Erythromycin Infusion or Gastric Lavage for Upper Gastrointestinal Bleeding: A Multicenter Randomized Controlled Trial

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Study objective: The quality of endoscopy depends on the quality of upper gastrointestinal tract preparation. We determine whether in acute upper gastrointestinal bleeding the frequency of satisfactory stomach visualization was different after intravenous erythromycin, a nasogastric tube with gastric lavage, or both.

Methods: We performed a prospective, randomized, multicenter (6 emergency departments) study in patients with acute upper gastrointestinal bleeding presenting with hematemesis or melena. The patients were randomized into 3 groups: (1) intravenous erythromycin infusion without nasogastric tube placement (erythromycin group), (2) nasogastric tube placement without erythromycin (nasogastric group), and (3) intravenous erythromycin infusion combined with nasogastric tube placement (nasogastric-erythromycin group).

Results: Two hundred fifty-three patients (181 men, mean age 61 years [SD 15 years], 84 with cirrhosis) were randomized: 84 (erythromycin group), 85 (nasogastric group), and 84 (nasogastric-erythromycin group). Overall, there was 85% satisfactory stomach visualization; between-group differences were not significant: 4% (95% confidence interval [CI] –15% to 6%) for the erythromycin group and nasogastric-erythromycin group, 2% (95% CI −14% to 9%) for the erythromycin group and nasogastric group, and 6.5% (95% CI −17% to 4%) for the nasogastric group and nasogastric-erythromycin group. The duration of the endoscopic procedure, rebleeding frequency, the need for a second endoscopy, the number of transfused blood units, and mortality at days 2, 7, and 30 did not differ significantly between groups.

Conclusion: In acute upper gastrointestinal bleeding, administration of intravenous erythromycin provides satisfactory endoscopic conditions, without the need for a nasogastric tube and gastric lavage. [Ann Emerg Med. 2011;xx:xxx.]

Please see page XX for the Editor’s Capsule Summary of this article.

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INTRODUCTION

Background

Improvements in endoscopic diagnosis and hemostasis have radically changed the management of acute upper gastrointestinal bleeding, a common medical emergency with a high incidence of morbidity and mortality. Endoscopy is used to determine the cause of bleeding and for hemostasis and should be performed within 12 hours of the first clinical signs of bleeding. The reliability of the procedure depends on the good visualization of the gastrointestinal tract. A nasogastric tube is placed to establish that bleeding is from the upper tract.
gastric lavage, or both.

different after intravenous erythromycin, a nasogastric tube with
bleeding the frequency of satisfactory stomach visualization was
was more effective than placebo in cleaning the
gastrointestinal tract, to monitor bleeding on repeated gastric
lavage, and to clear the gastrointestinal tract.4-7 However,
nasogastric tube placement is highly unpleasant, rather painful,
and time consuming.8 Complications such as aspiration
pneumonia, misplacement, or digestive perforation may occur,
although they are reported to be rare.9 Furthermore, guidelines
for nasogastric tube placement are based on a low level of
scientific evidence.10

Erythromycin is a motilin receptor agonist that accelerates
gastric emptying by inducing antral contractions.11
Randomized controlled studies showed that erythromycin
was more effective than placebo in cleaning the
gastrointestinal tract before endoscopy and that
erythromycin associated with gastric lavage was more
effective than gastric lavage alone.12-14 However, there are no
head-to-head comparisons of erythromycin versus gastric
lavage or versus combination treatment in the management
of acute upper gastrointestinal bleeding.

Goals of This Investigation
We determined whether in acute upper gastrointestinal
bleeding the frequency of satisfactory stomach visualization was
different after intravenous erythromycin, a nasogastric tube with
gastric lavage, or both.

Editor’s Capsule Summary

What is already known on this topic
Erythromycin has promotility properties and has been used in the setting of acute upper gastrointestinal bleeding to improve conditions for
endoscopy. Nasogastric tube placement with lavage is commonly used for the same indication.

