

Original Article

Potential role for emergency physicians with endoscopy training in the treatment of upper gastrointestinal hemorrhage: a retrospective observational study

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Aim: Urgent endoscopy is essential in gastrointestinal (GI) bleeding. Emergency physicians with endoscopy training treat patients with GI bleeding in our hospital. We compared the management and clinical outcomes of GI bleeding cases between those treated by an emergency physician (EP) and those treated by a non-emergency physician (NEP; e.g., gastroenterologist or general surgeon).

Methods: We undertook a retrospective chart review of upper GI bleeding cases treated using endoscopy in the emergency department between 2012 and 2014. We examined patients characteristics, endoscopic findings, hemostatic procedures, need for transfusion, rebleeding and adverse events, length of hospital stay, and mortality.

Results: The EP group included 33 patients (39%) and the NEP group included 51 (61%). Patient characteristics and diseases did not differ between the groups. The EP group underwent urgent endoscopy more often (100% versus 86%, $P = 0.04$). Procedure times were not statistically different between the groups. The EP group had fewer hemostatic procedures (42% versus 65%, $P = 0.04$). Transfusion requirements were lower in the EP group (0.5 U versus 2.1 U, $P = 0.006$). There were no statistical differences in rebleeding and adverse events. The length of hospital stay was shorter (8 versus 11 days, $P = 0.03$) and the in-hospital mortality rate was lower in the EP group (0% versus 13.7%, $P = 0.04$).

Conclusion: Short-term outcomes in GI bleeding cases managed by emergency physicians with endoscopy training were comparable to those by gastroenterologists and general surgeons. However, the extent of endoscopic training and experience emergency physicians should have remains unclear.

Key words: digestive system, Emergency medicine, endoscopy, ER, gastroenterology & hepatology, gastrointestinal hemorrhage

INTRODUCTION

UPPER GASTROINTESTINAL (GI) bleeding is a common and potentially life-threatening emergency. Fiberoptic endoscopy has recently been recognized as essential for patients with upper GI bleeding and plays an important role in treatment. Endoscopy is currently recommended for patients with signs and symptoms of acute non-variceal upper GI bleeding within 24 h of presentation.^{1,2} Endoscopy carried out within this timeframe may decrease the

requirement for blood transfusion and may also decrease the length of hospital stay.¹

Public health care in Japan is well organized.³ However, emergency medical systems in Japan now face shortages of doctors in certain specialties, such as general surgery, pediatrics, and obstetrics.^{4,5} Upper GI endoscopy services are not readily available or affordable for most patients in many developing countries.⁶ Patients with GI bleeding in some districts of Japan reportedly have difficulty finding hospitals where endoscopy can be carried out. Few hospitals in our district have gastroenterologists and general surgeons who can perform endoscopy to treat GI bleeding, especially during nights and holidays. As a result, our hospital receives many patients with GI bleeding from a wide area. Owing to the large intake in patients with GI bleeding, the emergency department at our hospital decided to treat these patients requiring endoscopy, to lessen the burden on

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Received 31 Aug, 2017; accepted 7 Jan, 2018; online publication 12 Feb, 2018

gastroenterologists and general surgeons. The aim of this study was to examine the differences in management, adverse events, and outcomes in patients with GI bleeding treated by emergency physicians and non-emergency physicians (gastroenterologists and general surgeons) in our hospital.

METHODS

Study design and setting

A RETROSPECTIVE CHART review was carried out on all patients admitted to the emergency department (ED) of Kuki General Hospital (Saitama, Japan) between April 2012 and March 2014. The hospital is a community hospital with 300 beds. The ED was managed by three emergency physicians accredited by the Japanese Association for Acute Medicine. Two emergency physicians worked daytime hours on weekdays and weekends and sometimes worked at night; one part-time emergency physician worked a 24-h shift on one weekday during the study period. Upper GI endoscopy was carried out by a non-emergency physician (NEP, e.g., gastroenterologist or general surgeon) or an emergency physician (EP) in the hospital. All EPs underwent GI endoscopy training during a general surgery rotation for at least 1 year. Training mostly consisted of screening for suspected esophageal and gastric carcinoma in otherwise healthy adult patients under the supervision of experienced general surgeons, who were also available for support in the event of GI bleeding. Endoscopic simulation was not used for training. The EPs sometimes used endoscopy for insertion of enteric feeding tubes in the intensive care unit after training. The intensive care unit was also managed by the two EPs and one part-time EP. Until 2012, when a patient with GI bleeding presented to the ED, an EP or other physician on ED duty examined the patient and called a gastroenterologist or a general surgeon, who then performed the endoscopy. However, beginning in 2013, when a patient with GI bleeding presented to the ED during daytime hours or at night when an EP was on duty, the physician often initially carried out the endoscopy, regardless of vital signs. When the ED was busy with patients including those with GI bleeding, the EP consulted a gastroenterologist or general surgeon to carry out endoscopies. As the ED received approximately 3,000 patients per year, ED physicians saw approximately nine patients per day. Gastroenterologists and general surgeons also regularly performed outpatient endoscopy in the clinic in 2013, as well as at night and on weekends when they were called to the ED by a physician managing a patient with GI bleeding. Unless the patients required treatment by other physicians (e.g.,

