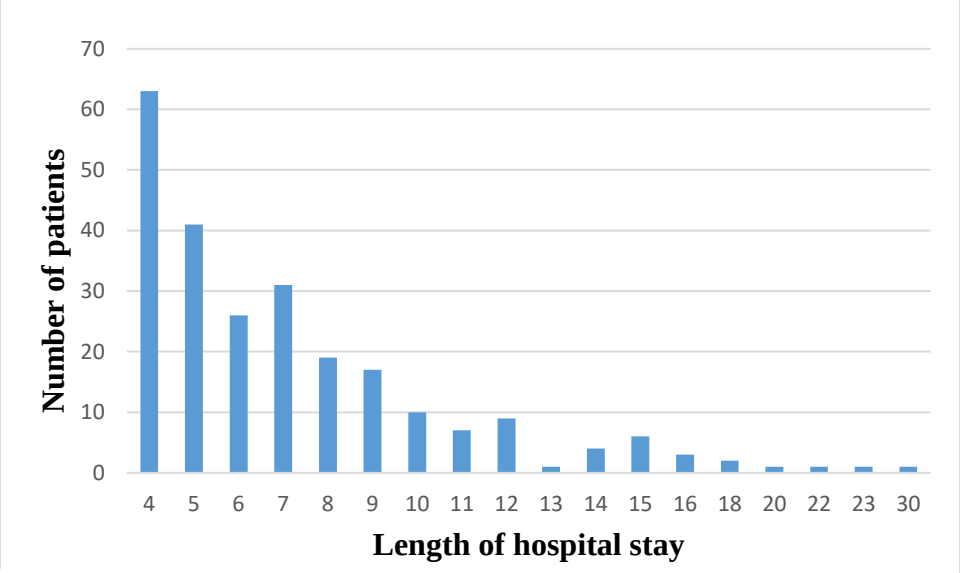

Figure 1: shows that, majority, 63(25.9%) of patients stayed in the hospital for 4 days, but there are those patients who stayed for as long as 20 to 30 days in the hospital.

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Figure 2: Showing time of death for patients who died.

Figure 2: shows that, most patients 7(47%) died at night than during day or evening time.

Change of medication

Figure 3: Showing change of medication

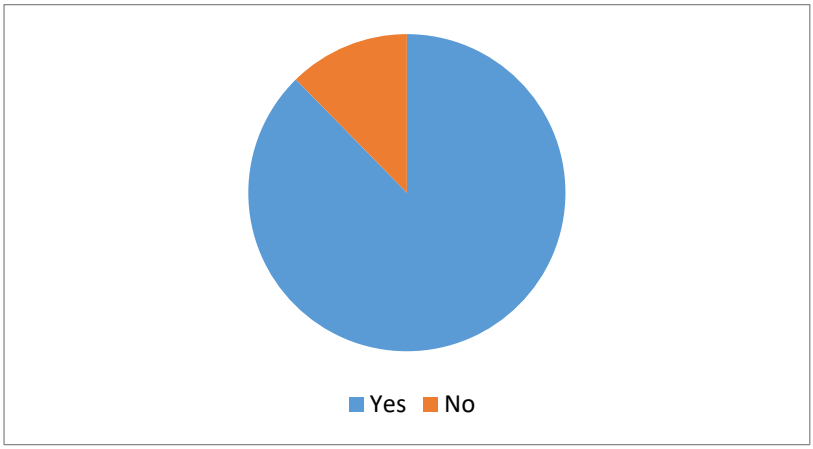

Figure 3 indicates that, majority of patients 213, 88%) had a change of medication during their hospitalization.

Number of vital signs measurement equipment per ward

Table 4: Showing Number of vital signs measurement equipment per ward

	Medical ward	Surgical ward
BP Machine	1	1
Pulse oximeter	1	1
Thermometer	1	0
Stopwatch	0	0

Table 4 shows that the medical ward had more vital signs measurement equipment than the surgical ward.

Number of nurses on the ward per shift

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Table 5: Number of qualified nurses on the ward per shift.

	Morning	Evening	Night
Medical ward	2	1	1
Surgical ward	2	1	1

Table 5 indicates that, morning shift had more nurses (2) than the evening and night shift.