What question this study addressed
In the setting of acute upper gastrointestinal bleeding, which intervention most frequently provides satisfactory endoscopy conditions: intravenous erythromycin, nasogastric tube with
lavage, or both?

What this study adds to our knowledge
In this 253-patient trial, the frequency of satisfactory endoscopy conditions was similar among groups.

How this is relevant to clinical practice
In acute upper gastrointestinal bleeding, administration of intravenous erythromycin provides satisfactory endoscopy conditions, potentially obviating the need for a nasogastric tube.

MATERIALS AND METHODS

Study Design
This was a prospective, randomized, multicenter, clinical trial for patients with acute upper gastrointestinal bleeding and presenting with hematemesis or melena. The emergency
departments (EDs) of 6 hospitals participated in the study.
Patients were randomized in 3 parallel groups. The study was
approved by the regional ethics committee and registered with the
Clinical Trials registry. Patients gave written informed consent for
nasogastric tube placement or erythromycin infusion before
endoscopy. Our study complied with the CONSORT reporting
guidelines for randomized controlled trials.

Setting and Selection of Participants
All patients older than 18 years and who were referred to the
6 EDs for acute upper gastrointestinal bleeding between
October 2005 and December 2007 were eligible for inclusion.
Acute upper gastrointestinal bleeding was defined as
presentation with hematemesis or melena either at or during the
12 hours before admission to the ED. A clinical examination
and standard laboratory tests were performed on patient arrival.
Routinely performed ECG eliminated patients with a
contraindication to erythromycin (QTc interval >0.45
seconds). Other criteria of noninclusion were (1) Glasgow
Coma Scale score less than 15; (2) shock, defined as a persistent
decrease in systolic arterial pressure (<90 mm Hg) and a pulse
rate above 110 beats/min, unresponsive to fluid replacement;
(3) known allergy to erythromycin; (4) treatment with drugs
that might interact with erythromycin (eg, carbamazepine,
theophylline, ergot alkaloids); (5) pregnancy; and (6) previous
gastrectomy.

Interventions
As soon as the inclusion criteria had been checked in the ED,
an interactive voice response system at the data management
center randomized patients into one of 3 groups: (1)
erthyromycin group: patients received an intravenous infusion
of erythromycin (250 mg during 20 minutes) and underwent
endoscopy 30 minutes after the end of the infusion; (2)
nasogastric group, control group: after nasogastric tube
placement (16 to 20 French), gastric lavage was carried out with
500 mL of water at room temperature and repeated every hour
until the aspirated gastric fluid was clear, and endoscopy was
performed 15 minutes after the last irrigation; and (3) nasogastric-
erthyromycin group: nasogastric tube placement and gastric lavage
were performed as in the nasogastric group, followed by
erthyromycin infusion as in the erythromycin group.

All patients underwent upper gastrointestinal endoscopy
when hemodynamically stable (pulse rate <100 beats/min,
systolic arterial pressure >100 mm Hg). Endoscopists were
unaware of treatment assignation because it was not mentioned
either verbally or in written reports (patient’s medical record)
and because the emergency physicians removed the nasogastric
tube and erythromycin infusion before patient arrival in the
endoscopy room. In the event of active bleeding from a peptic
ulcer during the endoscopic procedure, the endoscopist could choose the method of hemostasis (injection therapy, mechanical treatment, or thermal treatment). The patient received intravenous omeprazole for 72 hours and then oral antibiotics to eradicate *Helicobacter pylori*. In the event of variceal bleeding, endoscopic sclerotherapy or ligature was performed. Patients with a diagnosis of cirrhosis (known cirrhosis or 2 of the following signs: jaundice, hepatomegaly, spider angiomas, cutaneous collateral portocaval circulation, palmar erythrosis) received somatostatin, octreotide, or terlipressin as soon as possible for 48 hours to 5 days and norfloxacin (400 mg orally twice a day) for 7 days.\(^\text{15}\)

A note was made of the hospital admission department (ICU, ED, medical department) or of whether the patient returned home. The results for standard laboratory tests (WBC count, platelets, hemostasis, ionogram, and blood urea nitrogen), the number of transfused blood units, and any rebleeding were recorded on days 2, 7, and 30. Discharged patients who failed to come to their follow-up visit were contacted by telephone.