cardiologist or neurologist) for non-GI comorbidity, the patients with GI bleeding who underwent endoscopy by an EP were under the care of the EP, whereas the patients who underwent endoscopy by NEP were under the care of the NEP until discharge. Red cell transfusion was carried out at the treating physician's discretion. A red cell unit was approximately 240 mL.

Study subjects

Subjects of this study included patients with upper GI bleeding who were brought to the ED and underwent endoscopy. All were admitted to the hospital. Patients were excluded if they were aged under 18 or over 100 years, and if they were transferred from other hospitals, or had GI bleeding during the hospital stay due to non-GI causes. Data on patient demographics, time of arrival, anticoagulant and antiplatelet medication use, comorbidity, presence of shock, and endoscopic diagnosis were collected. Comorbidity was calculated by using the Rockall clinical risk score (Table 1).⁷ Shock was defined as systolic blood pressure <90 mmHg or a heart rate >100 b.p.m. on initial assessment in the ED. Data on endoscopic management including time to endoscopy, hemostatic procedures, and procedure time were also extracted. Transfusion requirements, rebleeding events, adverse events, length of hospital stay, and patient outcomes were also recorded. Transfusion volume was measured to the point where active bleeding ceased with endoscopic treatment.

Ethical considerations

The study was approved by the institutional review board of Kuki General Hospital. The institutional review board also waived the requirement for informed consent due to the retrospective nature of the study.

Statistics

Patient outcomes after treatment by an EP or NEP were compared with respect to patient demographics and endoscopic and clinical variables using the Mann–Whitney *U*-test or Fisher's exact test for continuous variables and the χ^2 -test for categorical variables. A two-sided *P*-value <0.05 was considered statistically significant.

RESULTS

DURING THE STUDY period, of 6,257 patients who presented to the ED, 201 had GI bleeding, 84 of whom underwent endoscopy. Some of these patients were admitted

Table 1. Rockall clinical risk scores of patients with upper gastrointestinal bleeding who underwent endoscopy in the emergency department

Score	0	1	2	3
Age, years	<60	60–79	≥80	–
Shock		Tachycardia	Hypotension	
HR, b.p.m.	≤100	>100	>100	–
SBP, mmHg	≥100	≥100	<100	–
Comorbidity	None	–	IHD, CHF, any major comorbidity	Renal failure, liver failure, metastatic malignancy

–, not applicable. CHF, congestive heart failure; HR, heart rate; IHD, ischemic heart disease; SBP, systolic blood pressure.

Table 2. Characteristics of patients with upper gastrointestinal bleeding treated by an emergency physician (EP) or by a non-emergency physician (NEP)

	EP, <i>n</i> = 33	NEP, <i>n</i> = 51	<i>P</i> -value
Sex, male; <i>n</i> (%)	24 (72.7)	35 (68.6)	0.88
Age, years; mean (SD)	66.5 (14.9)	69.7 (13.0)	0.09
No. of patients by arrival time			0.17
Day shift	13	10	
After hours	18	32	
Holiday shift	2	9	
Source of bleeding			0.92
Gastric ulcer, AGML	21	24	
Esophageal varix	1	8	
Gastric varix	0	1	
Duodenal ulcer	5	5	
Mallory–Weiss syndrome	4	4	
Reflux esophagitis	1	4	
Anastomotic ulcer	1	3	
Gastric cancer	1	2	
Duodenal cancer	0	1	
Gastric polyp	0	1	
Antithrombotic medication, <i>n</i> (%)	6 (18.2)	14 (27.5)	0.48
Shock, <i>n</i> (%)	22 (66.7)	32 (62.7)	0.89
Rockall clinical risk score, mean (SD)	2.8 (1.8)	3.2 (1.7)	0.38

AGML, acute gastric mucosal lesion; SD, standard deviation.

after undergoing endoscopy, while other patients were admitted first and then underwent endoscopy; 33 were treated by an EP and 51 were treated by an NEP. The patient characteristics are shown in Table 2. No significant difference was observed.

