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CONTRIBUTION OF HOSPITAL SERVICES TO THE OCCURRENCE OF ADVERSE EVENTS AFTER DISCHARGE FROM A SECONDARY HOSPITAL IN NORTHERN GHANA

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ABSTRACT

Background: Being discharged from the hospital is sometimes associated with complications which may be dangerous to the patient. Adverse events are unintended injuries or complications which may result in death, disability and prolonged hospital stay after discharge or related to the hospital visit. 6th to 19th of January 2018 and the incidence, types and severity of adverse events after hospitalization in a secondary hospital in Northern Ghana. **Method**: A prospective cohort study was used to establish the relationship between adverse events and hospital services. This was carried out with patients admitted and discharged from Wa Hospital. A total of 206 patients were recruited from the medical, surgical and emergency wards of the hospital. **Finding**: the result shows that there was a significant influence of the type of hospital ward a patient was admitted to on types of adverse events reported (r=-0.251, *p*=0.005) 6th to 19th of January 2018. However there were no other significant influences of service delivery factors on the severity of adverse events reported. There were also no significant influences of specific service delivery factors on the general incidence of reported adverse events. **Conclusion:** Understanding of how health services delivered leads to adverse events will help in improvement in patient outcomes and reduce the occurrence of adverse events after patients had been discharged from the hospital.

KEYWORDS: Adverse Events, Admissions, Discharged, Services, Nursing Care.

INTRODUCTIONS

Adverse events according to Hanskamp-Sebregts et al., (2016) are unintended injuries or complications resulting in death, disability, harm or prolonged hospital stay that arise from health care management. Service delivery is about all the health care services provided to a client on admission to a health facility. These ranges from nursing services, pharmaceutical services, laboratory services, diagnostic services and all other services provided in the hospital.

According to Alper et al., (2016), factors most strongly associated with potentially preventable adverse events and readmissions included emergency department decision-making regarding the readmission, failure to relay important information to outpatient providers, discharge of patients too soon, and lack of goals of care discussions among patients with serious illnesses. It was noted that one-half of all potentially preventable readmissions were thought to be linked to interventions that could have been provided during the initial hospitalization. As length of stay for hospitalized patients' decreases, there is a reasonable concern raised that early discharge, if premature, could increase rates of readmission. However, available evidence, while limited to observational studies, does not suggest that earlier discharge is associated with readmission (Alper et al., 2016**;** Zuckerman, Sheingold, & Orav, 2016)**.**

The importance of the continuity and quality of discharged patient information has been well described. Although the discharge summary is not the only tool for discharge communications, it does function as a significant portion of it. In a Canadian cohort of over 4600 patients, there was a trend toward lower re-hospitalization rates if the primary care physician (PCP) had received a copy of the discharge summary before the post-hospitalization visit (Zuckerman, Sheingold, & Orav, 2016). Other authors corroborated the deficits in the information transfer between the inpatient and outpatient settings. A systematic review of information transfer from inpatient to outpatient caregivers by De Meester, Van Bogaert, Clarke and Bossaert, (2013) revealed that discharge summaries varied in structure, might take up to a month to arrive at the Primary Care Physician's office, and were frequently incomplete. In addition, at least two thirds of patients saw their physicians in follow-up before the summary was

received. These deficiencies raise the question of whether it would be useful for the inpatient caregiver to provide the initial post-hospitalization care personally or whether close and frequent follow-up by primary caregivers can trump card the communication issues above and reduce unplanned re-hospitalization. Van Walraven, Mamdani, Fang and Austin (2004) used an administrative database, 938,833 discharges were screened and revealed a 5% relative decrease in death, and non-elective readmissions occurred in patients seen by their inpatient caregiver.

According to Baker et al., (2004) 51.4% of the adverse events after discharge are related to the services, rendered from mainly surgical procedures, 45.0% from medicine through drug or fluid-related events and 3.6% from others services such as dentistry, physical therapy and podiatry. The most common types of adverse events were related to surgical procedures, and the next most common was associated with drug or fluid-related events. In the medicine service, adverse events resulting from errors of omission (57.1%) were more common than those resulting from errors of commission (42.9%). For the surgery services, the frequency of these errors was assessed as being roughly equal (50.8%) (Baker et al., 2004).

