



## Alimentary Tract

## Time trends and outcome of gastrointestinal bleeding in the Veneto Region: A retrospective population based study from 2001 to 2010



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## ARTICLE INFO

## Article history:

Received 6 June 2013

Accepted 12 November 2013

Available online 22 December 2013

## Keywords:

Incidence

Lower gastrointestinal bleeding

Mortality

Upper gastrointestinal bleeding

## ABSTRACT

**Background:** Gastrointestinal bleeding is the most frequent emergency for gastroenterologists. Despite advances in management, an improvement in mortality is still not evident.

**Aim:** Determining time trends of gastrointestinal bleeding hospitalization and outcomes from 2001 to 2010 in the Veneto Region (Italy).

**Patients and methods:** Data of patients admitted with gastrointestinal bleeding from Veneto regional discharge records were retrospectively evaluated. Chi-squared and multivariate logistic regression model were used.

**Results:** Overall, 44,343 patients (mean age  $64.2 \pm 8.6$  years) with gastrointestinal bleeding were analysed: 23,450 (52.9%) had upper, 13,800 (31.1%) lower, and 7093 (16%) undefined gastrointestinal bleeding. Admission rate decreased from 108.0 per 100,000 in 2001 to 80.7 in 2010, mainly owing to a decrease in upper gastrointestinal bleeding (64.4 to 35.9 per 100,000,  $p < 0.05$ ). Reductions in hospital fatality rate (from 5.3% to 3%,  $p < 0.05$ ), length of hospital stay (from 9.3 to 8.7 days,  $p < 0.05$ ), and need for surgery (from 5.6% to 5%,  $p < 0.05$ ) were observed. Surgery (OR: 2.97, 95% CI: 2.59–3.41) and undefined gastrointestinal bleeding (OR: 2.89, 95% CI: 2.62–3.19) were found to be risk factors for mortality.

**Conclusions:** Patient admissions for gastrointestinal bleeding decreased significantly over the years, owing to a decrease in upper gastrointestinal bleeding. Improved outcomes could be related to regional dedicated clinical gastroenterological management.

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## 1. Introduction

Gastrointestinal bleeding (GIB) is the most probable reason for emergency hospital admission for patients with a gastrointestinal disorder and still remains an important cause of both morbidity and mortality.

The incidence of upper GIB has been estimated to be about 100 out of 100,000 cases per year and its incidence is approximately five times more than that of lower GIB [1,2]. Recent studies reported a decreasing trend of upper GIB incidence along with a slightly increasing trend of lower GIB incidence [3–5].

Over the last decades, endoscopy has become the linchpin for diagnosis, treatment, and risk categorization of GIB. According to the international guidelines [6–9], in acute GIB, early endoscopy

allows to deliver prompt therapy to both active bleeding and high-risk stigmata. In the years 2003–2004 and 2007–2008, two Italian multicentre prospective observational studies highlighted the importance of endoscopic treatment in improving GIB outcomes [10,11]. Furthermore, administrative data from a population-based study from the Lazio Region (Centre of Italy) reported not only the protective effect of endoscopic procedures, but also the key role of specialist care in reducing the mortality rate [12]. However, in the last two decades, despite the improvement of clinical gastroenterological bleeding management, several international studies still failed to demonstrate a significant improvement in overall mortality [3,13,14]. Conversely, an Italian single-centre study from the Veneto Region, comparing the years 1983–1985 and 2002–2004, published an observational report of patients with upper GIB that showed a significant reduction of its incidence and improved outcomes, such as a decrease in mortality, re-bleeding rates, and need for surgery (NFS) [15]. Although widely studied, there is still insufficient evidence for the proper management of GIB, as well as for the best outcome predictor of GIB. In the present investigation, we

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aimed to evaluate the time trend and outcomes of GIB in the Veneto Region during the period 2001–2010.

## 2. Methods

### 2.1. Source of data

Administrative data on the resident population of Veneto discharged from public and academic hospitals, as well as from accredited private hospitals, with a diagnosis indicative of GIB between January 2001 and December 2010, were retrospectively collected. The hospital discharge records (HDRs) database, which included demographic data, surgery or medical procedures performed during hospitalization and both admission and discharge data, was queried according to the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM).

The Veneto Region, located in the North-East of Italy, has a resident population of 4,912,438 inhabitants (1st January 2010, data from the National Institute of Statistics, ISTAT). It is divided into 21 health districts (local health units) with 55 hospitals with emergency departments and 24 with Gastroenterology Units, of which 85% with an “out-of-hours” emergency endoscopy on-call rota.

All hospital discharge records were retrieved according to the following characteristics: (1) yearly admissions to hospitals in the Veneto Region between 2001 and 2010; (2) residents with a diagnosis indicative of GIB, including those requiring surgery according to the ICD-9-CM codes (see Appendix A). Cases were also included if the diagnosis indicative of GIB followed a primary diagnosis of haematemesis (ICD-9-CM code 578.0), blood in the stools (ICD-9-CM code 578.1), or unspecified haemorrhage of the gastrointestinal tract (ICD-9-CM code 578.9). Cases were excluded if the secondary discharge diagnoses included any of the following: pregnancy, birth, puerperium (major ICD-9-CM diagnosis categories: 11 and 14), or trauma (ICD-9-CM codes 800–999).

