Post-endoscopy checklist reduces length of stay for non-variceal upper gastrointestinal bleeding

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Abstract

Objective. To examine the effect of improved gastroenterologist-to-admitting service communication on hospital stay for upper gastrointestinal bleeding. Hypothesis: a detailed checklist addressing factors relevant to discharge planning would shorten hospital stay, when added to the procedure report.

Design. Pre–post intervention design, recording balance measures (potential confounders).

Setting. A Canadian university hospital.

Study participants. Intermittent 5- to 7-day batches of consecutive emergency patients presenting with non-variceal upper gastrointestinal bleeding as their primary problem. The durations of the background and intervention periods were 3 months (beginning 9 June 2003) and 4 weeks (beginning 8 September 2003), respectively.

Intervention. The gastrointestinal bleeding Quality Improvement and Health Information multidisciplinary team (quality improvement personnel; emergency physicians, hospitalists, gastroenterologists, in-patient and endoscopy nurses) developed a one-page checklist, outlining detailed recommendations (3-Ds—diet, drugs, discharge plan) to append to the procedure report.

Main outcome measures. Difference in median length of hospital stay was the primary endpoint. As balance measures, demographics, bleeding severity, comorbidities, readmission rates, and various benchmark times were recorded prospectively.

Results. Thirty-nine patients met the criteria in the background period (4 months, intermittently sampled), and 22 in the intervention period (4 weeks, continuously sampled). There were no significant baseline differences. Median in-patient stay was 7.0 (95% interquartile range 2–24) versus 3.5 (95% interquartile range 1–12) days for the background and intervention periods, respectively ($P = 0.003$). This remained significant when outliers (stay > 10 days) were removed ($P = 0.02$).

Conclusion. A checklist, with very specific recommendations to the admitting service, significantly reduced hospital stay for non-variceal gastrointestinal bleeding.

Keywords: Quality assurance/improvement, length of stay, economics, upper gastrointestinal bleeding, patient care maps

Non-variceal upper gastrointestinal bleeding is a large problem in North America, accounting for over $2 billion US health care dollars annually and over 300 000 hospital admissions [1]. There is increasing awareness of the importance of efficient management of these patients, whether it be to curb intravenous (i.v.) proton pump inhibitor (potent acid antisecretory) costs [2], or discharge low-risk patients early [3,4].

In our center and in many other centers, gastroenterologists provide consultation and endoscopy for most patients with upper gastrointestinal bleeding, but do not usually provide day-to-day primary care of uncomplicated in-patients. Daily in-patient care is provided, depending on the severity of the bleed, by general medicine or the hospitalist service (family physicians), and rarely surgeons. In some cases, patients with upper gastrointestinal bleeding undergo endoscopy while still registered to the emergency department, before admission, and therefore the attending referring physician after the endoscopy in this case remains the emergency physician.

Anecdotally, via feedback from referring services and via crude diagnosis-specific length-of-stay estimates, there...
appeared to be problems at our institution with the communication of specific detailed recommendations (dose, route, and duration of proton pump inhibitors, expected length of stay or monitoring period, ability to feed and type of diet, treatment of Helicobacter pylori gastric infection, and non-steroidal anti-inflammatory drugs). Although recommendations were often made in the consultation note and endoscopy report, referring physicians felt that these were often not detailed enough, which may or may not be contributing to errors or overcautious care (e.g. extended in-patient monitoring periods) to compensate for uncertainty. In addition, notes and recommendations were sometimes not reviewed until rounds the next morning, thereby delaying some recommendations from being carried out. Gastroenterologists are asked routinely to reassess patients with a clinical suspicion of recurrent bleeding, but when no signs of recurrent bleeding are noted, the care is often completed by the referring in-patient service.

We hypothesized that if inadequately detailed communication from the gastroenterologist to the admitting service is significantly contributing to excessive length of stay, then a more structured set of recommendations specifically aimed at issues critical to discharge planning (such as resuming oral food intake, duration of i.v. pharmacological therapy, duration of standard observation period), reported promptly to the attending physician, might decrease length of stay. This study, using a prospective collection of data in an a priori defined ‘background’ and ‘intervention’ period, was performed to determine whether a detailed checklist of important discharge-related issues could in fact reduce average length of stay and result in more efficient care of patients with non-variceal upper gastrointestinal bleeding.