Hemostatic procedures did not differ between groups. Endoscopic variceal ligation was only performed by gastroenterologists. These results are shown in Table 3, and the outcomes are shown in Table 4. The rebleeding rate was similar in both groups and no emergency surgical treatment was required in either group. Transfusion requirements were significantly lower in the EP group (0.5 U versus 2.1 U, $P < 0.01$). Adverse events in the EP group included duodenal perforation and ischemic colitis; in the NEP group, liver dysfunction, cardiac failure, cardiac arrest, multiple organ failure, seizure, and lung edema were observed. Rates of adverse events were similar in both groups. The EP group required the assistance of a general surgeon for two bleeding cases: one was a gastric ulcer and the other was a duodenal ulcer that was found to be perforated after treatment by a general surgeon. In the NEP group, a gastroenterologist treated esophageal varices after preliminary endoscopic evaluation by a general surgeon, who requested assistance from the gastroenterologist. Length of hospital stay and in-hospital mortality rates were significantly lower in the EP group (8 versus 11 days, $P = 0.03$; 0% versus 13.7%, $P = 0.04$). Seven deaths were reported in the NEP group. The causes of death included initial lower limb ischemia followed by multiple organ failure in one patient, heart failure in one patient, respiratory failure due to unknown cause in one patient, aspiration pneumonia, liver failure, carcinoma, and hemorrhage from gastric varices with liver cirrhosis in the remaining patients. Death directly related to hemorrhage occurred in only one case in the NEP group.

DISCUSSION

THIS STUDY EVALUATED short-term outcomes of upper GI bleeding cases treated by EPs and NEPs in our hospital. The results showed no significant difference in rebleeding rates and adverse events. Blood transfusion requirements, length of hospital stay, and in-hospital mortality rates were favorable in the EP group.

Table 3. Details of endoscopy procedures for patients with gastrointestinal bleeding treated by an emergency physician (EP) or by a non-emergency physician (NEP) in the emergency department

	EP, <i>n</i> = 33	NEP, <i>n</i> = 51	<i>P</i> -value
Time to endoscopy, min; median (IQR)	75 (55, 116)	300 (110, 873)	0.008
No. of patients who underwent emergent endoscopy (%)	33 (100)	44 (86.3)	0.040
No. of patients who underwent therapeutic endoscopy (%)	14 (42.4)	33 (64.7)	0.040
Therapeutic technique			0.72
Hemoclip	12	22	
HSE	3	12	
EVL	0	7	
Ethanol	0	2	
Electrocautery	1	0	
SB tube	0	1	
Procedure time, min; median (IQR)	30 (20, 45)	25 (14, 45)	0.240
Blood transfusion, units; median (IQR)	0 (0, 0)	2 (0, 4)	0.006

EVL, endoscopic variceal ligation; HSE, hypertonic saline with epinephrine; IQR, interquartile range; SB, Sengstaken–Blakemore.

Table 4. Outcomes of endoscopy procedures for patients with gastrointestinal bleeding treated by an emergency physician (EP) or by a non-emergency physician (NEP) in the emergency department

	EP, <i>n</i> = 33	NEP, <i>n</i> = 51	<i>P</i> -value
Rebleeding, <i>n</i> (%)	4 (12.1)	7 (13.7)	0.91
Adverse event, <i>n</i> (%)	2 (6.1)	9 (17.6)	0.19
Time in hospital, days; median (IQR)	8 (3, 12)	11 (8.5, 15.5)	0.03
In-hospital mortality, <i>n</i> (%)	0 (0.0)	7 (13.7)	0.04

IQR, interquartile range.

The favorable outcomes in the EP group could be attributed to the shorter time to endoscopy and intervention for bleeding. Early endoscopy and endoscopic therapy reduced transfusion requirements and length of hospital stay in patients with bloody nasogastric tube aspirate in a randomized controlled trial,⁸ and a systematic review showed that early endoscopy is safe and effective.¹ One guideline based on these studies recommended early endoscopy (within the first 24 h) to improve outcomes for patients at high risk and to reduce resource utilization.² However, another study showed that endoscopy within 6 h of presentation is not more effective than endoscopy at 6–24 h after presentation in high-risk, acute non-variceal upper GI bleeding patients, even if they have hypotension and tachycardia.⁹ Tai *et al.*

