Outcomes of Implementing a Care Bundle for the Early Management of Patients with Acute Upper Gastrointestinal Bleeding

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Abstract

Background: *Care bundles are the most common form of standardizing patient care that can lead to a high quality of care for frequent admission diagnoses. Gastrointestinal (GI) bleeding is still a prevalent and potentially fatal emergency problem that encounters critically ill patients. Critical care nurses play a crucial role in the implementation of standards of care through recognizing the importance of early and timely management as rapid resuscitation and early endoscopy are associated with better outcomes. The British society of gastroenterology emphasized ongoing differences in practice and inadequate management of patients with acute upper GIT haemorrhage. That is why, major initiatives such as the acute upper GI bleeding bundle are still required to address these differences and improve patients' clinical outcomes*. ***Objective:*** *To determine the outcomes of implementing a care bundle for the early management of patients with acute upper gastrointestinal bleeding* ***Setting:*** *This study was conducted in the Hematemesis intensive care unit of Alexandria Main University Hospital, Egypt.* ***Subjects:*** *A convenience sample of 60 newly admitted adult patients with acute upper gastrointestinal bleeding were included in this study. Patients were assigned into two equal groups (30 patients each).* ***Tool:*** *"Assessment of Upper Gastrointestinal Bleeding Bundle Implementation Outcomes" is the tool used to collect the data of this study.* ***Results:*** *There was a statistically significant difference was observed between the study and control groups in the first, second, and third day of MAP readings (p= 0.001, <0.001 and 0.013) respectively. Time waiting until doing the endoscopy was less for the study group compared to the control group with significant difference between both groups. Mortality rate, incidence of rebleeding and length of stay were higher in the control group compared to the study group with no statistically significant differences.* ***Conclusion:*** *implementation of a care bundle for acute upper GIT bleeding patients can lead to improvement of their management and outcomes.* ***Recommendations:*** *Critical care nurses should collaborate with other health team members in the implementation of upper GIT bleeding bundle of care. Hospital administration should conduct educational training to health team members about upper GIT bleeding bundle and its importance in improving patients' outcomes.*

Keywords: Patients' Outcomes, Care bundle, Acute upper gastrointestinal bleeding.

Introduction

Acute Gastrointestinal Tract (GIT) bleeding accounts for a considerable proportion of intensive care unit (ICU) patients, resulting in high morbidity, resources consumption, and even death. Moreover, upper GIT bleeding is nearly five times more prevalent than lower GIT

bleeding. Also, upper GIT bleeding affects between 80 to 150 people per 100,000 in the United States each year, with fatality rates ranging from 2% up to 15% (Farrar, 2018; Kalkwarf & Cotton, 2017). In Alexandria Main University hospital, 192 patients were admitted to the hematemesis ICU in 2020 according to the medical record statistics (Alexandria Main University Hospital records, 2020).

Peptic ulcers are considered a common source of acute upper gastrointestinal bleeding accounting for approximately 40% of upper GI bleeding cases due to their anatomical proximity to major arteries. Other causes of upper GIT bleeding include esophageal varices caused by portal hypertension from liver illness. Haemorrhage from esophageal varices is linked to a significant mortality rate of around 20% and can rise to 60% in rebleeding patients. Stomach lymphoma that is frequently caused by malignancy can lead to ulceration of the mucosal surface and bleeding (Costable & Greenwald, 2020).

Upper GIT bleeding is a critical condition which may be fatal if left untreated. It can cause large volume of blood loss that can cause systemic hypoperfusion with multiple organs failure due to shock. Application of care bundle to overcome these risks associated with upper GIT bleeding is a must, as it has been approved that the implementation of care bundle is one of the best methods to overcome bleeding and variation of care between health care providers(Oakland et al., 2019).

Critical care nurses play a crucial role in the initial stabilization along with the management of patients with acute upper GIT bleeding. This preliminary care comprises a thorough examination of the airways, breathing, and circulation, as well as venous access, laboratory testing, and the delivery of fluids and blood transfusions as needed. In addition to the preparation for early endoscopy which is associated with better outcomes. However, endoscopy should be postponed in patients with respiratory failure or hemodynamic instability until they have been appropriately resuscitated and stabilized (Dains et al., 2018; Stanley & Laine, 2019).