Methods

The study was approved locally as a quality assurance initiative, as part of the Calgary Health Region Quality Improvement Health Information (QIHI) collaborative, by the local institutional review process. The checklist itself was developed by this QIHI committee after several iterations over several weekly meetings, with input from gastroenterology, in-patient and endoscopy nursing, emergency physicians, and the hospitalist service. The checklist was finalized after consensus was reached regarding its contents and wording. Complete consensus was required and achieved for all items, except the necessity for recommendations pertaining to Helicobacter pylori gastric infection and non-steroidal anti-inflammatory drugs, and the three categories of diet, drugs (Helicobacter pylori treatment, non-steroidal anti-inflammatory drugs, proton pump inhibitor acid antisecretory therapy) and discharge planning were thought to be the only components needed by all members of the panel. No other items were proposed or deleted.

All patients presenting to Emergency with either melena or hematemesis (vomiting of coffee grounds-looking material or blood) were identified through a daily prospective manual search of triage records in the Foothills Medical Centre emergency department. Patients with varices were excluded. The aim of the study was to facilitate discharge amongst patients whose primary diagnosis was upper gastrointestinal bleeding, therefore, patients with gastrointestinal bleeding occurring while admitted for another reason were not considered. These latter patients’ lengths of stay are driven strongly by their primary diagnosis and were felt to be a group that would be influenced very little by the checklist. The Foothills Medical Centre is the major tertiary care university teaching hospital (University of Calgary) in Calgary with over 750 beds and over half a million visits per year.

Patients were then tracked, again using a manual medical record review by trained health records and QIHI personnel, for demographics, hemoglobin, urea, vital signs, and presenting symptoms. Endoscopic findings were noted, and high-risk endoscopic stigmata were defined as the presence of a bleeding or non-bleeding visible vessel, or an adherent clot. The proposed source of bleeding was documented, including lower risk lesions such as Mallory–Weiss tears (mucosal and/or submucosal tears most commonly at or just below the gastro-esophageal junction, most often caused by vomiting or retching), intermediate lesions such as ulcers, and higher-risk lesions like malignancies. Comorbidities that might be relevant to the prospectively validated Blatchford [5] and Rockall [6] gastrointestinal bleeding severity scores were also recorded, as was the need for blood transfusion and the primary outcome, length of stay in days. The Blatchford score comprises clinical variables only, whereas the Rockall uses both clinical and endoscopic variables; both have been prospectively validated as predicting recurrent bleeding or need for intervention [5,6]. During the background period, the gastroenterologists and hospitalists were aware that length of stay and other parameters were being monitored for patients with upper gastrointestinal bleeding, but were not aware that it was being used as the background data for the checklist intervention.

After a 3-month background period (Monday 9 June 2003 to Friday 15 August 2003), a 4-week intervention period began, the duration of which was defined a priori. The background period was intermittently sampled in 5- to 7-day batches (during which enrolment was consecutive) depending on the availability of QIHI personnel to identify and review health records; the study period was continuously and consecutively sampled. In the study period, beginning Monday 8 September 2003, the endoscopist was asked to fill out a one-page checklist (Figure 1), available in the endoscopy unit, after the patient with upper gastrointestinal bleeding had completed their endoscopy, in addition to the usual Endopro® (Pentax Corp) report. The checklist was clipped to the outside front cover of the in-patient chart and on it, highlighted, was an instruction to page the admitting service with ‘the following recommendations’. Because the checklist was not a formal part of the medical records, and because the admitting physician was someone other than the endoscopist, the items on the checklist were structured as ‘recommendations’ rather than ‘orders’. The prospective identification of patients and the recording of patient and disease variables and length-of-stay data were identical to that performed in the background period. Readmission rates were tracked for all included patients for 30 days.