**Methods of Measurement**

The primary endpoint was the quality of gastrointestinal tract visualization, as given by the scoring system by Frossard et al.
Table 1. Baseline clinical and biological characteristics in each group.*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>ER (N=84)</th>
<th>NG (N=85)</th>
<th>NGER (N=84)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age, y</td>
<td>61 (14)</td>
<td>61 (15)</td>
<td>60 (17)</td>
</tr>
<tr>
<td>Men/women</td>
<td>58/26</td>
<td>62/23</td>
<td>61/23</td>
</tr>
<tr>
<td>Mean pulse rate, beats/min</td>
<td>97 (20)</td>
<td>95 (19)</td>
<td>100 (20)</td>
</tr>
<tr>
<td>Mean systolic arterial BP, mm Hg</td>
<td>124 (21)</td>
<td>128 (24)</td>
<td>124 (23)</td>
</tr>
<tr>
<td>Mean diastolic arterial BP, mm Hg</td>
<td>69 (15)</td>
<td>70 (15)</td>
<td>68 (15)</td>
</tr>
<tr>
<td>Cirrhosis, No. (%)</td>
<td>28 (33)</td>
<td>29 (34)</td>
<td>27 (33)</td>
</tr>
<tr>
<td>Known peptic ulcer, No. (%)</td>
<td>16 (19)</td>
<td>11 (13)</td>
<td>13 (16)</td>
</tr>
<tr>
<td>Previous gastrointestinal bleeding, No. (%)</td>
<td>29 (35)</td>
<td>26 (31)</td>
<td>27 (33)</td>
</tr>
<tr>
<td>NSAI D during last 15 days, No. (%)</td>
<td>32 (38)</td>
<td>26 (31)</td>
<td>22 (27)</td>
</tr>
<tr>
<td>Mean hemoglobin, g/100 mL</td>
<td>8.9 (2.8)</td>
<td>8.5 (3.0)</td>
<td>8.4 (3.2)</td>
</tr>
<tr>
<td>Mean leucocytes, No./mm³</td>
<td>10.2 (5.8)</td>
<td>11.6 (12.5)</td>
<td>11.3 (7.3)</td>
</tr>
<tr>
<td>Mean platelets, No.×10³/mm³</td>
<td>198 (128)</td>
<td>217 (126)</td>
<td>229 (141)</td>
</tr>
<tr>
<td>Mean prothrombin time, %</td>
<td>65 (20)</td>
<td>61 (24)</td>
<td>63 (24)</td>
</tr>
<tr>
<td>Mean urea, mmol/L</td>
<td>12 (8)</td>
<td>15 (23)</td>
<td>12 (9)</td>
</tr>
<tr>
<td>Mean AST, IU/L</td>
<td>71 (82)</td>
<td>54 (63)</td>
<td>97 (174)</td>
</tr>
<tr>
<td>Mean ALT, IU/L</td>
<td>46 (58)</td>
<td>35 (31)</td>
<td>57 (85)</td>
</tr>
</tbody>
</table>

BP, Blood pressure; NSAID, nonsteroidal anti-inflammatory drug; AST, aspartate aminotransferase; ALT, alanine aminotransferase.

*All means are given with SD.

The endoscopist scored each of 4 areas of the stomach and duodenum (fundus, corpus, antrum, and bulbus) from 0 to 2 (0: less than 25% of the surface visible; 1: 25% to 75% visible; 2: more than 75% visible). The total score was the sum of the 4 individual scores and ranged from 0 to 8. A total score of 6 or more indicated a satisfactory stomach visualization and a score below 6 an unsatisfactory visualization.