In a Brazilian study it was found that extended length of stay has been shown to be associated with increased adverse events (Mendes, Monica, Sueley, & Travassos, 2009). Ashbrook, Mourad & Sehgal (2013) also revealed that miscommunication in discharge information, delay sending discharge summaries to primary Care Physician's office, which were frequently incomplete, could contribute to the occurrence of adverse events. In their findings 51.4% of the adverse events after discharge related to the services were surgery related, for 45.0% were medicine and 3.6% was due to other services. The most common types of adverse events were related to surgical procedures, and the next most common was associated with drug or fluid-related events (Baker et al., 2004). In the medicine service, adverse events resulting from errors of omission were more common than those resulting from errors of commission. For the surgery services, the frequency of these errors was assessed as being roughly equal (Baker et al., 2004; Mendes et al., 2009). This paper therefore aims at giving an insight into the relationship between hospital services and the incidence, types and severity of adverse events after hospitalization in a secondary hospital in Northern Ghana.

DESIGN AND METHODS

Research Design

In Ghana, there has been no scientific study to determine whether there is any association between discharged patients and hospital services rendered and adverse events. This study will therefore provide. The study design employed a prospective cohort using a sequential method to unearth the relationship between hospital services and the occurrence of adverse events after discharge from the hospital as described in Polit and Beck, (2010) and Euser, Zoccali, Jager, and Dekker (2009).

Research Settings

The study setting was the Regional Hospital at Wa, which is a multisite secondary referral facility in the Upper West Region of Ghana. The Upper West Region has a total of eleven (11) administrative districts. The projected population for 2015 based on the 2010 Population and Housing Census growth rate of 1.9% was 771,394 (Ofosu, 2016).The Hospital has 22 specialized units with nine (9) of these units admit patients. The research was on adult health and therefore focused on seven (7) main units. These were female medical ward, female surgical ward, male medical ward, male surgical ward, fevers unit, infectious disease holding centre and emergency ward.

Population

The target populations of the study were patients discharged from the Regional Hospital, Wa. The patients recruited were 206 admitted and discharged from the medical, surgical and emergency wards during the data collection period.

Sampling Technique

Selection of the study participants' were done by census (Mustafa, 2015). The participants were recruited at the point when the discharge decisions were made and were informed about the study and its importance. Those who consented to the study were then recruited.

Research Instruments

Two (2) instruments were used sequentially, these were records review guide and semi-structured interview guide. The records review guide was used to record the patient demographic data which included. The patient age, marital status, sex, occupation, educational status, addresses, ward, date of admission, date of discharge, diagnosis, oral medications, injectable medications, other procedures, referral to public health services, follow up information and telephone number.

With the semi-structured interviews there were lists of broad questions/topic guide to be addressed in the interview as adapted from (Polit & Beck, 2010). These involved whether the patient had any new or worsening symptoms after discharge. The assessment of the severity of any such symptom, how the symptom affected physical functioning and what the patient have done to help resolve the symptom including the determination of the cause. Timing of the symptom in relation to the hospitalization, the date, location and reason for all hospital visits and hospital readmissions were recorded.

Data Collection Procedure

This prospective cohort study was conducted in the Regional Hospital, Wa, a multisite secondary-care

regional facility. Permission was obtained from the Upper West Regional Directorate of Health Services, the Regional Hospital, Wa and the patients, after ethical clearance was obtained from the ethical review board of the University of Cape Coast.

Patients discharged for home from 7 wards were recruited for the study and followed for over 21 days. Patients who consented to the study had their medical charts reviewed to record demographic data and hospital services provided. These selected patients were then visited or telephoned approximately 21days after discharged from the hospital. A registered nurse documented the patient records and later visited the patient at home or administered the semi-structured telephone interview.

Data Processing and Analysis

Patients were considered to have adverse outcome after discharge, when they had new or worsening symptoms, a physician or health-facility visit that was unscheduled, an emergency ward detention or readmission to hospital, or if they had died. For such patients, information from the chart review, interviews and records of any post-discharge emergency detention or re-hospitalization were systematically summarized. The outcome summary included a detailed description of all outcomes, including time of onset, severity, health services used and resolution. Descriptive analysis, cross tabulation and multiple logistic regressions were used to measure the independent association of patient characteristics and services and their effect on the likelihood of an adverse event using SPSS version 22.

Ethical Consideration

Ethical clearance was obtained from the University of Cape Coast Institutional Ethical Review Board (Number UCCIRB/CHAS/2016/12). Participants were given information sheets introducing the study, the benefits of the findings this research will generate, the responsibility of the participants, and the ability to withdraw from the study were all explained to the participants. The ethical considerations were read and translated to participants who could not read or write.

RESULTS

The purpose of this paper is to provide insight determine the relationships between health service delivery and the possible factors that might have contributed to the development of adverse effect 21 days after discharge from the hospital.

Relationship between Adverse Events and Service Delivery Factors

The objective of the paper sought to establish the relationship between adverse events and service delivery factors.

