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ORIGINAL ARTICLE

The impact of delays on the outcomes of emergency abdominal surgeries in Komfo Anokye Teaching Hospital, Kumasi, Ghana

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Emergency abdominal surgery is the most appropriate intervention for patients who suffer traumatic abdominal injuries, acute surgically-related disease processes, or surgical complications. The greater burden of difficulty in accessing surgical care falls on those living in low and middle income countries (LMICs). The situation is often associated with undue delays for surgical intervention for emergency admission. A descriptive cross-sectional and quantitative research design was used to sample 109 participants using a convenience sampling technique with well-defined inclusion criteria. Data were collected with a structured questionnaire, using an electronic data-collecting tool and extracted onto STATA 13 for analysis. A multivariate logistic regression analysis was carried out, taking into consideration odd ratios where statistical significance was derived with $p<0.05$. Sixty-eight (62.4%) of the participants were males and 41 (37.6%) females. A delay of more than 24 hours from the onset of symptoms was found in 58.7%. Delays in the decision to go to the hospital (pre-hospital delay) and waiting time in the theatre bay (in-hospital delay) were significantly associated with long stay in hospital.

Keywords: Delays in surgery, abdominal surgery, emergency surgery

INTRODUCTION

Emergency abdominal surgery is the most appropriate intervention for patients who suffer traumatic abdominal injuries, acute abdominal surgical disease process, or surgical complications (Leppäniemi, 2013). Whiles some conditions require immediate surgical intervention, others require a stable physiological state before surgery, but the delay should not exceed twenty-four (24) hours from presentation (Leppäniemi, 2013). The need for emergency care is often associated with undue delays for surgical intervention following emergency admission (Adamu *et al.,* 2010). These delays are precursors for many patients' inability to access the required surgical care in poor-resource settings. These can serve as barriers to an early presentation (Tabiri *et al.,* 2018).

The time lag between the onset of symptoms and surgical intervention is critical in determining the surgical outcomes (Kluger *et al.,* 2013, Ologunde *et al.,* 2014). Delays in emergency abdominal surgery for acute abdomen are harmful

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unless justified by adequate and specific preoperative optimisation (Svenningsen *et al.*, 2014; Buck *et al.,* 2013; Saunders *et al.,* 2012). The aim of this study was to establish the impact of delays on the 30-days outcomes of emergency abdominal surgery. The primary outcome measure was 30-days mortality and the secondary outcomes were length of hospital stay and surgical site infection.

MATERIALS AND METHODS

A prospective cross-sectional descriptive survey and quantitative research design were used for this study at Komfo Anokye Teaching Hospital (KATH), Kumasi, Ghana. Ethical clearance for the study was granted by KATH Institutional Review Board. The questionnaire was pretested at KATH on 15 patients for validation. A convenience sampling technique was used to collect responses from 109 participating patients, undergoing emergency abdominal surgery at KATH between 1st December 2019 and 31st March 2020, using a structured questionnaire. After obtaining consent for participation, the questionnaire was administered through a face-to-face interaction with study participants. Data on demography and events leading to pre-hospital delays were documented using an electronic data collection tool. The folders of participants were explored for information such as timing and events leading to in-hospital delays, receiving bay to start-of-surgery time, length of hospital stay and surgical outcomes.

Data analysis

A database for questionnaire responses was built using Research Electronic Data Capture (REDCap) where data were coded with unique numbers. Following data collection, data were extracted from REDCap and analysed using STATA 13. Patient demographics are presented in tables as percentages, frequencies, and means (± standard deviation). Bivariate and multivariate logistic regression analysis was performed; odds ratios were considered to be statistically significant at $p<0.05$. A chi-square test was used in addition to Fisher's exact test at a 95% level of significance to identify associations between determinants of delays in access to surgical interventions and 30-days outcomes of emergency abdominal surgery.

RESULTS

A total of 117 patients were admitted for emergency abdominal surgeries within the study period. Data from 109 patients were however analysed. Eight patients (6.8%) were omitted from the analysis because of incomplete data. Patients' demographics are listed in **Table 1**.