Secondary endpoints were patient outcomes until day 30, duration of the endoscopic procedure, number of endoscopic hemostasis procedures, ability to identify the source of bleeding, adverse effects related to erythromycin infusion or nasogastric tube placement, number of transfused blood units, rebleeding, and death. Pain after nasogastric tube placement was assessed by a visual analog scale (0: no pain; 100: maximum pain).

Primary Data Analysis

Our study was a superiority trial designed to demonstrate a difference between the 3 groups. The sample size needed to detect a 15% absolute difference in the proportion of satisfactory stomach visualization between 2 groups with 80% power (if the proportion in one group was 80) was 270 (90 patients per group) when Tukey’s adjustment of α for multiplicity (2-sided α risk of 5%) was used. Two-by-two comparisons of satisfactory stomach visualization frequencies between groups were made with the Mantel-Haenszel test, after stratification by center. The Breslow-Day method was used to test for odds-ratio heterogeneity among centers. Normally distributed variables were compared by a t test and non-normally distributed quantitative variables by the Mann-Whitney test. All tests were 2-sided at a significance level adjusted for multiplicity by Tukey’s method. The analysis was intention to treat. Missing data were considered to be primary endpoint failures. All P values were 2-tailed, and P<.05 was considered significant.

A post hoc analysis of the most severe cases was planned (ICU admissions, transfused patients, and patients with cirrhosis who are known to have a poor prognosis). Any benefit of erythromycin administration, either alone or combined with gastric lavage, might differ in these patients.

RESULTS

Characteristics of Study Patients

A total of 270 patients were included and assessed for eligibility between October 2005 and December 2007. They were followed up until January 2008. Of these patients, 253 presented at the ED with hematemesis or melena and met the inclusion criteria. Eighty-four patients (33%) were diagnosed with cirrhosis. Patients were randomized as follows: 84 (erythromycin), 85 (nasogastric), and 84 (nasogastric-erythromycin) (Figure). Ten patients did not undergo endoscopy because of early death (n=2), esophageal stenosis (n=1), and lack of cooperation (n=7). The main clinical and biological characteristics at patient admission and the interval between the onset of bleeding and endoscopy did not differ significantly between groups (Tables 1 and 2).

Main Results

The mean endoscopic score did not differ significantly between groups (Table 2). There was a satisfactory stomach visualization in 85% of all patients, with no significant difference between groups (84%, 82%, and 88% for erythromycin, nasogastric, and nasogastric-erythromycin, respectively). The differences between groups were as follows: −4.3% (95% confidence interval [CI] −14.9% to 6.3%) for erythromycin and nasogastric-erythromycin, 2.2% (95% CI −13.7% to 9.2%) for erythromycin and nasogastric, and −6.5% (95% CI −17.4% to 4.4%) for nasogastric and nasogastric-erythromycin. When patients with a missing score were considered as having failed treatment (n=2 for both erythromycin and nasogastric, n=6 for nasogastric-erythromycin), the percentages were similar (82%, 80%, and 82%, respectively) and the differences were 0% (95% CI −11.6% to 11.6%) for erythromycin and nasogastric-erythromycin, 2.1% (95% CI −9.7% to 14%) for erythromycin and nasogastric, and −2.1% (95% CI −14% to 9.7%) for nasogastric and nasogastric-erythromycin groups. In no case was the Breslow-Day test for heterogeneity significant.

The percentage of patients with a satisfactory stomach visualization did not differ between groups in patients with cirrhosis or admitted to an ICU (Table 3). However, the percentage of transfused patients with a satisfactory stomach visualization was significantly higher in the nasogastric-
score exceeded 60, indicative of severe pain, in 28% of the sample. The patients did not tolerate gastric tube placement. The mean visual analog score for pain after tube placement was 42 (SD 32). The mean duration of the endoscopic procedure, need for transfusion, and admission to an ICU were similar between the nasogastric-erythromycin and erythromycin groups (Table 3). On the other hand, there was no significant difference between the nasogastric and erythromycin groups (P=0.53; Breslow-Day test, P=0.98) or between the nasogastric-erythromycin and erythromycin groups (P=0.11; Breslow-Day test, P=0.07).