From Table 1, the result shows that there was no significant influence of service delivery factors on rate of reported adverse events, Ward (r=-0.134, *p*=136), Duration (r=0.019, *p*=0.821), Diagnosis (r=0.006, *p*=0.933), Injectable (r=-0.071, *p*=0.338), Procedures (r=0.090, *p*=0.246), Referrals for PH (r=0.008, *p*=0.905), Follow-up (r=-0.047, *p*=0.512). It is therefore worth noting that there are no significant influences of service delivery factors on reported adverse events.

Table 1: Effect of Service Delivery Factors on Incidence of Adverse Events.

Model		Unstandardized Coefficients		Standardized Coefficients	T	P-value
		B	Std. Error	Beta		
1	(Constant)	1.876	0.387		4.852	
	Ward	-0.034	0.023	-0.134	-1.496	0.136
	Duration	0.011	0.048	0.019	0.226	0.821
	Diagnosis	0.000	0.004	0.006	0.084	0.933
	Injectable	-0.130	0.136	-0.071	-0.960	0.338
	Procedures	0.014	0.012	0.090	1.165	0.246
	Referrals for PH	0.022	0.183	0.008	0.119	0.905
	Follow-up info.	-0.054	0.083	-0.047	-0.657	0.512

Dependent variable: Reported Adverse Events
(Significant level= 0.05)

From Table 2, the result shows that there was a significant influence of type of hospital ward on types of adverse events reported, Ward (r=-0.251, *p*=0.005), however there were no other significant influences of service delivery on the types of adverse events reported, Duration (r=-0.008, *p* = 0.925), Diagnosis(r = 0.084, *p* = 0.250), Injectable (*r* = -0.067, *p* = 0.353), Procedures (*r* = 0.018, *p* = 0.813), Referrals for PH (*r* = 0.007, *p*=0.922), Follow-up (*r* = -0.013, *p* = 0.856). It is therefore, worth noting that there was a significant influence of hospital ward on type of adverse of adverse events reported.

Table 2: Effect of Service Delivery factors on the of Types of Adverse Events.

Model	Unstandardized Coefficients		Standardized Coefficients	T	P-value
	B	Std. Error	Beta		
(Constant)	6.281	1.963		3.200	
Ward	-0.326	0.114	-0.251	-2.855	0.005
Duration	-0.023	0.243	-0.008	-0.094	0.925
Diagnosis	0.022	0.019	0.084	1.153	0.250
Injectable	0.642	0.690	0.067	0.931	0.353
Procedures	0.015	0.063	0.018	0.237	0.813
Referrals for Public Health	0.091	0.927	0.007	0.099	0.922
Follow-up	0.076	0.419	0.013	0.181	0.856
Dependent Variable: Types of Adverse Events					

(Significant level= 0.05)

Table 3 shows adverse events reported in the various wards; out of the 87 participants from the casualty, 20 out of the total participants of 87 from the casualty ward reported adverse event. Among participants from the male medical ward 10 out of the 23 patients reported an adverse event from the male medical ward. Also 6 out of the 15 participants from the male surgical ward reported with an adverse event. In female medical ward 18 out of the 38 participants had adverse events. Two (2) out of the 24 participants from the female surgical ward reported adverse events. For participants from the fevers unit, 7 out of the 13 participants who participated in the study reported an adverse event. In the IDHC, 2 out of the 6 participants reported an adverse event. There were statistical significant influences of the various wards on which participants were admitted on the rate of reported adverse events.

Table 3: Cross tabulation of Hospital Ward and Reported Adverse Events/

Hospital Ward		Reported Adverse Events		Total
		Yes	No	
Casualty	Frequency	20	67	87
	% within hospital ward	23.0%	77.0%	100.0%
	% within Reported Adverse Events	30.8%	47.5%	42.2%
	% of Total	9.7%	32.5%	42.2%
Male Medical Ward	Frequency	10	13	23
	% within hospital ward	43.5%	56.5%	100.0%
	% within Reported Adverse Events	15.4%	9.2%	11.2%
	% of Total	4.9%	6.3%	11.2%
Male Surgical Ward	Frequency	6	9	15
	% within hospital ward	40.0%	60.0%	100.0%
	% within Reported Adverse Events	9.2%	6.4%	7.3%
	% of Total	2.9%	4.4%	7.3%
Female Medical Ward	Frequency	18	20	38
	% within hospital ward	47.4%	52.6%	100.0%
	% within Reported Adverse Events	27.7%	14.2%	18.4%
	% of Total	8.7%	9.7%	18.4%
Female Surgical Ward	Frequency	2	22	24
	% within hospital ward	8.3%	91.7%	100.0%
	% within Reported Adverse Events	3.1%	15.6%	11.7%
	% of Total	1.0%	10.7%	11.7%
Fevers Unit	Frequency	7	6	13
	% within hospital ward	53.8%	46.2%	100.0%
	% within Reported Adverse Events	10.8%	4.3%	6.3%
	% of Total	3.4%	2.9%	6.3%
IDHC	Frequency	2	4	6
	% within hospital ward	33.3%	66.7%	100.0%
	% within Reported Adverse Events	3.1%	2.8%	2.9%
	% of Total	1.0%	1.9%	2.9%
Total	Frequency	65	141	206
	% within hospital ward	31.6%	68.4%	100.0%
	% within Reported Adverse Events	100.0%	100.0%	100.0%
	% of Total	31.6%	68.4%	100.0%