Table 1: Demographic Status of Patients

Variable	Frequency (N=109)	Percentage
Age		
Less than 30 years	17	15.6
30-59 years	77	70.6
60 years and above	15	13.8
Gender		
Male	68	62.4
Female	41	37.6
Marital status		
Single	41	37.6
Married	62	56.9
Cohabiting	2	1.8
Others	4	3.7
Occupational status		
Civil/Public Servant	16	14.7
Self-employed	69	63.3
Unemployed	24	22.0
Religion		
Christian	95	87.2
Islam	13	11.9
Other	1	0.9
Ethnicity		
Akan	87	79.8
Dagomba	7	6.4
Others	15	13.8
Family System		
Nuclear	50	45.9
Extended	59	54.1
Residence		
Rural	31	28.4
Urban	78	71.6

The determinants of delay were categorised into pre-hospital delays and in-hospital delays. Determinants of pre-hospital delay as indicated in **Table 2** consisted of the level of education, decision-maker to go to a health facility, means of transport to a health facility, type of health facility close to patients' residence, means of transport on referral, and duration of symptoms before reporting.

Table 2: Determinants of delays of emergency

Variable	Frequency (N=109)	Percentage
Level of Education		
Basic school (Primary/ JHS)	48	44.0
SHS/middle school	49	45.0
Tertiary	12	11.0
Decision Maker		
Family Member	56	51.4
Friends	18	16.5
Self	35	32.1
Means of Transport to a health facility		
Taxi	90	82.6
Trotro (privately owned minibus)	2	1.8
Walked	2	1.8
Private Car	15	13.8
Type of health facility close by N=64		
Clinic	19	29.7
Hospital	45	70.3
Means of Transport on referral to KATH	**N=41**	
Ambulance	11	26.8
Taxi	30	73.2
Duration of symptoms before reporting to KATH	**N=109**	
< 24 hours	45	41.3
> 24 hours	64	58.7

Source: Field Data, 2020
JHS- Junior high school; *SHS*- Senior high school

Table 3 shows duration of symptoms participants had before reporting to the Accident and Emergency Unit at KATH with the possible determinants of a delay (more than 24 hours before reporting to KATH).

Table 3: Duration of symptoms before reporting and determinants of prehospital delay.

Variable	Duration of symptoms before reporting		
	<24 Hours	**> 24 Hours**	**P value**
Level of Education	**45**	**64**	**0.07**
Primary	1 (2.2)	2 (3.1)	
JHS	20 (44.4)	25 (39.1)	
SHS	11 (24.4)	18 (28.1)	
Middle school	7 (15.7)	13 (20.3)	
Tertiary	6 (13.3)	6 (9.4)	
Decision Maker			**0.58**
Family Member	24 (53.3)	32 (50.0)	
Friends	10 (22.2)	8 (12.5)	
Self	11 (24.5)	24 (37.5)	
Means of Transport to a health facility			**0.81**
Taxi	36 (80.0)	54(84.4)	
Trotro	2 (4.4)	0 (0)	
Walked	0 (0)	2 (3.1)	
Private Car	7 (15.6)	8 (12.5)	
Type of health facility close by	**29**	**35**	**0.11**
Clinic	12 (41.4)	7 (20.0)	
Hospital	17 (58.6)	28 (80.0)	
Means of Transport on referral to KATH	**16**	**25**	**0.74**
Ambulance	5 (31.35)	6 (24.0)	
Taxi	11 (68.7)	19 (76.0)	

Most (62.5%) patients who reported late needed approval from someone else such as a friend or family member, and (17.2%) reported late for financial reasons. Whilst 10.8% of patients reported late because their symptoms were insignificant to them, 7.8% did not have a health facility located close by and 1.6% had difficulty in means of transport. The determinants of In-hospital delay consisted of the time taken in minutes in initiating care (that is the time to first contact with a doctor after triaging), the time taken for blood samples to reach the laboratory, laboratory processing time, time taken for review by the surgical team, X-ray and/or ultrasound processing time, time between receiving patient in the theatre bay and surgery start time. These data were obtained from the patients' records by our research assistants and shown in **Table 4.** The outcome of surgery is depicted in **Table 5.**