Of the 253 patients, 232 were followed up until day 30. The mean duration of the endoscopic procedure, need for hemostasis, ability to identify the source of the bleeding, and need for a second endoscopy did not differ significantly between groups (Table 2). There were no complications associated with endoscopy or nasogastric tube placement in any group. However, 6 patients (2 nasogastric, 4 nasogastric-erythromycin) did not tolerate gastric tube placement. The mean visual analog scale score for pain after tube placement was 42 (SD 32). The score exceeded 60, indicative of severe pain, in 28% of patients in the nasogastric group and 24% in the nasogastric-erythromycin group (P=0.59).

The mean number of blood units transfused, rebleeding, and mortality during follow-up did not differ significantly between groups (Table 4). Rebleeding occurred in 22 patients (9%) within 24 hours of endoscopy, in 27 further patients (10%) within 1 week, and in 7 further patients (3%) within 1 month (Table 4). A similar proportion of patients in the 3 groups underwent second-look endoscopy for rebleeding or poor gastric visualization (Table 2). Overall mortality rate was 7% (9 erythromycin, 7 nasogastric, and 3 nasogastric-erythromycin) (Table 4). Most patients were admitted to an ICU.

**LIMITATIONS**
Our study was designed to detect a difference in the occurrence of satisfactory stomach visualization between groups. However, the observed absence of a significant difference does not imply equivalence of patient preparation methods. There was a 2.2% difference (95% CI -2.2% to 1.7%) in the proportion of satisfactory stomach visualization gastrointestinal tracts in favor of the erythromycin infusion alone group versus the nasogastric tube placement group. The lower limit of this CI indicates that any potential difference between the 2 groups is unlikely to exceed 9%. This clinically acceptable difference is much smaller than the 15% difference we used to calculate sample size.

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**Table 2. Endoscopic features and treatment in each group.**

<table>
<thead>
<tr>
<th>Endoscopic Features and Treatment</th>
<th>No. (%) or Median (IQR)</th>
<th>Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Endoscopic score</td>
<td>ER (N=84)</td>
<td>NG (N=85)</td>
</tr>
<tr>
<td>interval between onset of bleeding and endoscopy, h</td>
<td>5.3 (3, 12.5)</td>
<td>6.4 (2.8, 13.3)</td>
</tr>
<tr>
<td>Endoscopic findings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Esophageal varices</td>
<td>25 (30)</td>
<td>30 (36)</td>
</tr>
<tr>
<td>Ulcer</td>
<td>36 (22)</td>
<td>24 (14)</td>
</tr>
<tr>
<td>Gastritis</td>
<td>8 (10)</td>
<td>20 (24)</td>
</tr>
<tr>
<td>Mallory-Weiss syndrome</td>
<td>11 (13)</td>
<td>9 (11)</td>
</tr>
<tr>
<td>Other</td>
<td>69 (84)</td>
<td>68 (82)</td>
</tr>
<tr>
<td>Empty stomach</td>
<td>31 (38)</td>
<td>28 (34)</td>
</tr>
<tr>
<td>Hemostatic treatment</td>
<td>64 (78)</td>
<td>65 (78)</td>
</tr>
<tr>
<td>Duration of endoscopy (min)</td>
<td>10 (7.16)</td>
<td>12 (7.15)</td>
</tr>
<tr>
<td>Need for a second endoscopy</td>
<td>14 (20)</td>
<td>20 (26)</td>
</tr>
</tbody>
</table>

IQR, Interquartile range.

*There were no significant differences between groups for any variable.