From Table 4, the duration of admission in days revealed that between 1 to 3 days were 122 participants and out of these 34 patients reported with adverse events. For the 4 to 7 days group, 25 out of the 61 participants reported with adverse events. Among the 8 to 10 days group, 4 out 13 participant reported and those who spend 11 and above days on the ward, 2 out of 10 participants reported with adverse events. There were no statistical significant influences of duration of admission of participants on rate of reported adverse events.

Table 4: Cross-tabulation of Duration of Admission and Reported Adverse Events.

Duration of Admission		Reported Adverse Events		Total
		Yes	No	
1 to 3	Frequency	34	88	122
	% within duration of admission	27.9%	72.1%	100.0%
	% within Reported Adverse Events	52.3%	62.4%	59.2%
	% of Total	16.5%	42.7%	59.2%
4 to 7	Frequency	25	36	61
	% within duration of admission	41.0%	59.0%	100.0%
	% within Reported Adverse Events	38.5%	25.5%	29.6%
	% of Total	12.1%	17.5%	29.6%
8 to 10	Frequency	4	9	13
	% within duration of admission	30.8%	69.2%	100.0%
	% within Reported Adverse Events	6.2%	6.4%	6.3%
	% of Total	1.9%	4.4%	6.3%
11 and above	Frequency	2	8	10
	% within duration of admission	20.0%	80.0%	100.0%
	% within Reported Adverse Events	3.1%	5.7%	4.9%
	% of Total	1.0%	3.9%	4.9%
Total	Frequency	65	141	206
	% within duration of admission	31.6%	68.4%	100.0%
	% within Reported Adverse Events	100.0%	100.0%	100.0%
	% of Total	31.6%	68.4%	100.0%

Table 5 shows the cross tabulation of duration of admission with severity of adverse events. On the 1 to 3 days 2 participants reported with 1day of symptoms, 15 reported several days of symptoms, 16 participants also reported non-permanent disability, 3 death were recorded, in all 36 participants out of the 122 participants who spent 1 to 3 days on the ward reported with adverse events while the rest (86) of the participants spending 1 to 3 days did not report any adverse events.

For the 4 to 7 days, no participant reported with 1day of symptoms, 18 participants reported several days of symptoms, 4 reported non-permanent disabilities and 4 deaths were recorded. In all 26 participants out of the 61 participants who spent 4 to 7 days on the ward reported with adverse events while the rest did not.

For the 8 to 10 days, 1 participant reported with 1day of symptoms, 3 reported several days of symptoms, 1 for non-permanent disability and no death. Among the 13 participants who spent 8 to 10 days on the ward only 5 participants reported with adverse events.

For 11 days and above, no participant reported with 1day of symptoms, 1 participant reported several days of symptoms, 1 non-permanent disability, and 1 death. Moreover 3 out of 10 participants spending 11 days and above reported with adverse events while the rest (7) of the participants reported with no adverse event.

Table 5: Cross tabulation of Duration of Admission with Severity of Adverse Events.

Duration of Admission (Days)		Severity of Adverse Events					Total
		1 day of Symptoms	Several days of Symptoms	Non-Permanent Disability	Death	No Adverse Events	
1 to 3	Frequency	2	15	16	3	86	122
	% within duration of admission	1.6%	12.3%	13.1%	2.5%	70.5%	100.0%
	% within severity of adverse events	66.7%	40.5%	72.7%	37.5%	63.2%	59.2%
	% of Total	1.0%	7.3%	7.8%	1.5%	41.7%	59.2%
4 to 7	Frequency	0	18	4	4	35	61
	% within duration of admission	0.0%	29.5%	6.6%	6.6%	57.4%	100.0%
	% within severity of adverse events	0.0%	48.6%	18.2%	50.0%	25.7%	29.6%
	% of Total	0.0%	8.7%	1.9%	1.9%	17.0%	29.6%
8 to 10	Frequency	1	3	1	0	8	13