compared the outcomes of patients who received endoscopy within 8 h with those of patients who received endoscopy at 8–24 h. Patients who received endoscopy within 8 h had more active lesions and more therapeutic attempts. However, no difference in outcomes was found between the two groups.¹⁰ Another study showed no difference in outcomes between rapid endoscopy within 6 h and routine endoscopy within 48 h.¹¹ The median time to endoscopy after arrival was 75 min in the EP group and 300 min in the NEP group. In the authors' experience, the NEP group tended to perform imaging studies before the procedure, whereas the EP group tended to perform endoscopy without imaging. This would delay the time to endoscopy; however, both groups performed endoscopy within 6 h and rapid endoscopies were carried out by both groups. These favorable results could not be attributed to rapid endoscopy. There might be other reasons, but we identified no other factors, because our study period was short and the numbers in the study groups were small. Moreover, heterogeneity between the EP group and NEP group was large. For example, the NEP group mainly performed the procedure at night, although no statistical difference was seen.

Villanueva *et al.*¹² compared restrictive and liberal transfusion strategies in patients with upper GI bleeding. The mean number of units transfused was 1.5 in the restrictive strategy group and 3.7 in the liberal strategy group. The volume of a unit ranged from 250 to 320 mL. The mean numbers of transfusions in our study were 0.5 and 2.1 U in the EP and NEP groups, respectively, both of which were less than in Villanueva *et al.*'s study.

Rebleeding rates in our study were 12.1% in the EP group and 13.7% in the NEP group. Schacher *et al.* reported a rebleeding rate of approximately 15% and Hong *et al.* reported a rebleeding rate of 17.8%.^{13,14} These results suggest that the endoscopic hemostatic skills in our hospital are acceptable.

Our study showed no significant differences in adverse event rates. One adverse event was a case of duodenal perforation. An EP performed endoscopy and found a duodenal ulcer, but believed it would be difficult to stop the bleeding. He consulted a general surgeon. One day later after the bleeding was stopped, the patient was found to have a duodenal perforation. We did not know whether the EP or general surgeon caused this adverse event.

Only one death directly due to hemorrhage (from gastric varices) occurred among the seven deaths in the NEP group; the others died of comorbidities. The difference could be attributed to higher Rockall clinical scores in patients managed by the NEP group. There was no significant difference in in-hospital mortality if deaths due to gastric varices were excluded. In the EP group, there was only one case of bleeding due to esophageal varices, whereas there were nine cases of bleeding due to esophageal and gastric varices in the NEP group. An EP might be psychologically resistant to calling an NEP when an ambulance crew asks the ED to accept a patient with presumed varices, and the EP might divert the patient to another hospital. Post hoc analysis with exclusion of cases with esophageal and gastric varices revealed no significant differences in rebleeding, adverse events, or in-hospital mortality, although there were still significant differences in the number of blood transfusions (0.5 U versus 2.0 U, $P = 0.002$) and total hospital days (7.5 versus 11 days, $P = 0.02$). Differences in the number of cases with bleeding due to esophageal varices may have had an effect on favorable outcomes in the EP group.

The extent of training in endoscopy an EP should receive and the number of patients an EP should treat to acquire endoscopic skills for treating GI bleeding need to be determined. The World Gastroenterology Organisation proposes a minimum number of endoscopic procedures that must be carried out during a fellowship:¹⁵ 100 esophagogastroduodenoscopies and 20 cases with non-variceal bleeding, including 10 with active non-variceal bleeding. The American Society for Gastrointestinal Endoscopy requires a minimum number of procedures to certify competency: 130 diagnostic esophagogastroduodenoscopies and 25 for non-variceal hemostasis, including 10 with active bleeding in the upper or lower GI tract.¹⁶ These are only some of the procedures required to gain expertise or receive GI endoscopic privileges. However, there is no global standard for endoscopy training. Many countries

have no detailed training guidelines and some only specify the duration of training. No conclusion has been reached concerning training duration or the number of cases non-endoscopy specialists should have to be able to treat GI bleeding. Although training case numbers for upper GI endoscopies were not recorded before this study, the requirements by certifying organizations may serve as a reference for use by an EP before attempting endoscopic treatment of GI bleeding.

This study has several limitations. The case numbers were small and the study period was short. Moreover, this was a retrospective single-center study. A longer study period might have yielded different results. Long-term outcomes in patients treated by the EP group were unclear. Moreover, because this was a retrospective single-center study, the results cannot be generalized. Therefore physicians should apply these findings to their own institution after careful evaluation of both this study and their own situation. However, this study suggests that an EP with endoscopy training could treat GI bleeding in collaboration with endoscopic specialists.