Histograms of length of stay indicated that this variable was skewed, with and without removal of outliers. The median lengths of stay for the two periods were compared, with the intention-to-treat principle, using the Wilcoxon rank sum (Mann–Whitney) test. Alpha threshold level was 0.05.
## POST-ENDOSCOPY GASTROENTEROLOGY RECOMMENDATIONS

**INSTRUCTIONS TO NURSING:** PLEASE PAGE THE ATTENDING PHYSICIAN WITH THE FOLLOWING RECOMMENDATIONS

### 1. DIET

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Starting...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear fluids (advance as tolerated)</td>
<td>In 2 hours</td>
</tr>
<tr>
<td>Full diet (resume previous diet)</td>
<td>In 4 hours</td>
</tr>
<tr>
<td>Other diet</td>
<td>Tomorrow AM (assuming no evidence of rebleeding)</td>
</tr>
</tbody>
</table>

___ KEEP NPO UNTIL FURTHER NOTICE OR ASSESSMENT BY ATTENDING___

### 2. PROTON PUMP INHIBITORS (PPI)

- **IV PPI:** __Start IV Pantoloc bolus stat (80 mg bolus IVPB over 15 mins) followed by infusion (8 mg/hr x 72 hours)__
- **ORAL PPI:** __Once daily ___ BID___

___ 1st dose ASAP OR ___ following end of IV infusion → for ___ (weeks/months)___

### 3. H. PYLORI ERADICATION (CHECK FOR ALLERGIES!)

- _____ 7-DAY ERADICATION PROTOCOL RECOMMENDED FOR...
  - Rapid-urease test positivity
  - Empiric eradication
  - Amoxil - 1 gram bid PO or Metronidazole 500 mg bid PO
  - Clarithromycin - 500 mg bid PO
  - PPI bid PO
  - Other eradication protocol

___ Biopsy results pending – patient to F/U with family physician for results & Rx (1-2wks)___

### 4. NSAIDS (skip to #5 if the patient has not been on NSAIDS:)

- __Discontinue NSAIDs indefinitely__
- __Discontinue NSAIDs for ________ days__

If NSAID cannot be discontinued, consider: __A COX-2 NSAID instead ___ longterm PPI OD___

### 5. CBC

- ___ Repeat later today ___ HRS (page attending MD with result) ___ Tomorrow AM___
  - Daily x 3 days ___ Other ______

### 6. DISCHARGE PLAN (assuming no evidence of rebleeding)

- ___ Today (in 2hrs) ___ Tomorrow AM ___ in 72 hours___

### 7. FOLLOW-UP

- __No follow-up required with the GI service unless there is evidence of rebleeding__
  - Endoscopy – in _____ (weeks/months)
  - GI Clinic – in _____ (weeks/months)
  - Family physician

Phone: _______ *_________ for an appointment with Dr. ____________

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**Figure 1** The post-endoscopy checklist of recommendations to the referring in-patient service, including three Ds: diet, drugs, and discharge plan.
*A priori*, it was felt that the subgroup with lengths of stay of <10 days would also be analyzed separately (to eliminate outliers whose extended length of stay may have been more due to comorbidities and may skew the results), as a secondary analysis. Descriptive statistics were calculated for the other demographic variables including means, standard deviations, medians, and interquartile ranges (IQRs) as appropriate.

Sample size calculation indicated that 32 patients in one arm and 16 patients in the other arm would be needed to detect a 50% reduction in length of stay from a baseline of 7 days, with a SD of 4 days and a 2:1 background:intervention ratio, with 80% power and an alpha error of 0.05. Our actual mean values and variance (SD 7 days) correspond to 71% power.

**Results**

There were 39 patients admitted in the background period and 22 in the intervention period, with a mean age overall of 70.6 (SD 19) years. The groups did not differ in age, sex, severity scores, mean hemoglobin, vitals, or proportion requiring blood transfusion in either a statistically or clinically significant way (Table 1). Data collection was complete in all cases, except for a blood test for urea (increased when a blood protein is in the gastrointestinal tract). The latter was missing in ~40% of both groups and was assumed to be in the normal range, when it was missing, for the calculation of the Blatchford score. This modified Blatchford score has been shown to predict outcomes [7]. As a secondary analysis of this variable, the median urea value for each group, instead of a normal value, was substituted for the missing values. The median urea in each group corresponded to a component score of 4 points in each group. Neither method of handling the missing ur eas showed a difference in this risk score between the two periods. When the median urea value in each group (Table 1) was substituted for the missing values, the median Blatchford scores become 9 and 10, respectively.