### 2.2. Data analysis and statistical comparisons

Patients included in the study were arbitrarily divided according to gender and the following nine classes of age (in years): less than 1, 1–5, 6–14, 15–24, 25–44, 45–64, 65–74, 75–84, and 85 or more. In order to calculate the overall regional rate of hospitalizations for GIB, the reference population considered was the mean number of residents in Veneto between 2001 and 2010: 4,713,312 inhabitants (data from ISTAT). Conversely, the time trend of incidences (overall, upper, lower, and undefined GIB) were calculated referring to the specific resident population of each year (data from ISTAT).

Case fatality rate for GIB was defined as the proportion of in-hospital deaths among the total number of hospitalizations for GIB. Causes of death, as well as patient comorbidities, were not available in the database. Furthermore, the database distinguished surgical from medical treatment, but was not able to identify interventional radiology, which was included into the medical procedure. NFS was defined as the percentage of patients submitted to surgery among all GIB hospitalized patients.

Comparisons between GIB overall incidence and gender were calculated by using the chi square test. Similarly, outcomes (case fatality and length of hospital stay), type of treatment (surgical versus medical), and site of bleeding (upper, lower, and undefined) were compared by means of the same statistical test.

Time trend of both incidence and outcomes were analysed using the chi square test.

A multivariate logistic regression model was used to assess the impact of gender, surgery, and diagnosis (upper, lower, and undefined GIB) on intra-hospital mortality (odds ratio (OR), 95% confidence intervals (CI)).

Statistical analyses were performed with the Epi Info™ version 3.5, 2011 software. *p*-Values less than 0.05 were considered statistically significant.

## 3. Results

In the studied period, 44,343 residents (55% males, mean age  $64.2 \pm 8.6$  years) in Veneto were admitted to the hospitals for GIB. Overall, 23,450 patients (53%) had an upper GIB, 13,800 (31%) a lower GIB, and 7093 (16%) had an undefined GIB. Gastric and/or duodenal peptic ulcer accounted for the majority (58%) of upper GIBs, gastritis or duodenitis for 16% of them, and gastroesophageal varices for only 6%. Colonic diverticula and anorectal diseases represented about 60% of the overall lower GIBs.

### 3.1. Incidence per year per 100,000 inhabitants

The overall incidence of admissions for GIB was 94 per 100,000 inhabitants. Incidence was significantly higher in men (105.7 per 100,000) than in women (83.0 per 100,000,  $p < 0.05$ ), with the highest incidence in the oldest age group ( $\geq 85$  years) for both men (930.4 per 100,000) and women (714.0 per 100,000) (Table 1). Upper, lower, and undefined GIB had the following incidence rates: 49.8 per 100,000, 29.3 per 100,000, and 15.0 per 100,000, respectively. Upper GIB incidence was higher in men than in women (60.5 vs 39.5 per 100,000,  $p < 0.05$ ) and the opposite was observed for lower GIB incidence (29.9 per 100,000 in men vs. 28.6 per 100,000 in women,  $p < 0.05$ ) (Table 2).

The incidence of all hospitalizations for GIB decreased over the years from 108.0 per 100,000 inhabitants in 2001 to 80.7 in 2010 ( $p$ -value for trend  $< 0.05$ ), with the same significant time trend in male and female patients (Fig. 1).

The incidence of upper GIB markedly decreased over the years from 64.4 per 100,000/year to 35.9 per 100,000/year ( $p < 0.05$ ), whereas lower GIB showed a small, non significant, increase (from 27.3 per 100,000/year to 30.6 per 100,000/year) and undefined GIB remained stable (Fig. 2).

### 3.2. Length of hospital stay

The mean length of hospital stay (LOS) for all causes of GIB was 8.8 days (Table 1). In both men and women, LOS significantly increased with age: from 6 days in younger patients (25–44 years old), to 9.9 days in patients older than 75 years ( $p < 0.05$ ). From 2001 to 2010, the mean LOS significantly decreased from 9.3 to 8.7 days ( $p < 0.05$ ).

The LOS significantly increased in patients who performed a surgical procedure ( $p < 0.05$ ) in both genders and all sites of bleeding. Furthermore, LOS was significantly higher when surgery was performed in patients with upper GIB than in those with lower GIB (18.2 vs 11.2 days,  $p < 0.05$ ) (Table 2).

### 3.3. Need for surgery and case fatality

The overall NFS for GIB was 5.0% (Table 1), without differences between genders, and showed two peaks in the age classes 25–44 years (9%) and 45–64 years (8%). NFS slightly decreased from 5.6% in 2001 to 5.0% in 2010 ( $p < 0.05$ ) (Fig. 3).

Overall case fatality rate was 4.4%. Case fatality in both genders significantly increased from 1.2 to 2.0% in younger patients (25–44 years) to 8.5–9% in patients older than 75 years ( $p < 0.05$ ) (Table 1).

Case fatality in patients with upper GIB was significantly higher for those who performed surgical rather than medical treatment (16.9 vs 3.6%,  $p < 0.05$ ; OR 4.49, 95% CI: 3.79–5.32). Conversely, no significant difference was observed in patients with lower GIB

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