Table 4: Determinants of in- hospital delays of emergency abdominal surgeries with time in minutes

Variable	Mean	SD	Min	Max
Time taken in initiating care	191.8	± 355.8	0	2880
Time taken before blood samples got to laboratory	231.8	± 376.2	10	2160
Laboratory turnaround time	268.3	± 323.2	30	1380
Time taken for first contact with surgical team	237.2	± 291.5	10	1200
X ray turnaround time	802.2	± 677.8	36	1560
Ultrasound turnaround time	292.3	± 332.6	23	1800
Time between theater bay and start of surgery	95.9	± 115	7	900

Source: Field Data, 2020

There was statistical significance between duration of stay in hospital and decision by the responsible person to go to a healthcare facility in both bivariate (p=0.01) and multivariate (p=0.03) analyses. However, for mortality and surgical site infection (SSI), there was no statistical significance in bivariate and multivariate analyses between mortality and SSI and pre-hospital delay.

A delay in the time taken for the first contact with the surgical team (more than 60 minutes after the patient had been seen by the first emergency physician) resulted in a longer length of hospital stay (p=0.02) but did not affect mortality (p=0.30) and SSI (p=0.42). Similarly, a delay in theatre receiving bay to start of surgery time (theatre time), more than 60 minutes, prolonged length of hospital stay (p=0.01) but had no effect on SSI (p=0.13). Patients who spent longer time between the receiving bay and the start of surgery were likely to be alive in 30 days (p=0.01)

Table 5: Distribution of Outcomes of Patients

Variable	Frequency (N=109)	Percentage
Duration of stay in the hospital		
≤ 10 days	62	56.9
11-20 days	29	26.6
21-30 days	18	16.5
Mortality		
Alive	93	85.3
Dead	16	14.7
SSI		
No	90	82. 6
Yes	19	17.4

Source: Field Data, 2020

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Table 6: Distribution of Mortality and Pre-hospital delay

Variable	Mortality		
	Alive	**Died**	**P value**
Decision Maker			0.07
Family Member	44 (47.3)	12 (75.0)	
Friends	17 (18.3)	1 (6.3)	
Self	32 (34.4)	3 (18.7)	
Means of transport to a health facility			0.70
Taxi	77 (82.7)	13 (81.3)	
Trotro	2 (2.2)	0 (0)	
Walked	2 (2.2)	0 (0)	
Private Car	12 (12.9)	3 (18.7)	
Means of transport on referral			0.21
Ambulance	11 (29.7)	0 (0)	
Taxi	26 (70.3)	4 (100)	
Duration of symptoms before reporting			0.19
24 hours and below	36 (38.7)	9 (56.3)	
More than 24 hours	57 (61.3)	7 (43.7)	
Reason for reporting late			0.84
Financial	10 (17.5)	1 (14.3)	
Means of transport was difficult	1 (1.8)	0 (0)	
Needed Approv-al from someone	35 (61.4)	5 (71.4)	
No Health facili-ty close by	4 (7.0)	1 (14.3)	
Symptoms didn't pose problem	7 (12.3)	0 (0)	

Source: Field Data 2020

Table 7: Distribution of Mortality and In-hospital delay

Variable	Mortality		
	Alive	**Died**	**P value**
Time in initiating Care			0.76
No delay time seen	37 (84.1)	7 (15.9)	
Delay time	56 (86.2)	9 (13.8)	
Blood sample time			0.71
No delay time seen	15 (88.2)	2 (11.8)	
Delay time	78 (84.8)	14 (15.2)	
Lab report time			0.23
No delay time seen	17 (94.4)	1 (5.6)	
Delay time	76 (83.5)	15 (16.5)	
Surgical team time			0.30
No delay time seen	48 (88.9)	6 (11.1)	
Delay time	45 (81.8)	10 (18.2)	
X-ray Time			
No delay time seen	1 (100)		
Delay time	6 (100)		
Ultrasound time			0.55
No delay time seen	3 (75.0)	1(25.0)	
Delay time	90 (85.7)	15 (14.3)	
Theatre time			**0.009***
No delay time seen	49 (77.8)	14 (22.2)	
Delay time	44 (95.6)	2 (4.4)	

Source: Field Data 2020

A bivariate and multivariate analyses showed a statistical significance between length of stay and theatre time (time between getting to the receiving bay and start of surgery), p-value =0.001, as shown of **Tables 8 and 9.** Of the 46 people who had a delay between the receiving bay and start of surgery, 34.8% had a length of stay of 11-20 days and 32.6% had a length of stay of 21-30 days.