The median (range) length of stay was 7 (1–40) days with a 95% IQR of 2–24 days in the background period, and 3.5 (1–13) days with an IQR of 1–12 days in the intervention period.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Comparison of potential confounders between the two study periods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Background period (<em>n</em> = 39)</td>
</tr>
<tr>
<td>Demographics</td>
<td>Mean age (SD)</td>
</tr>
<tr>
<td></td>
<td>% Male</td>
</tr>
<tr>
<td>Admitting service</td>
<td>Hospitalist (family physician)</td>
</tr>
<tr>
<td></td>
<td>General internal medicine</td>
</tr>
<tr>
<td></td>
<td>Other specialist</td>
</tr>
<tr>
<td></td>
<td>Not applicable (discharged from emergency department)</td>
</tr>
<tr>
<td>Timing</td>
<td>Weekend</td>
</tr>
<tr>
<td></td>
<td>Pre-weekend (Thurs/Fri)</td>
</tr>
<tr>
<td></td>
<td>Monday–Wednesday</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>Heart failure or ischemic heart disease</td>
</tr>
<tr>
<td></td>
<td>Liver disease</td>
</tr>
<tr>
<td></td>
<td>No known heart or liver disease</td>
</tr>
<tr>
<td>Endoscopic diagnosis</td>
<td>Mallory–Weiss tear</td>
</tr>
<tr>
<td></td>
<td>Ulcer</td>
</tr>
<tr>
<td></td>
<td>Malignancy</td>
</tr>
<tr>
<td></td>
<td>Other</td>
</tr>
<tr>
<td>Endoscopic appearance</td>
<td>Visible vessel, active bleeding, or adherent clot</td>
</tr>
<tr>
<td></td>
<td>Non-bleeding lesion with clean base or flat spot</td>
</tr>
<tr>
<td>GI bleed severity</td>
<td>Median Rockall score (IQR)</td>
</tr>
<tr>
<td></td>
<td>Median Blatchford scorea (IQR)</td>
</tr>
<tr>
<td></td>
<td>Mean Hb, g/L (SD)</td>
</tr>
<tr>
<td></td>
<td>Mean systolic BP, mmHg (SD)</td>
</tr>
<tr>
<td></td>
<td>% Transfused</td>
</tr>
</tbody>
</table>

All values are % (*n*), unless indicated otherwise. Hb, hemoglobin; BP, blood pressure; SD, standard deviation; IQR, interquartile range.

*a* Urea assumed to be in normal range when missing. See text.
period \( P = 0.003 \). The means of the two groups were 8.3 and 4.5 days, respectively. In the subgroup of patients with a ≤10-day length of stay, the difference between the two groups remained statistically significant (median 5.5 days vs. 3.0 days; \( P = 0.02 \)).

Although an average length of stay of >3 days was expected, because those with unstable or newly diagnosed comorbidities and those with recurrent bleeding would not be advised to be discharged at 72 hours, as per the checklist, 11 patients in the intervention group stayed longer than 3 days. The reasons for this were the following: requiring re-anticoagulation after 3-day observation period (two patients); colonoscopy and/or small bowel follow-through performed before discharge because insignificant findings noted on upper endoscopy (four patients); and five patients with multiple comorbidities (one patient with unexplained bacteria in the blood and new onset atrial fibrillation, one patient with chronic nerve-associated pain in his extremities with inadequate pain control, one with severe osteoarthritis requiring physical rehabilitation before discharge, and one with end-stage (palliative) heart failure and elemental. One patient with a bioprosthesis aortic valve did not have a clear explanation for staying 5 days.

There was one readmission for bleeding of patients recruited during the background period (length of stay 2 days) and one in the study period (length of stay 4 days). The single patient in the study period was palliative and died during the second admission. There were two other readmissions in the background period but they were for unrelated conditions (cardiac disease, lower limb fracture) with length of stay of 4 days and 8 days, respectively.