Missed opportunities

Table 6: Showing missed opportunities in the medical ward

Condition	Number of missed vital signs					Outcome		
	Temp	**PR**	**RR**	**BP**	**SpO2**	**Discharged (<7days)**	**Discharged (>7days)**	**Deaths**
Respiratory	116(64.4%)	94(52.2%)	121(67.2%)	94(52.2%)	139(77.2%)	3(18.7%)	13(81.3%)	2(50%)
Cardiovascular	216(67.5%)	178(55.6%)	217(67.8%)	176(55.0%)	258(80.6%)	20(64.5%)	11(35.5%))	1(25%)
Central Nervous	137(72.1%)	117(61.6%)	152(80.0%)	118(62.1%)	176(92.6%)	12(63.2%)	7(36.8%)	0
Gastrointestinal	217(67.8%)	178(55.6%)	220(68.8%)	177(55.3%)	257(80.3%)	21(67.7%)	11(32.3%)	0
Renal	86(71.7%)	61(50.8%)	87(72.5%)	63(52.5%)	95(79.2%)	4(36.4%)	7(63.6%)	1(25%)
Malignancy	49(70.0%)	38(54.0%)	51(72.9%)	43(61.4%)	56(80.0%)	3(42.9%)	4(57.1%)	0
Sepsis	13(65.0%)	12(60%)	13(65.0%)	12(60.0%)	19(95.0%)	1(50%)	1(50%)	0

Table 6 shows that, majority of patients with prolonged hospital stay 13(81.3%) and deaths 2(50%) had respiratory conditions on medical ward.

Table 7: Showing missed opportunities in Surgical ward

Condition	Number of missed vital signs					Outcome		
	Temp	**PR**	**RR**	**BP**	**SpO2**	**Discharged (<7days)**	**Discharged (>7days)**	**Deaths**
Central Nervous	(87.2%)	(58.9%)	(86.1)	(58.9%)	(92.8%)	(71.4%)	(28.6%)	(36.4%)
Gastrointestinal	(95.5%)	(90.1%)	(92.9%)	(91.6%)	(97.7%)	(53.8%)	(46.2%)	(45.4%)
Musculoskeletal	(92.2%)	(65.0%)	(88.3%)	(68.3%)	(96.1%)	(12.5%)	(87.5%)	(9.1%)
Integumentary	(91.8%)	(60.0%)	(78.2%)	(64.7%)	(95.3%)	(31.2%)	(68.8%)	(9.1%)
Genital urinary	(88.8%)	(57.5%)	(86.3%)	(66.3%)	(92.5%)	(50.0%)	(50.0%)	0
Malignancy	(74.4%)	(62.2%)	(82.2%)	(62.2%)	(80.0%)	(33.3%)	(66.7%)	0

Table 7 shows that the majority of patients with prolonged hospital stay 14(87.5%) in the surgical ward were patients with musculoskeletal conditions, and more deaths 5(45.5%) occurred in patients with gastrointestinal conditions.

Discussion of results

From the study, more than half, 2573(66.2%% %) of the patients' vital signs were not recorded in the patient files from admission to discharge on both medical and surgical wards, and this indicates a reduced possibility of noticing deteriorating conditions in hospitalized patients. Overall, from admission throughout hospitalization to discharge, Pulse rate and Blood pressure were the most frequently monitored and documented vital signs, followed by Respiratory rate and Temperature, with Oxygen saturation being the least recorded vital sign onwards. These findings are similar to other studies (Kamio et al., 2018; Leuvan et al., 2008) that reported blood pressure and pulse rate as the most frequently recorded vital signs. However, these two studies reported respiratory rate as the less frequently monitored and recorded vital sign, which is different from

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this study's findings that showed oxygen saturation as the less frequently monitored and recorded vital sign. This is because these studies didn't consider oxygen saturation measurement in their studies.

From the results, blood pressure and pulse rate being the most frequently recorded vital signs does not mean that all patients' blood pressure and Pulse rate were taken and documented, for example on admission, there was a 9.5% and 4.9% respectively of patients whose blood pressure and pulse rate were not recorded and yet were admitted to wards. This can be attributed to several factors, including Nurse staffing levels and vital sign equipment availability, and this agrees with the conceptual model used in this study that represents the relationship between structure, process, and outcome in examining and evaluating the quality of care given to patients.

The findings clearly show that wards lacked even the basic vital sign measurement equipment. For example, in a surgical ward, they had more than one Blood pressure machine, but only one was functional and could be used; the rest had no batteries, and others were spoilt. These findings are similar to studies done by Smith et al. (2017) and Redfern et al. (2019) that found a clear association between vital signs monitoring frequency and equipment availability in the hospital.