Table 8: Duration of Stay and In-hospital delay

Variable	Duration of Stay			
	Within 10 days	**11-20 days**	**21-30 days**	**p-value**
Time in initiating Care				0.56
No delay time seen	26 (59.09)	12 (27.27)	6 (13.64)	
Delay time	36 (55.38)	17 (26.15)	12 (18.46)	
Blood sample time				0.52
No delay time seen	10 (58.82)	2 (11.76)	5 (29.41)	
Delay time	52 (56.52)	27 (29.35)	13 (14.13)	
Lab report time				0.92
No delay time seen	11 (61.11)	3 (16.67)	4 (22.22)	
Delay time	51 (56.04)	26 (28.57)	14 (15.38)	
Surgical team time				**0.02***
No delay time seen	27 (50.00)	13 (24.07)	14 (25.93)	
Delay time	35 (63.64)	16 (29.09)	4 (7.27)	
Xray Time				0.72
No delay time seen	0 (0)	1 (100)	0 (0)	
Delay time	3 (50.00)	2 (33.33)	1 (16.67)	
Ultrasound time				0.11
No delay time seen	4(100)	0 (0)	0 (0)	
Delay time	58 (55.24)	29 (27.62)	18 (17.14)	
Theatre time				**0.001***
No delay time seen	47 (74.60)	13 (20.63)	3 (4.76)	
Delay time	15 (32.61)	16 (34.78)	15 (32.16)	

Source: Field Data, 2020

Table 9: Multivariate regression of duration of stay and determinant of delay (In-hospital)

Variables	Odd Ratios	P value	95% CI
Time in initiating care	1.16	0.70	0.53 – 2.52
Blood sample time	1.09	0.86	0.38 – 3.14
Lab report time	1.23	0.69	0.43 – 3.46
Surgical team time	0.57	0.15	0.26 – 1.22
X ray time	1		
Ultrasound time	1		
Theatre time	6.07	**0.001***	2.62 – 14.03

Source: Field Data, 2020

DISCUSSION

This study combined two categories of delay (pre-hospital and in-hospital) and examined their impact on the outcome of emergency abdominal surgery at a teaching hospital in a low-resource setting in Sub-Saharan Africa.

The majority of the patients were self-employed which is a reflection of the higher percentage of informal sector workers in Ghana. Contrary to the report from Anne *et al.*, we did not demonstrate an association between being self-employed and a delay in presentation.

In Ghana, similar to other LMICs, the family system influences major decisions in the life of an individual. The number of patients who had family members as decision-makers were more than half of the total number of participants. This is in agreement with Khanapure *et al.* The pre-hospital interval of delay is related to family issues from the findings from Salman and Razzouki in Iraq but contrary to the findings from Ghana by Tabiri *et al.* A delay in the decision to come to the hospital from the onset of symptoms was found to be associated with the length of stay hospital (p=0.01)

A significant number of the patients came to KATH in public transport which is similar to other findings from earlier reports from previous authors (Tabiri *et al.*, 2018) which is a reflection of the general means of transport in Ghana. Few patients arrived in the hospital by ambulance. This may be because ambulances are not readily available in Ghana. This is in line with Mofikoya *et al.* on limited ambulance services in Africa. However, the mode of transportation did not cause any delay in the current study.

The majority of patients in this study were self-referred which is a common practice in Ghana as a result of no well-structured referral system in the health sector in Sub-Sahara Africa (Give *et al.*, 2019; Amoah *et al.,* 2017; Ansah *et al.,* 2016). Almost 60% of the patients in the current study lived close to a healthcare facility. Had there been some form of well-structured referral systems, patients would have got some initial treatment and stabilisation before referral.