	% within duration of admission	7.7%	23.1%	7.7%	0.0%	61.5%	100.0%
	% within severity of adverse events	33.3%	8.1%	4.5%	0.0%	5.9%	6.3%
	% of Total	0.5%	1.5%	0.5%	0.0%	3.9%	6.3%
	Frequency	0	1	1	1	7	10
11 and above	% within duration of admission	0.0%	10.0%	10.0%	10.0%	70.0%	100.0%
	% within severity of adverse events	0.0%	2.7%	4.5%	12.5%	5.1%	4.9%
	% of Total	0.0%	0.5%	0.5%	0.5%	3.4%	4.9%
	Frequency	3	37	22	8	136	206
Total	% within duration of admission	1.5%	18.0%	10.7%	3.9%	66.0%	100.0%
	% within severity of adverse events	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	1.5%	18.0%	10.7%	3.9%	66.0%	100.0%

Table 6 shows a cross tabulation of diagnosis of participants and adverse events reported from highest to the lowest are; chicken pox 1, meningitis 4, lacerations 2, congestive cardiac failure/chronic kidney failure 5, hernia 3, pyelonephritis 2, hepatitis 2, pneumonia 9, Urinary tract Infection (UTI) 2, stroke 1, snake bite 5, gastroenteritis 10, diabetes 2, Peptic Ulcer Disease 5, ulcers 1, hypertension 4, Road Traffic Accident (RTA) 5, Pulmonary Tuberculosis (PTB) 1 and malaria 1. However the following conditions did not record any adverse events asthma, Upper Respiratory Tract Infection (URTI), psychiatric disorders, oral conditions, cellulitis, acute abdomen, migraine, intestinal obstruction, cancer and burns.

Table 6: Cross tabulation of Diagnosis of Participants with Reported Adverse Events.

Diagnosis of Participants		**Reported Adverse Events**		**Total**
		Yes	**No**	
Malaria	Frequency	0	17	17
	% within Reported Adverse Events	0.0%	12.1%	8.3%
	% of Total	0.0%	8.3%	8.3%
Hypertension	Frequency	4	13	17
	% within Reported Adverse Events	6.2%	9.2%	8.3%
	% of Total	1.9%	6.3%	8.3%
Pneumonia	Frequency	9	10	19
	% within Reported Adverse Events	13.8%	7.1%	9.2%
	% of Total	4.4%	4.9%	9.2%
Peptic ulcer disease	Frequency	5	8	13
	% within Reported Adverse Events	7.7%	5.7%	6.3%
	% of Total	2.4%	3.9%	6.3%
Hernia	Frequency	3	2	5
	% within Reported Adverse Events	4.6%	1.4%	2.4%
	% of Total	1.5%	1.0%	2.4%
Road Traffic Accidents	Frequency	5	13	18
	% within Reported Adverse Events	7.7%	9.2%	8.7%
	% of Total	2.4%	6.3%	8.7%
Ulcers	Frequency	1	3	4
	% within Reported Adverse Events	1.5%	2.1%	1.9%
	% of Total	0.5%	1.5%	1.9%
Meningitis	Frequency	4	4	8
	% within Reported Adverse Events	6.2%	2.8%	3.9%
	% of Total	1.9%	1.9%	3.9%
Asthma	Frequency	0	4	4
	% within Reported Adverse Events	0.0%	2.8%	1.9%
	% of Total	0.0%	1.9%	1.9%
Upper Respiratory Tract Infection	Frequency	0	1	1
	% within Reported Adverse Events	0.0%	0.7%	0.5%
	% of Total	0.0%	0.5%	0.5%
Psychiatric disorders	Frequency	0	6	6
	% within Reported Adverse Events	0.0%	4.3%	2.9%
	% of Total	0.0%	2.9%	2.9%
Snake bite	Frequency	5	6	11
	% within Reported Adverse Events	7.7%	4.3%	5.3%
	% of Total	2.4%	2.9%	5.3%
Gastroenteritis	Frequency	10	10	20