Another factor contributing to these disparities in vital sign recording was the low nurse staffing levels on both medical and surgical wards, and this not only affects vital signs measurement but also directly affects nursing care delivery, which affects patients' clinical outcomes. The findings indicate that the day shift had only two nurses responsible for so much, including admitting patients, preparing and attending a ward round, and ordering and preparing drugs for administration, among other activities. This makes nurses exhausted and ends up considering monitoring vital signs as an overwhelming, time-consuming, and low-priority task, as a study done by Mok et al. (2015) indicates. During the night shift, only one nurse was assigned on duty for both male and female wings of the ward and as it can be observed from the results, most deaths occurred at night, 7(47%) than day time, 6(40%) or evening, 2(13%) and this can be attributed to the availability of few health workers at night to identify patients' physiological instability. Therefore, greater attention to nurse staffing ratios in the hospital might improve the situation.

From the findings, none of the vital signs was recorded more than twice with the majority recorded just once a day and there were very few patients whose vitals were recorded twice each day for their first, second, and third day after admission (Temp:42, PR:89, RR:37, BP:95, SpO2:24). This is contrary to the recommended standard of care of monitoring at least three times per day (Jones, 2010). These findings also indicate little evidence of nurses prioritizing sicker patients or those with severe or multiple illnesses for frequent monitoring, and this is similar to a study done by Ogero et al. (2018), which indicated low vital sign counts as compared to the agreed standard of three times per day across hospitals.

Study findings further indicate that vital signs were recorded more often in the medical wards than in surgical wards. Also, there were patients in surgical wards whose vital signs were not documented at all from the time of admission throughout hospitalization to discharge. This was unexpected because of the protocol of postoperative vital sign measurements, which states that for postoperative patients, vital signs should be taken every 15 minutes for the first hour, every 30 minutes for the next two hours, and then every four hours for the next 24 hours (Filson et al., 2018). This also shows a possibility of nurses monitoring vital signs without documenting them, and this affects the continuity of care by the incoming shift and prevents them from noticing trends in a patient's condition, thereby contributing to the deterioration being missed. This might explain the higher mortality rate that originated from the surgical ward, 11(73.3%), than on the medical ward, 4(26.7%), as observed from the study findings.

Study findings further indicate that most of the patient files reviewed had missed vital signs with instances of greater than 50% for all the vital signs, as seen in Tables 7 and 8. Undesirable outcomes like death and prolonged stay in the hospital were seen in most of the conditions. All patients' files reviewed showed a hospital stay of more than 4 days, with some files showing a stay as long as 20 to 30 days. The average length of hospital stay is 3 days, and it's considered prolonged if it's more than 7 days for most conditions (Jeffrey et al., 2012). Arguably if vital
signs were regularly monitored and recorded, maybe patients would have had better outcomes and fewer days of hospital stay.

Conclusion

Most of the patient files reviewed had missed vital signs, 2573(66.2%) from admission to discharge on both medical and surgical wards. Pulse rate and Blood pressure were the most frequently monitored and recorded vital signs, and Oxygen saturation was poorly monitored and documented in both wards. More patients' vital signs were recorded in the medical ward than in the surgical ward. Missed opportunities were seen in patients with life-threatening conditions. Nurse staffing levels and vital signs equipment availability in the hospital were factors that undermined vital signs monitoring and quality of care.

Study limitations

It's a retrospective study; therefore, some of the information might be missing.

Inability to distinguish between monitoring and recording of vital signs since the data only reflected what was recorded, but it's possible that nurses monitored vital signs without recording them.

Study was conducted on only two wards (medical and surgical) of the hospital and therefore findings may not be generalized to other settings.

Recommendations

More emphasis should be put on vital sign observation policy, for example, the postoperative vital sign measurement protocol on surgical ward.

Nurse staffing levels should be paid attention to, and vital sign equipment should be availed to these wards to ensure that vital signs are monitored and the quality of care to patients is improved.

Generalizability

This refers to the extension of research findings and conclusions from a study done on a sample population to a population at large (Polit & Beck, 2012). According to Brown (2006), the generalizability of the study can be ensured by choosing a large sample study population as it helps to improve the representativeness of the sample, and the researcher ensured this by using 243 patient files.

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Lastly, I thank my friends and class mates who have helped me in one way or the other to make this study a success, May the good lord grant you your heart's desires.

List of abbreviations.

DON: Department of Nursing
MOH: Ministry of Health
MRRH: Mbarara Regional Referral Hospital
MUST: Mbarara University of Science and Technology
PhD: Doctor of Philosophy
WHO: World Health Organisation?

Source of funding.

There is no source of funding.

Conflict of interest.

No conflict of interest was declared.

Availability of data.

Data used in this study is available upon request from the corresponding author.

Authors contribution

VN designed the study, conducted data collection, cleaned and analyzed data, and drafted the manuscript, and GN supervised all stages of the study from the conceptualization of the topic to manuscript writing.

Authors biography.

Viola Nabiddo is a student with a bachelor's degree in Nursing at Mbarara University of Science and Technology**.**

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