**Table 3. Patients with a clean gastrointestinal tract in subgroup analyses.**

<table>
<thead>
<tr>
<th>Patients</th>
<th>ER (N=84)</th>
<th>NG (N=85)</th>
<th>NGER (N=84)</th>
<th>ER vs NG</th>
<th>ER vs NGER</th>
<th>NG vs NGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>With cirrhosis</td>
<td>23 (85.2)</td>
<td>20 (71.4)</td>
<td>22 (95.7)</td>
<td>13.8 (-7.7 to 35.2)</td>
<td>-10.5 (-26.3 to 5.3)</td>
<td>-2.4 (-42.9 to -5.5)</td>
</tr>
<tr>
<td>Transfused</td>
<td>47 (82.5)</td>
<td>46 (76.7)*</td>
<td>52 (92.9)*</td>
<td>5.8 (-8.8 to 20.4)</td>
<td>-10.4 (-22.4 to 1.6)</td>
<td>-16.2 (-28.8 to -3.5)</td>
</tr>
<tr>
<td>Admitted to ICU</td>
<td>38 (84.4)</td>
<td>39 (78)</td>
<td>39 (88.6)</td>
<td>6.4 (-9.2 to 22.1)</td>
<td>-4.2 (-18.3 to 10.0)</td>
<td>-10.6 (-25.5 to 4.2)</td>
</tr>
</tbody>
</table>

*The percentage of transfused patients with a clean gastrointestinal tract was significantly higher in the NGER group than the NG group (93% versus 77%, P=.021; Breslow-Day test, P=.021).

erythromycin than nasogastric group (Table 3). On the other hand, there was no significant difference between the nasogastric and erythromycin groups (P=.53; Breslow-Day test, P=.98) or between the nasogastric-erythromycin and erythromycin groups (P=.11; Breslow-Day test, P=.07).

Of the 253 patients, 232 were followed up until day 30. The mean duration of the endoscopic procedure, need for hemostasis, ability to identify the source of the bleeding, and need for a second endoscopy did not differ significantly between groups (Table 2). There were no complications associated with endoscopy or nasogastric tube placement in any group. However, 6 patients (2 nasogastric, 4 nasogastric-erythromycin) did not tolerate gastric tube placement. The mean visual analog scale score for pain after tube placement was 42 (SD 32). The score exceeded 60, indicative of severe pain, in 28% of patients in the nasogastric group and 24% in the nasogastric-erythromycin group (P=.59).

The mean number of blood units transfused, rebleeding, and mortality during follow-up did not differ significantly between groups (Table 4). Rebleeding occurred in 22 patients (9%) within 24 hours of endoscopy, in 27 further patients (10%) within 1 week, and in 7 further patients (3%) within 1 month (Table 4). A similar proportion of patients in the 3 groups underwent second-look endoscopy for rebleeding or poor gastric visualization (Table 2). Overall mortality rate was 7% (9 erythromycin, 7 nasogastric, and 3 nasogastric-erythromycin) (Table 4). Most patients were admitted to an ICU.
DISCUSSION

Our study has shown that gastrointestinal visualization by endoscopy in patients with acute upper gastrointestinal bleeding is not influenced by the method of patient preparation (nasogastric tube placement, erythromycin infusion, or their combination). A satisfactory stomach visualization was achieved in approximately 85% of patients, regardless of preparation method, and outcomes in the month after endoscopy did not differ significantly. Nasogastric tube placement provided no additional clinical benefit over intravenous erythromycin infusion in the management of patients with acute gastrointestinal bleeding.