Discussion

The management of upper gastrointestinal bleeding has evolved over the past decade, with advances in endoscopic therapy, acid antisecretory therapy, and randomized and nonrandomized trials showing that early discharge of patients without endoscopic predictors of recurrent bleeding (so-called ‘high-risk stigmata’) is safe. This non-randomized study shows the potential impact of simple measures attempting to improve communication by responding to specific issues in a very detailed way. The checklist itself has not been validated and this would clearly have to be done before its use could be recommended. The preliminary evidence provided by this study of this checklist’s usefulness and the effectiveness of such a maneuver in general, serves to provide justification for a more laborious validation study.

Other large centers have also reported overly cautious admissions for patients with upper gastrointestinal bleeding, despite studies and reviews suggesting otherwise [8]. In a UCLA study by Dulai et al. [8] a low-risk subgroup of patients (Rockall score ≤ 2) who should otherwise have been discharged immediately post-endoscopy were found to have been hospitalized for over 2 days, with 49% of these low-risk patients admitted to an intermediate-care or intensive care unit. The length of stay in our background period was also higher than ideal but comparable to our previous crude length-of-stay estimates for patients with upper gastrointestinal bleeding at our institutions (data not shown), which prompted this study. More than half of our patients had known cardiac disease and the Blatchford and Rockall scores were intermediate to high. The average age was also high at over 70 years old.

The use of clinical pathways and endoscopy-based guidelines to encourage early discharge of low-risk patients has also been studied [9–12]. However, if the guidelines that we recognize as appropriate are not communicated effectively and in a detailed and timely manner to our colleagues, their potential benefit may be lost. Although Hay’s study [11]showed that length of stay could be lowered by having dedicated personnel monitoring upper gastrointestinal bleeding patients on a daily basis, this intervention is cumbersome and costly. In addition, Hay’s study excluded patients who did not become ‘low risk’ by endoscopic criteria, and even then, the length of stay was only reduced to 2.9 days; our study included all-comers through the emergency room. The study period still had a median length of stay of over 3 days despite apparent recommendations in the checklist for either early discharge for low-risk patients or a 72-hour monitoring period for others. It should be noted that these discharge guidelines were meant to be interpreted as ‘assuming no other issues requiring continued admission’. That is, a patient with heart failure may stay longer than 72 hours because of residual pulmonary edema, despite being ‘dischargeable’ with respect to their gastrointestinal bleeding.

There are certainly limitations of this study design, given its non-randomized nature, but we have made an effort to show that the two populations were similar in ways that could potentially confound the comparison. It was felt that given the unavoidably unblinded nature of the intervention, and the insufficient power in our resources to assess for period or order effects, that a crossover design was not going to be better at avoiding confounding. Both the background period and the study period would have been expected to have been biased towards a shorter length of stay due to the Hawthorn effect [13] of being observed. We felt it important for the participating services to know that they were being monitored during the background period but be unaware of the hypothesis or design so that the study period would not be the only one influenced by the Hawthorn effect.

The upper gastrointestinal bleeding presentation rate appeared higher in the intervention group (24 bleeds versus 44 bleeds), but this is likely due to the intermittent nature of sampling during the background period; the severity of the bleeds in the two periods appeared similar and there did not appear to be any difference in emergency department volume during that time (data not shown). Readmission rates were low and similar in both periods. The sample sizes are relatively small, but the difference observed, even using non-parametric testing, was significant. Because of the potential for the median length of stay to be skewed by lengthy admissions due to comorbidities, for which the non-parametric test partially controls, the secondary analysis chosen involved those with less than 10 days in hospital; this \textit{a priori} defined subgroup analysis remained significant.
Our primary outcome in this study was length of stay and we did not analyze the data with respect to other aspects of care, e.g. adherence to treatment recommendations for *H. pylori* gastric infection, non-steroidal anti-inflammatory use, or i.v. proton pump inhibitor use. It is possible that other aspects of care, other than the efficiency of hospital admission, also improved.

The results of this study need to be confirmed in a larger, perhaps cluster-randomized trial (randomizing centers rather than individuals to either intervention or no intervention); the checklist also requires validation. Unfortunately, even a cluster-randomized design will have anticipated challenges in avoiding confounding. In this study, however, there appears to be early evidence for a beneficial impact on health resources when more detailed post-endoscopy recommendations are made by gastroenterologists to attending non-gastroenterologists when a center’s average length of stay is longer than ideal.

**Acknowledgements**

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**References**


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