	% within Reported Adverse Events	15.4%	7.1%	9.7%
	% of Total	4.9%	4.9%	9.7%
	Frequency	5	3	8
Congestive Cardia Failure /CKD	% within Reported Adverse Events	7.7%	2.1%	3.9%
	% of Total	2.4%	1.5%	3.9%
	Frequency	0	1	1
Oral condition	% within Reported Adverse Events	0.0%	0.7%	0.5%
	% of Total	0.0%	0.5%	0.5%
	Frequency	2	3	5
Diabetes	% within Reported Adverse Events	3.1%	2.1%	2.4%
	% of Total	1.0%	1.5%	2.4%
	Frequency	2	2	4
Urinary Tract Infection	% within Reported Adverse Events	3.1%	1.4%	1.9%
	% of Total	1.0%	1.0%	1.9%
	Frequency	0	8	8
Cellulitis	% within Reported Adverse Events	0.0%	5.7%	3.9%
	% of Total	0.0%	3.9%	3.9%
	Frequency	0	4	4
Acute abdomen	% within Reported Adverse Events	0.0%	2.8%	1.9%
	% of Total	0.0%	1.9%	1.9%
	Frequency	0	1	1
Migraine	% within Reported Adverse Events	0.0%	0.7%	0.5%
	% of Total	0.0%	0.5%	0.5%
	Frequency	1	1	2
Stroke	% within Reported Adverse Events	1.5%	0.7%	1.0%
	% of Total	0.5%	0.5%	1.0%
	Frequency	2	3	5
Pyelonephritis	% within Reported Adverse Events	3.1%	2.1%	2.4%
	% of Total	1.0%	1.5%	2.4%
	Frequency	2	1	3
Hepatitis	% within Reported Adverse Events	3.1%	0.7%	1.5%
	% of Total	1.0%	0.5%	1.5%
	Frequency	0	2	2
Intestinal obstruction	% within Reported Adverse Events	0.0%	1.4%	1.0%
	% of Total	0.0%	1.0%	1.0%
	Frequency	1	4	5
Retrovirus/ Pulmonary Tuberculosis	% within Reported Adverse Events	1.5%	2.8%	2.4%
	% of Total	0.5%	1.9%	2.4%
	Frequency	0	2	2
Cancer	% within Reported Adverse Events	0.0%	1.4%	1.0%
	% of Total	0.0%	1.0%	1.0%
	Frequency	0	1	1
Burns	% within Reported Adverse Events	0.0%	0.7%	0.5%
	% of Total	0.0%	0.5%	0.5%
	Frequency	0	1	1
Home Accidents	% within Reported Adverse Events	0.0%	0.7%	0.5%
	% of Total	0.0%	0.5%	0.5%
	Frequency	2	1	3
Lacerations	% within Reported Adverse Events	3.1%	0.7%	1.5%
	% of Total	1.0%	0.5%	1.5%
	Frequency	0	1	1
Appendicitis	% within Reported Adverse Events	0.0%	0.7%	0.5%
	% of Total	0.0%	0.5%	0.5%
	Frequency	0	1	1
Sprain	% within Reported Adverse Events	0.0%	0.7%	0.5%
	% of Total	0.0%	0.5%	0.5%
	Frequency	0	2	2
Arthritis	% within Reported Adverse Events	0.0%	1.4%	1.0%
	% of Total	0.0%	1.0%	1.0%
Chicken pox	Frequency	1	0	1

	% within Reported Adverse Events	1.5%	0.0%	0.5%
	% of Total	0.5%	0.0%	0.5%
Pulmonary Tuberculosis	Frequency	1	1	2
	% within Reported Adverse Events	1.5%	0.7%	1.0%
	% of Total	0.5%	0.5%	1.0%
Breast abscess	Frequency	0	1	1
	% within Reported Adverse Events	0.0%	0.7%	0.5%
	% Total	0.0%	0.5%	0.5%
Total	Frequency	65	141	206
	% within Reported Adverse Events	100.0%	100.0%	100.0%
	% of Total	31.6%	68.4%	100.0%

Table 7 shows the cross tabulation of oral medication with reported adverse events, those who received oral medications and reported adverse events are 65 forming 31.6%of participants who received oral medication while the rest 141 forming 68.4% of participants did not report any event.

Table 7: Cross tabulation of Oral Medications with Reported Adverse Events.

Oral Medications		Reported Adverse Events		Total
		Yes	No	
Yes	Frequency	65	141	206
	% within oral medications	31.6%	68.4%	100.0%
	% within Reported Adverse Events	100.0%	100.0%	100.0%
	% of Total	31.6%	68.4%	100.0%
Total	Frequency	65	141	206
	% within oral medications	31.6%	68.4%	100.0%
	% within Reported Adverse Events	100.0%	100.0%	100.0%
	% of Total	31.6%	68.4%	100.0%

Table 8 shows a cross tabulation of injectable medications and reported adverse events, those who received injectable medications and reported adverse events were 59, this forms 30.7% of participants who received injectable medications while the rest 133 forming 69.3% of participants did not report any event.

Table 8: Cross tabulation Injectable Medication and Reported Adverse Events.