Aims of the Study

This study aims to determine the outcomes of implementing a care bundle for the early management of patients with acute upper gastrointestinal bleeding.

Research hypotheses

Patients with acute upper GIT bleeding subjected to the bundle of care exhibit positive clinical outcomes than those who are not subjected.

Materials and Method

Materials

Design: A quasi experimental research design was used to conduct this study.

Setting: This study was conducted in the hematemesis intensive care unit of Alexandria Main University Hospital. The bed capacity in the hematemesis intensive care unit is 5 beds.

Subjects: A convenience sample of 60 newly admitted adult patients with acute upper gastrointestinal bleeding (aging 18 to 65 years old) were included in this study. Patients were assigned into two equal groups (30 patients each); **group A** (control group) was subjected to the unit routine care, while **group B** (study group) was subjected to the acute upper GIT bleeding bundle of care. EP Info 7 program was used to estimate the critically ill patients sample size according to the following information: expected frequency =50, acceptance error =5%, confidence coefficient =95%, design effect =1.

Tool:

"**Assessment of Upper Gastrointestinal Bleeding Bundle Implementation Outcomes"** is the tool used to collect the data of this study. This tool consists of four parts:

Part I: Patient's demographic and clinical data. This part includes patient's demographic

data such as age and gender, clinical data namely; diagnosis, chief complain, APACHE II score, vital signs, and level of consciousness.

Part II: The national early warning score (NEWS). The national early warning score is adopted from (Smith et al., 2013)and is used to determine hemodynamic stability and need for prompt intervention. Hemodynamic instability is defined by active bleeding where blood pressure or heart rate cannot be normalized or where rapid intravenous fluids are required to maintain hemodynamic stability. NEWS uses six physiological measurements: respiratory rate; oxygen saturation; temperature; systolic blood pressure; heart rate and level of consciousness. Each item scores 0–3 and individual scores are added together for an overall score in addition to 2 points added to the total score for any supplemental oxygen used. The total possible score ranges from 0 to 20. The higher the score (≥5) the greater the bleeding and the need for fluid resuscitation. The National early warning score is proved to be reliable (r =0.94).

Part III: The Modified Glasgow Blatchford Score. The modified Glasgow Blatchford Score (GBS) is adopted from (Quach et al., 2016) and is used for risk stratification of patients with acute upper gastrointestinal bleeding. It includes tool measuring Hb, BUN, systolic blood pressure, and pulse. Each variable has an appointed numeric value, and the maximal number of points is 16, where the higher the score, the higher the risk. Scores between 1 and 5 indicate a need for hospital admission, though, the chance for the patient to require surgery is not that significant. Scores of 6 or more have an increased risk of acute upper gastrointestinal bleeding, and chances of over 50% in need of surgical intervention, blood transfusion or endoscopic intervention. The GBS is proved to be reliable (r =0.86)

Part IV: Patient's clinical outcomes. This part was developed by the researcher based on reviewing the related literature (Farrar, 2018; Feng et al., 2021; Saltzman et al., 2018; Siau et al., 2020) and used to measure the following outcomes: perfusion outcomes (including measures of mean arterial blood pressure and level of consciousness), length of ICU stays, rebleeding, and time of endoscopy.

Method

Approval of the ethics committee of the faculty of nursing was obtained. An official approval to conduct this study was obtained from hospital administration after providing explanation of the aim of the study. The study tools were tested for content validity by 5 experts in the field of the study. The necessary modifications were done accordingly. A pilot study was carried out on 10% of the study sample in order to test the clarity and applicability of the research tools. Data collection took approximately five months from August 2021 to December 2021.

Data were collected from group "A" (control group) first then from group "B" (study group) to avoid the double Hawthorne effect.

The control group received the routine care implemented in the unit. According to the researcher observation this included measuring only the Glasgow coma scale. No definite protocol was used and there were some variations in interventions according to the ICU resident preferences. Interventions mainly included fluid and coagulants administration, blood transfusion, making enemas, gastric lavage, and preparation for endoscopy.