Nearly 60% of the patients presented later than 24 hours from the onset of the symptoms. This is similar to the findings from publications by Khanapure *et al.* from India *and* Marine *et al* in Malawi. It is, however, in sharp contrast to the findings of Salman and Razzouki that showed less than 40% of patients presenting after 24 hours from the onset of clinical disease in Iraq. Salman and Razouski also found a higher incidence of mortality in patients who delayed in receiving care. Commonly, patients would have to queue for beds after triaging to be sent to the appropriate colour-coded ward to be seen by a doctor. Even though mortality in the group with delay in initiating care was higher compared to the non-delay group, this was not significant. The current study established an association between delays and the length of stay after surgery similar to a study by Maine *et al* in Malawi.

The mean time spent by patients in the Accident and Emergency Departments was 3 hours before they were reviewed by a physician after triaging. This was higher than what was published by Adamu *et al* in neighbouring Nigeria. This prolonged waiting time could be attributed to the fact that KATH is the only tertiary hospital serving the middle belt of Ghana with a population of 9,724,472 (Ghana Statistical Service, 2013). KATH has a wide catchment area with patients coming from as far as a 100-150km radius (Ohene-Yeboah, 2006). This is in contrast to a study by Mustapha and Abass which demonstrated that patients have to travel 5km for an appendicectomy in Lahore, Pakistan

Laboratory, X-ray, and ultrasound processing times were prolonged. From observation, prolonged turnaround time in our centre can be attributed to frequent equipment breakdowns, frequent shortage of reagents and radiologists not being available to do or report on radiological investigations. Mofikoya *et al* reported that in Lagos, delays in laboratory and x-ray services constituted 42% of all in-hospital delays. In Zaria, Nigeria, the second most common cause of delay was found to be waiting for complementary investigations and that waiting time was an independent predictor of mortality(Adamu *et al*., 2010). In the current study, the prolonged investigation processing time did not influence the outcome of emergency abdominal surgery.

Nearly half of the patients in our study spent more than one hour in the theatre bay receiving treatment before the start of surgery. A lower mean time was found in rural Uganda by Nwanna-Nzewunwa *et al*. Large patient volumes as well as unavailability of personnel were noted to be some of the leading causes of delays in the study in Uganda. Here in Kumasi-Ghana, the occasional shortage of anaesthetists and perioperative nurses, non-functioning theatre equipment are causes of delay in the theatre waiting bay. The main theatre of KATH, where abdominal surgeries are done, has five (5) operating rooms. Out of these only two (2) are dedicated to emergency surgeries which is shared between ten (10) teams (five general surgery teams, two paediatric surgery teams, and three urology teams). This creates long queues of patients leading to a prolonged waiting time. The waiting time in the theatre bay was associated with prolonged length of hospital stay (p=0.001)

Delays in surgical emergencies have been documented to affect the outcomes of surgeries in LMICs (Maine *et al.,* 2019; McIsaac *et al.,* 2017). The overall mortality in this study was similar to reports from Uganda (McIsaac *et al.,* 2017). In our study, mortality was low compared to a study from Ottawa (McIsaac *et al*., 2017). This could be attributed to the fact that priority was given to patients who were relatively very sick to access the operating room whenever there was a long queue in the theatre. Such patients were thus allowed to overtake relatively stable patients in the struggle for theatre space.

The overall SSI (SSI) rate was comparatively lower than the findings in a study by Agrawal and Singh, for emergency abdominal surgeries. Even though the data in this study showed higher numbers of SSI in areas of delays, this was statistically not significant.

CONCLUSION

Delays in the decision to go to the hospital and long waiting time in the theatre receiving bay before start of surgery were significantly associated with the length of hospital stay.

RECOMMENDATION

This was a single-centre study over four months, thus, a multi-centre randomised study over an extended period is necessary to ascertain the effect of delay on surgical outcomes.

Time spent at the theatre receiving bay should be minimised to reduce the duration of hospital stay.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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