Injectable Medication		Reported Adverse Events		Total
		Yes	No	
Yes	Frequency	59	133	192
	% within injectable medication	30.7%	69.3%	100.0%
	% within Reported Adverse Events	90.8%	94.3%	93.2%
	% of Total	28.6%	64.6%	93.2%
No	Frequency	6	8	14
	% within injectable medication	42.9%	57.1%	100.0%
	% within Reported Adverse Events	9.2%	5.7%	6.8%
	% of Total	2.9%	3.9%	6.8%
Total	Frequency	65	141	206
	% within injectable medication	31.6%	68.4%	100.0%
	% within Reported Adverse Events	100.0%	100.0%	100.0%
	% of Total	31.6%	68.4%	100.0%

Table 9 shows a cross tabulation of procedures performed on clients with reported adverse events. For those who were given intravenous medications 46 of the 206 participants reported with adverse events representing 32.6% of the participants who received intravenous fluid/lines with the rest 95 (67.4%) reporting no event.

Among those who went in for major operations, 1 out of the 2 participants reported with adverse events representing 50% of the participants who had major operations with 50% reporting no event.

Also among those who went in for minor operations 1 out of the 2 participants reported with adverse events representing 50% of the participants who had minor operations with the other 50% reporting no event.

For the one participant who had lumber puncture performed reported with no event.

For participants who had IV line with other procedures performed, 11 of the 28 participants reported an adverse event representing 39.3% and 17 participants representing 60.7% did not report adverse events.

Among the other groups which comprised of procedures not specified reported 2 events representing 40.0% of participants of the 5 participants in the other procedures group and 3 representing 60.0% in the same group reported with no event.

Out of the 27 participants that did not have any procedure performed on them, 4 representing 14.8% reported an event while 23 out of the 27 representing 85.2% in this group did not report any adverse event.

Table 9: Cross tabulation Procedures Performed on Client with Reported Adverse Events.

Procedures Performed on Participants		Reported Adverse Events		Total
		Yes	No	
IV line	Frequency	46	95	141
	% within procedures performed on client	32.6%	67.4%	100.0%
	% within Reported Adverse Events	70.8%	67.4%	68.4%
	% of Total	22.3%	46.1%	68.4%
Major Operations	Frequency	1	1	2
	% within procedures performed on client	50.0%	50.0%	100.0%
	% within Reported Adverse Events	1.5%	0.7%	1.0%
	% of Total	0.5%	0.5%	1.0%
Minor Operations	Frequency	1	1	2
	% within procedures performed on client	50.0%	50.0%	100.0%
	% within Reported Adverse Events	1.5%	0.7%	1.0%
	% of Total	0.5%	0.5%	1.0%
Lumber Puncture	Frequency	0	1	1
	% within procedures performed on client	0.0%	100.0%	100.0%
	% within Reported Adverse Events	0.0%	0.7%	0.5%
	% of Total	0.0%	0.5%	0.5%
Others	Frequency	2	3	5
	% within procedures performed on client	40.0%	60.0%	100.0%
	% within Reported Adverse Events	3.1%	2.1%	2.4%
	% of Total	1.0%	1.5%	2.4%
No procedure performed	Frequency	4	23	27
	% within procedures performed on client	14.8%	85.2%	100.0%
	% within Reported Adverse Events	6.2%	16.3%	13.1%
	% of Total	1.9%	11.2%	13.1%
IV line with Other procedure	Frequency	11	17	28
	% within procedures performed on client	39.3%	60.7%	100.0%
	% within Reported Adverse Events	16.9%	12.1%	13.6%
	% of Total	5.3%	8.3%	13.6%
Total	Frequency	65	141	206
	% within procedures performed on client	31.6%	68.4%	100.0%
	% within Reported Adverse Events	100.0%	100.0%	100.0%
	% of Total	31.6%	68.4%	100.0%

Table 10 shows a cross tabulation of referrals of participants for public health services with reported adverse events, which were 2, forming 28.6% of participants who were referred for public health services while the rest 5, forming 71.4% of participants were referred for public health services did not report any event. Among those who were not referred for public health services, 63 participants representing 31.7% of the 199 participants who were not referred for services reported with adverse events while 136, representing 68.3% of this group did not report adverse events.

Table 10: Cross tabulation of Referrals for Public Health Services with Reported Adverse Events.