The study was conducted in three phases:

Phase I: Patients' Assessment

Patients in both control and study groups were assessed from ICU admission till transfer to the ward. Patient's demographic data was recorded and clinical data namely; diagnosis, APACHE II score, vital signs, level of consciousness using Glasgow coma scale.

Phase II: Upper GIT bleeding bundle implementation

The study group received the upper gastrointestinal bleeding bundle starting from the first 24 hours of patients' admission.

The upper gastrointestinal bleeding bundle was implemented according to six domains as follows:

- Recognizing bleeding through reporting/recording the presence of hematemesis, melena, or coffee ground vomiting from newly admitted patients.
- Providing fluid resuscitation through using part II of the tool to determine hemodynamic stability, risk level, and need for prompt intervention. Indicators that a patient needed fluid resuscitation include systolic BP less than 100 mm. Hg; pulse more than 90 bpm; capillary refill >2 seconds or peripheries cold to touch; respiratory rate >20 breaths per min; NEWS ≥5; passive leg raising with 45^{o} which increases pulse pressure by 10 % suggesting fluid responsiveness. The NICE guideline on intravenous fluid resuscitation was implemented by administering 500mL crystalloid over less than 15 minutes and avoiding using tetrastarch in fluid resuscitation. Blood transfusion with packed red blood cells was administered when the hemoglobin level was less than 7 g/dL.
- Assessing risk: the Modified Glasgow Blatchford Score (GBS) was used for risk stratification of patients with acute upper GIT bleeding using part III of the tool. It was done on admission.
- Administering treatment in collaboration with physician as proton pump inhibitors and antibiotics. All antithrombotics were suspended except aspirin.
- Nothing per mouth and gastric lavage was started to facilitate rapid referral for performance of endoscopy after patient stabilization.
- Reviewing the endoscopy report and planning for return of antithrombotic medications to avoid thrombotic complications.

Phase III: Clinical Outcomes. Both groups were assessed for clinical outcomes using part IV of the tool for the following:

- Perfusion (through measuring the mean arterial pressure and level of consciousness using Glasgow coma scale). these measurements were taken from admission till the 4th day and the mean of repeated measurements were taken daily.
- Length of ICU stay (by calculating the number of days that the patient had stayed in the ICU).
- Rebleeding (through repeated incidence of hematemesis, melena, or coffee ground vomiting after hemostatic and endoscopic interventions).
- Time of endoscopy (the time that the patient waited before the endoscopy).

Ethical Considerations:

Written informed consent was obtained from the patients after explaining the aim of the study. Patients' privacy was maintained during the implementation of the study. Confidentiality of the collected data was ascertained. The right to refuse to participate in the study was emphasized to the patients as well as the right to withdraw from the study at any time.

Results

Table 1 shows the distribution of patients with acute upper gastrointestinal bleeding in the control and study groups according to their demographic data. This table indicates that more than half of the patients in the study groups were males (60%, and 53.3%) respectively. Their mean age was 47.7 ±9.7 and 47.8 ±9.4 respectively. No statistically significant differences were observed between the two groups as regards demographic data (p = 0.602 and 0.98) respectively.

Table 2 illustrates the distribution of patients with acute upper gastrointestinal bleeding in the control and study groups according to their health-related data. It was noticed that less than half of the studied patients chief complain on admission was hematemesis (46.7%, 43.3%) respectively. It

was also observed that more than half of the patients in the control group (60%) had non variceal bleeding origin compared to two thirds in the study group (66.6%).

This table also shows that slightly more than two thirds of the patients in the control group and two thirds of the patients in the study group had no surgical history (70 %, and 66.6%) respectively. It was also noted that the mean days on mechanical ventilator was 2.3 ±3.06 and 2.3 ±3.1 for the study and control groups respectively.

No statistically significant differences were found between patient's chief complaint, diagnosis, surgical history and length of MV in the control and study groups, where (p = 1, 0.789, 1 and 1) respectively.