A high occurrence of good gastrointestinal tract preparation by erythromycin infusion before endoscopy has already been observed in patients with acute upper gastrointestinal bleeding. The seminal randomized study by Frossard et al. revealed that, compared with placebo, erythromycin markedly increased the proportion of satisfactory stomach visualization (82% versus 33%). Combining erythromycin infusion with gastric lavage also led to an increase and improved the quality of endoscopy over gastric lavage alone. Our study did not detect any significant difference in satisfactory stomach visualization frequency with erythromycin either alone or combined with gastric lavage, but our values were higher than those reported so far for all 3 preparation methods, and in particular for gastric lavage alone (82% in our study versus 44% in the study by Carbonell et al). The characteristics of our patient population with acute upper gastrointestinal bleeding might have accounted for this discrepancy. We included all patients presenting with hematemesis or melena even if their clinical condition was good, thus covering all patient types. Only 55% of our patients were admitted to an ICU, whereas in previous reports, all patients were admitted to an ICU or to a specialized unit.

In addition, we confirmed the benefit of combining erythromycin with lavage in the most severe cases. Transfused patients undergoing combined treatment rather than lavage alone had a higher proportion of satisfactory stomach visualization. A similar benefit of adding erythromycin has already been observed in patients with cirrhosis. The use of erythromycin before endoscopy has been reported to be cost-effective.

However, because we did not evaluate management of acute gastrointestinal bleeding without nasogastric tube placement or erythromycin, we cannot assert definitively that any intervention is required before endoscopy. The use of promotility agents in nonvariceal bleeding before endoscopy was not endorsed in the 2010 international consensus guidelines.

Rebleeding and mortality rates were similar in all 3 groups and were not influenced by nasogastric tube placement. Our overall 7% mortality rate was in line with that cited in epidemiology studies. We encountered no adverse effects in any group, although severe but rare complications have been described with nasogastric tube placement. Nasogastric tube placement was associated with significant pain, as already reported. A quarter of our patients experienced severe pain. The safety profile of erythromycin is excellent. It was easy to use, without severe adverse effects, and painless.

Although nasogastric aspiration has been described in several studies as useful, an observational study has shown that aspiration immediately before endoscopy has low sensitivity and low specificity in predicting active bleeding at endoscopy. In our study, nasogastric tube placement and gastric lavage did not influence outcomes even in the most severely ill patients. One can therefore conclude that erythromycin infusion might be a good substitute for gastric lavage, avoiding nasogastric tube placement before endoscopy, in ED patients with acute upper gastrointestinal bleeding.

### Table 4. Outcomes.

<table>
<thead>
<tr>
<th>Number of blood units transfused</th>
<th>No. (%) or Median (IQR)</th>
<th>Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ER (N=84)</strong></td>
<td><strong>NG (N=87)</strong></td>
<td><strong>NGER (N=84)</strong></td>
</tr>
<tr>
<td>First 24 h</td>
<td>2 (0, 3)</td>
<td>2 (0, 3)</td>
</tr>
<tr>
<td>First week</td>
<td>2 (0, 4)</td>
<td>2 (0, 4)</td>
</tr>
<tr>
<td>First month</td>
<td>2 (0, 4)</td>
<td>2 (0, 4)</td>
</tr>
<tr>
<td><strong>Rebleeding</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First 24 h</td>
<td>6 (7)</td>
<td>8 (10)</td>
</tr>
<tr>
<td>First week</td>
<td>13 (16)</td>
<td>17 (20)</td>
</tr>
<tr>
<td>First month</td>
<td>19 (23)</td>
<td>18 (21)</td>
</tr>
<tr>
<td><strong>Deaths</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First 24 h</td>
<td>3 (4)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>First week</td>
<td>7 (9)</td>
<td>5 (6)</td>
</tr>
<tr>
<td>First month</td>
<td>9 (12)</td>
<td>9 (12)</td>
</tr>
<tr>
<td><strong>Orientation from the ED</strong></td>
<td></td>
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<tr>
<td>ICU</td>
<td>46 (55)</td>
<td>52 (61)</td>
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<td>ED</td>
<td>22 (26)</td>
<td>23 (27)</td>
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<td>Medical department</td>
<td>14 (17)</td>
<td>10 (12)</td>
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<tr>
<td>Return home</td>
<td>2 (2)</td>
<td>0</td>
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</table>
gastrointestinal bleeding presenting with hematemesis or melena.

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