Referrals for Public Health Services		Reported Adverse Events		Total
		Yes	No	
Yes	Frequency	2	5	7
	% within referrals for public health services	28.6%	71.4%	100.0%
	% within Reported Adverse Events	3.1%	3.5%	3.4%
	% of Total	1.0%	2.4%	3.4%

No	Frequency	63	136	199
	% within referrals for public health services	31.7%	68.3%	100.0%
	% within Reported Adverse Events	96.9%	96.5%	96.6%
	% of Total	30.6%	66.0%	96.6%
Total	Frequency	65	141	206
	% within referrals for public health services	31.6%	68.4%	100.0%
	% within Reported Adverse Events	100.0%	100.0%	100.0%
	% of Total	31.6%	68.4%	100.0%

Table 11 shows cross tabulation of follow-up information with reported adverse events were 50 forming 30.5% of participants who given follow-up information while the rest 114 forming 69.5% of participants who were given follow-up information did not report any event. Among those who were not given follow-up information, 15 participants representing 35.7% of the 42 participants who were not given follow-up information reported with adverse events while 27 representing 64.3% of this group did not report adverse events.

Table 11: Cross tabulation of follow-up information with reported adverse events.

Follow-up information		**Reported Adverse Events**		**Total**
		Yes	**No**	
Yes	Frequency	50	114	164
	% within follow-up information	30.5%	69.5%	100.0%
	% within Reported Adverse Events	76.9%	80.9%	79.6%
	% of Total	24.3%	55.3%	79.6%
No	Frequency	15	27	42
	% within follow-up information	35.7%	64.3%	100.0%
	% within Reported Adverse Events	23.1%	19.1%	20.4%
	% of Total	7.3%	13.1%	20.4%
Total	Frequency	65	141	206
	% within follow-up information	31.6%	68.4%	100.0%
	% within Reported Adverse Events	100.0%	100.0%	100.0%
	% of Total	31.6%	68.4%	100.0%

Discussions of the Relationship between Service Delivery Factors and Adverse Events

There were no significant influences of service delivery factors on incidence of reported adverse events. There was a significant influence of the type of hospital ward on type of adverse events reported. In the medicine service, adverse events resulting from errors of omission were more common than those resulting from errors of commission. For the surgery services, the frequency of these errors was assessed as being roughly equal (Baker et al., 2004; Mendes et al., 2009).

There were statistical significant influences of the various wards on which participants were admitted on the rate of reported adverse events. As observed by this study, there were no statistical significant influences of duration of admission of participants on rate of reported adverse events. Alper et al., (2016**)**, and Zuckerman, Sheingold and Orav, (2016) noted that one-half of all potentially preventable readmissions were thought to be linked to interventions that could have been provided during the initial hospitalization. They found that as length of stay for hospitalized patients' decreases, especially if discharge is premature, could increase rates of readmission. However, most evidence, while limited to observational studies, does not suggest that earlier discharge is associated with readmission. In a Brazilian study it was found that extended length of stay has been shown to be associated with increased adverse events (Mendes, Monica, Sueley, & Travassos, 2009).

According to Baker et al., (2004) 51.4% of the adverse events after discharge are related to the services. For those who received injectable medications and reported adverse events were 59, this forms 30.7% of participants who received injectable medications while the rest 133 forming 69.3% of participants did not report any event.

A cross tabulation of oral medication with reported adverse events, those who received oral medications and reported adverse events formed 31.6% of participants who received oral medication. There were great variations among specialties with regard to the riskiness of the procedures employed and the severity of illness in the patients for who care was provided. The findings that patients in certain specialty groups, were at higher risk of adverse events was therefore not surprising. The percentage of adverse events did not, however, vary according to specialty in this study. The observations concerning rates of adverse events among specialties have implications relevant to today's system of malpractices. Brennan et al., (2004) found that specialties in surgery had higher rates of adverse events, but not higher rates of negligence. According to Alper et al., (2016), service delivery factors most strongly associated with potentially preventable adverse events

and readmissions included emergency department decision-making regarding the readmission, failure to relay important information to outpatient providers, discharge of patients too soon, and lack of goals of care discussions among patients with serious illnesses. However, this study findings supports Zuckerman, Sheingold, and Orav, (2016) assertion that available evidence, while limited to observational studies, does not suggest that earlier discharge is associated with readmission or adverse events. It is worth noting that there were no significant influences of service delivery factors on the rate of reported adverse events.

Implications of the Study

Patient safety has emerged as a priority at the national, regional, and districts levels in Ghana`s health care system. Promoting patient safety in the interest of protecting the public is central to the mandate of the Ministry of Health and Ghana Health Service. Therefore patient safety and quality assurance has always been important for Registered Nurses (RNs). Nurses act to keep patients safe, identify areas of risk, and recognize situations in need of improvement. The Ghana Registered Nurses and Midwives Association (GRNMA), the Nursing and Midwifery Council and the Ghana Health Services have declared their commitment to patient safety through the creation and dissemination of several protocols including the patient charter. Knowing the relationships between adverse events and service delivery factors has provided information on who, what, how and why these adverse events occur, these will facilitate interventions to address the problems of adverse events and patient safety.

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