Table 3 shows the comparison between the control and study groups according to their risk scores. The mean score of APACHE II was 14.2±6.7 and 15.8±6.1 for the control and study groups respectively. In relation to GBS score, it was observed that the mean score was 8.3±3.1 and 8.0±3.4 for the control and study groups respectively. Concerning the NEWS score, it was noted that the mean score was 7.5±3.4 and 7.9±3.4 for the control and study groups respectively, and no statistically significant differences were found between patients in the control and study groups regarding risk scores.

Table 4 shows the comparison between the control and study groups according to their mean arterial blood pressure (MAP). The median of MAP on admission for the control and study groups was 77 mmHg and 71 mmHg respectively with no statistically significant difference between both groups (p=0.92). on the other hand, there was a statistically significant difference between the study and control groups in the first, second, and third day of MAP readings (p= 0.001, <0.001 and 0.013) respectively. Moreover, it can be noted that there was a statistical significance differences in MAP within the same group when comparing from admission to fourth day for the control and the study groups (p= 0.002 and p= <0.01) respectively.

Table 5 illustrates the comparison between the control and study groups according to level of consciousness using Glasgow coma scale (GCS). It was noted that the median of GCS on admission was 13 for both groups with no significant difference between the two groups (p=0.75). on the other hand, a statistically significant difference between the study and control groups was observed in the first, second, and third day of GCS readings (p= <0.001, 0.008 and 0.03) respectively. Also, it was noted that the level of consciousness reached normal level for the study group from the first day to the fourth day.

Table 6 reveals a comparison between the control and study groups according to the incidence of rebleeding, patients' length of stay, Time before endoscopy, and discharge. This table revealed that two thirds (66.7) of the control group and slightly more than three quarters of the study group (76.7%) had no incidence of rebleeding with no statistical significance difference between the two groups (p=0.39). It was also noticed that the mean LOS for both control and study groups was 5.9±2.6 days and 5.6±2.4 days respectively with no statistically significant differences between the two groups (p=0.646). The mean waiting time before endoscopy for both groups was 57.6±16.2 hours and 42.8±10.3 hours respectively with a significant difference between both groups(p=0.001) and this reveals that the waiting time before endoscopy was less for the study group compared to the control group. Furthermore, more than half of the control group (60%) had been discharged to the ward compared to 70% of the study group

Discussion

Care bundles were developed to keep up with the standardization of health care

provided to critically ill patients as patients with upper GIT bleeding, to improve outcomes and promotes multidisciplinary cooperation (Brenner et al., 2020). There is no doubt that multidisciplinary cooperation is important in the development and implementation of care bundles. The interaction of all partners in the management of patients with upper GIT bleeding including critical care physicians, nurses, and gastroenterologists is the basis for the success of evidence-based intervention and standards implementation (Lancaster et al., 2022).

Several observations can be drawn from our results. Regarding the demographic data, findings of the current study showed no statistically significant differences between the study and control groups. This similarity in demographics can protect against selection bias as a basis for outcomes improvement. Therefore, regardless of which group we choose, the observations within both groups have a normal distribution with a common variance, accordingly the homogeneity of variance assumption is imposed.

Furthermore, no statistically significant differences were found between patients in the control and study groups regarding past medical history, APACHE II, NEWS, and GBS scores which prevent selection bias.

In relation to patients' chief complain, it was noticed that slightly less than half of the studied patients were admitted with hematemesis. This may be attributed to that hematemesis is easily noticed and complained by patients and although melena is later confirmed by ongoing assessment .This finding is congruent to some extent with a study about the effect of admission manifestations of upper GIT bleeding patients on their outcome which revealed that slightly more than half of the studied patients had hematemesis as a chief complain on admission (Li et al., 2019). This is in line with the study about clinical profile of patients presenting to emergency with upper gastrointestinal bleeding in a tertiary hospital of Nepal in which slightly less than third of the studied patients had hematemesis as a chief complain on admission (Adhikari et al., 2021).