CONCLUSION

EMERGENCY PHYSICIANS WITH GI endoscopy training treated GI bleeding as well as endoscopic specialists did, with regard to short-term outcomes. However, adequate training for endoscopy by EPs remains unclear.

ACKNOWLEDGEMENTS

AUTHOR Y. K. received research funding from Chiba University for English proof reading.

DISCLOSURE

Approval of the research protocol: The study was approved by the institutional review board of Kuki General Hospital.

Informed consent: The institutional review board waived the requirement for informed consent due to the retrospective nature of the study.

Registry and registration no. of the study/trial: UMIN000027450.

Conflict of interest: None declared.

REFERENCES

- 1 Spiegel BM, Vakil NB, Ofman JJ. Endoscopy for acute nonvariceal upper gastrointestinal tract hemorrhage: is sooner better? A systematic review *Arch. Intern. Med.* 2001; 161: 1393–404.

- 2 Barkun A, Bardou M, Nonvariceal MJ, Upper GI; Bleeding Consensus Conference Group. Consensus recommendations for managing patients with nonvariceal upper gastrointestinal bleeding. *Ann. Intern. Med.* 2003; 139: 843–57.
- 3 Ikegami N, Yoo BK, Hashimoto H *et al.* Japanese universal health coverage: evolution, achievements, and challenges. *Lancet* 2011; 378: 1106–15.
- 4 Japan man dies after hospitals reject him 36 times. *Inquirer News*. March 05, 2013. [cited 13 Mar 2017]. Available from <http://newsinfo.inquirer.net/368843/japan-man-dies-after-hospitals-reject-him-36-times>.
- 5 Suzuki T, Nishida M, Suzuki Y, Kobayashi K. The imminent healthcare and emergency care crisis in Japan. *West. J. Emerg. Med.* 2008; 9: 91–6.
- 6 Jaka H, Koy M, Liwa A *et al.* A Fiberoptic endoscopic study of upper gastrointestinal bleeding at Bugando Medical Centre in northwestern Tanzania: a retrospective review of 240 cases. *BMC Res. Notes* 2012; 5: 200.
- 7 Rockall TA, Logan RF, Devlin HB, Northfield TC. Risk assessment after acute upper gastrointestinal haemorrhage. *Gut* 1996; 38: 316–21.
- 8 Lin HJ, Wang K, Perng CL *et al.* Early or delayed endoscopy for patients with peptic ulcer bleeding. A prospective randomized study. *J. Clin. Gastroenterol.* 1996; 22: 267–71.
- 9 Targownik LE, Murthy S, Keyvani L, Leeson S. The role of rapid endoscopy for high-risk patients with acute nonvariceal upper gastrointestinal bleeding. *Can. J. Gastroenterol.* 2007; 21: 425–9.
- 10 Tai CM, Huang SP, Wang HP *et al.* High-risk ED patients with nonvariceal upper gastrointestinal hemorrhage undergoing emergency or urgent endoscopy: a retrospective analysis. *Am. J. Emerg. Med.* 2007; 25: 273–8.
- 11 Bjorkman DJ, Zaman A, Fennerty MB, Lieberman D, Disario JA, Guest-Warnick G. Urgent vs. elective endoscopy for acute non-variceal upper-GI bleeding: an effectiveness study. *Gastrointest. Endosc.* 2004; 60: 1–8.
- 12 Villanueva C, Colomo A, Bosch A *et al.* Transfusion strategies for acute upper gastrointestinal bleeding. *N. Engl. J. Med.* 2013; 368: 11–21.
- 13 Schacher GM, Lesbros-Pantoflickova D, Ortner MA, Wasserfallen JB, Blum AL, Dorta G. Is early endoscopy in the emergency room beneficial in patients with bleeding peptic ulcer? A “fortuitously controlled” study. *Endoscopy* 2005; 37: 324–8.
- 14 Hong MJ, Lee SY, Kim JH *et al.* Rebleeding after initial endoscopic hemostasis in peptic ulcer disease. *J. Korean Med. Sci.* 2014; 29: 1411–5.
- 15 Telleman H, Burger TF, Mulder CJ. Evolution of gastroenterology training. *World J. Gastroenterol.* 2009; 15: 1793–8.
- 16 Eisen GM, Baron TH, Dominitz JA *et al.* Methods of granting hospital privileges to perform gastrointestinal endoscopy. *Gastrointest. Endosc.* 2002; 55: 780–3.