The current study shows no significant difference between the control and study groups on admission regarding MAP. on the other hand, there was a significant difference between these groups in the first, second, and third days of MAP readings as the study group is exposed to strict and standardized fluid replacement part of bundle. Moreover, a statistical significance difference in the MAP was noted within the same groups when comparing between the control and the study groups from admission to the fourth day. the primary symptoms of upper GIT bleeding are hematemesis, hematochezia and melena but bleeding can lead to hypotension and hypoperfusion as can be manifested by secondary symptoms as syncopal attacks and weakness. Normal mean arterial pressure is maintained by cautious fluid replacement to avoid high blood pressure and further bleeding (Laine et al., 2021).

The finding of the current study is supported by a study of using perfusion index as a tool for fluid replacement of upper GIT bleeding patients where there was a significant relation between MAP of both groups (Firat et al., 2021). Other review studies suggested that the use of a standardized and bundled care can improve patients perfusion through maintaining normal MAP in patients with upper GIT bleeding (Haigh, 2022; Siau et al., 2020). On the other hand, this result is in opposition to a study about the outcomes of upper GIT bleeding patients according to their hypoperfusion measured by lactate level where they found no statistical significant difference in MAP between complicated and non-complicated groups (Lee et al., 2017).

Regarding GCS, no significant difference was noted on admission between both groups regarding GCS. on the other hand, a statistically significant difference between

the study and control groups was observed in the first, second, and third days of GCS readings. This may be attributed to the fact that improving perfusion to all body organs especially brain will improve level of consciousness. This result is in opposition to the study measuring the effect of increased MAP, central venous pressure on Glasgow coma scale in the intensive care units which revealed no correlation between them. This may be attributed to the fact that altered level of consciousness in ICU patients is not related only to hypoperfusion, but can be related to their comorbidities also (Lubis et al., 2022).

The current study showed that two thirds of the control group and slightly more than three quarters of the study group had no incidence of rebleeding. This can be explained by bundled interventions including early endoscopy for the study group decreased the incidence of rebleeding. This result is in line with the study about using standardized blood transfusion guidelines for upper GIT bleeding patients where half of patients in the study group and slightly less than half of patients in the control group didn't rebleed (Kumar et al., 2020). On the contrary, another randomized controlled trial of early endoscopy for upper GIT bleeding patients found that the incidence of rebleeding was 4.5% for the study group and 28.5% for the control group with a statistical significant difference between both groups, but this study measured the incidence of rebleeding only in the first 3 days (Chung et al., 2022).

The current study revealed that the time waiting before endoscopy for the study group was less compared to the control group with a significant difference between both groups. This can be due to the fact of following the upper GIT bleeding bundle which recommend performing early endoscopy after stabilizing patients. This finding is reinforced by Siau et al., (2019) who studied the effect of early endoscopy on upper GIT bleeding patients outcomes and found that early endoscopy was associated with decreased length of stay in hospital. Moreover, this finding was confirmed with another study about proper timing of endoscopy for acute upper GIT bleeding patients where early endoscopy was associated with better outcomes of decreased rebleeding and mortality (Guo et al., 2022).

The present study reveals that the mean length of stay (LOS) for both control and study groups was 5.9±2.6 days and 5.6±2.4 days respectively with no statistically significant differences between the two groups. This finding is supported by a study conducted by Haas et al., (2021) in which the ICU length of stay was between 6 and 10 days. Moreover, This finding is in line with the study conducted by Trindade et al., (2021) about gastrointestinal bleeding in hospitalized COVID-19 patients where the mean length of stay was 8.41±6.25. these findings may be due to most patients undertake some diagnostic examinations and surgical endoscopic intervention.

Conclusion

The use of a standardized care as the implementation of acute upper GIT bleeding bundle is associated with significant improvement in patient outcomes. Upper GIT bleeding bundle is useful in facilitating rapid implementation, identification, and timely treatment of those patients which may have a positive impact on patient outcomes.

Recommendations

Based on the findings of the current study, it can be recommended that:

- Encourage nurses to attend workshops about upper GIT bleeding bundle to clarify their further role in collaborating with other health team members.
- Implement quality improvement strategies to enhance appropriate use of risk assessment scales of upper GIT bleeding patients.

- Assess barriers for implementation of upper GIT bleeding bundle in intensive care units in future studies.

Table (1): Distribution of the patients in the study and control groups according to their demographic data

Demographic data	Control		study		P
	No.	%	No.	%	
Gender					
Male	18	60%	16	53.3%	p=.602
Female	12	40%	14	46.7%	
Age (years)					t=.013, p=.98
Mean ±SD.	47.7 ±9.7		47.8 ±9.4		
Min. – Max.	(27-62)		(28-63)		

p: p value for comparing between the studied groups *: Statistically significant at $p \leq 0.05$

Table (2) Distribution of patients in the control and study groups according to their health-related data:

Health-related data	Control		Study		P
	No.	%	No.	%	
Chief complaint					
Hematemesis	14	46.7%	13	43.3%	p=1
Melena	4	13.3%	5	16.7%	
Coffee ground vomiting	5	16.7%	5	16.7%	
Hematemesis and melena	7	23.3%	7	23.3%	
Diagnosis					
Variceal bleeding	12	40%	10	33.3%	p=.789
Non variceal bleeding	18	60%	20	66.6%	
Length of MV (days)					
Min. – Max.	(0-10)		(0-11)		t=.001, p=1
Mean ±SD.	2.3 ±3.06		2.3 ±3.1		

p: p value for comparing between the studied groups *: Statistically significant at $p \leq 0.05$

Table (3): Comparison between the control and study groups according to risk scores.

Calculated scores	Control (n=30)	Study (n=30)	P value
APACHE II			
Median (Min-Max)	14.5(3-25)	15(7-26)	.41
Mean ±SD.	14.2±6.7	15.8±6.1	
GBS score			
Median (Min-Max)	8(3-13)	8(2-13)	.783
Mean ±SD.	8.3±3.1	8.0±3.4	
NEWS			
Median (Min-Max)	6.5(2-14)	8(2-14)	.651
Mean ±SD.	7.5±3.4	7.9±3.4	

By Mann Whitney U test p: p value for comparing between the studied groups
*: Statistically significant at $p \leq 0.05$ **APACHEII:** Acute Physiology, Age, and Chronic Health Evaluation
GBS: Glasgow-Blatchford Bleeding Score **NEWS:** National Early Warning Score

Table (4): Comparison between the control and study groups according to their mean arterial blood pressure (MAP)

MAP (mmHg)	Control (n=30) Median (Min-Max)	Study (n=30) Median (Min-Max)	p value
Admission	77(55-101)	71(52-100)	.92
1st	62(57-79)	66.5(57-90)	.001*
2nd	66(63-81)	70(63-100)	<.001*
3rd	68(52-80)	70(63-107)	.013*
4th	70(54-73)	71(55-110)	.058
P value for Friedman test	**p=.002***	**p=.01***	

p: p value for comparing between the studied groups *: Statistically significant at $p \leq 0.05$

Table (5): Comparison between the control and study groups according to level of consciousness using Glasgow coma scale (GCS).

GCS	Control (n=30) Median (Min-Max)	Study (n=30) Median (Min-Max)	p value
admission	13(8-15)	13(6-15)	.75
1st	12(8-15)	15(11-15)	<.001*
2nd	11(8-15)	15(9-15)	.008*
3rd	13(7-15)	15(8-15)	.03*
4th	13(8-15)	15(9-15)	.14
P value for Friedman test	**p=.19**	**p=.08**	

p: p value for comparing between the studied groups *: Statistically significant at $p \leq 0.05$

Table (6): Comparison between the control and study groups according to the incidence of rebleeding, patients' length of stay (LOS) and Time before endoscopy.

Outcome	Control		Study		p
	No.	%	No.	%	
Rebleeding					
Yes	10	33.3%	7	23.3%	X^2=.739,
No	20	66.7%	23	76.7%	p=.39
LOS					t=.46,
Mean ±SD.	5.9±2.6		5.6±2.4		p=.646
Time before endoscopy					t=3.7,
Mean ±SD.	57.6±16.2		42.8±10.3		p=.001*
Discharge					
Death	12	40%	9	30%	X^2=.65,
Discharge to ward	18	60%	21	70%	p=0.12

p: p value for comparing between the studied groups *: Statistically significant at $p \leq 0.05$

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