Validation of Primary and Secondary ICD-9-CM codes for Upper Gastrointestinal Complications in Friuli Venezia Giulia, Italy

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BACKGROUND AND OBJECTIVE

- Accuracy of outcome measurement in pharmacoepidemiology studies using health care administrative databases is relevant to guarantee the validity of results.
- Errors in outcome measurement may result in inaccurate estimates of the disease incidence and failure to identify an increased risk or spurious association between a drug and a disease.
- The objective of this analysis was to validate cases in a study on the use of nimesulide and other nonsteroidal anti-inflammatory drugs (NSAIDs) and the risk of upper gastrointestinal complications (UGICs) in Friuli Venezia Giulia (FVG), Italy.

METHODS

Source Population

- General population in the region of FVG in northern Italy with 1.2 million inhabitants
- Regional database system with information on the individual use of health care resources
- Key databases: Patient Identification, Outpatient Prescription, and Hospital Service

Study Design

Retrospective population-based cohort and nested case-control study

Study Cohort

- All residents in FVG for at least 1 year prescribed an NSAID between January 1, 2001, and December 31, 2008
- No exclusion criteria applied

Follow-up

- From the first NSAID prescription to the earliest of the following: (1) hospital admission for UGIC, (2) emigration or disenrollment from health system, (3) end of study period, or (4) death

Case Definition

- Patient with a hospital admission for hemorrhage, perforation, and/or obstruction located in the stomach and/or duodenum, or a peptic ulcer causing bleeding, perforation, and/or obstruction confirmed by clinical evidence of hematemesis, melena, endoscopy, radiology, surgery, or autopsy

Case Identification

- Through primary and/or secondary hospital discharge International Classification of Disease 9th revision clinical modification (ICD-9-CM) codes:
  - Site- and lesion-specific: gastric ulcer (code 531), duodenal ulcer (532), peptic ulcer site unspecified (533), and gastrojejunal ulcer (534)
  - Nonspecific: hematemesis (578.0), melena (578.1), and unspecified bleeding of intestinal tract (578.9)

Case Validation

- Review of hospital medical charts for the following:
  - Random sample of cases identified with primary discharge codes 531 and 532 (n = 108)
  - All potential cases identified with primary discharge codes 533 (n = 40), 534 (n = 137), and 578 (n = 1,770)
  - Random sample of approximately 20% of the potential cases identified with secondary codes 531, 532, 533, 534, and 578 (n = 458)
- Information on clinical and diagnostic evidence of UGICs abstracted from hospital medical charts by trained personnel blinded to exposure status using a standardized abstraction form
  - Final confirmation of cases conducted by five research epidemiologists blind to exposure to NSAIDs
- Disagreements and complex cases discussed and agreed upon by the reviewers

Analysis

- Positive predictive value (PPV) (overall and by UGIC code) and discharge position (primary or secondary) calculated as the ratio of confirmed cases to potential cases
- For secondary codes, PPVs also calculated after stratification by primary code

RESULTS

- In the cohort of 588,827 users of NSAIDs a total of 4,014 potential cases of UGICs were identified.
- Hospital charts were requested for 2,513 potential cases.
- The overall chart retrieval percentage was 98.4% (2,473 retrieved charts, 40 not available), 98.5% for primary codes and 98.0% for secondary codes.

Codes in Primary Position

- The PPVs for codes 531 and 532 were based on the abstraction of a random sample of 108 charts, for the other codes on all the potential cases identified.
- The overall PPV for specific codes 531 and 532 was 94.3%, 96.6% for code 531 and 91.5% for code 532 (Table 1).
- For the other specific codes, PPV was 79.5% for code 533 and 83.1% for code 534. The overall PPV for primary nonspecific codes was 40.2%: 50.9% for 578.0, 33.1% for 578.1, and 41.0% for code 578.9.

Table 1. PPV for UGICs of Primary Discharge Diagnosis Codes, FVG, Italy, 2001-2008

ICD-9-CM Code	Code Description	Medical Charts Requested n	Medical Charts Retrieval %	Cases Confirmed n	PPV %
Site specific					
531[a]	Gastric ulcer	59	100.0	57	96.6
532[a]	Duodenal ulcer	49	95.9	43	91.5
531 and 532[a]		108	98.1	100	94.3
534[b]	Gastrojejunal ulcer	137	99.3	113	83.1
Lesion specific					
533[b]	Peptic ulcer	40	97.5	31	79.5
Nonspecific					
578.0[b]	Hematemesis	439	99.3	222	50.9
578.1[b]	Blood in stool (melena)	721	99.0	236	33.1
578.9[b]	Hemorrhage of gastrointestinal tract, unspecified	610	97.2	243	41.0
Overall nonspecific[b]		1,770	98.5	701	40.2
Total		**2,055**	**98.5**	**945**	**46.7**

[a] Data are from a random sample of 108 potential cases.
[b] Data are from all the potential cases identified.

- Table 2 shows the accuracy of the primary UGIC code information regarding the site of the lesion among validated cases (codes 533 and 534).
- The highest site-specific PPVs were for duodenal ulcer (91.5%) and peptic ulcer (74.4%).
- The PPV for gastric ulcer was 66.1%.
- A low site-specific PPV (9.0%) was found for nonspecific codes.

Table 2. PPVs for the Site of Lesion of the UGICs of Primary Discharge Diagnosis Codes, FVG, Italy, 2001-2008

ICD-9-CM Code	Code Description	Medical Charts Requested n	Medical Charts Retrieval %	Site of Lesion Confirmed n	PPV for Site of Lesion %
Site specific					
531[a]	Gastric ulcer	59	100	39	66.1
532[a]	Duodenal ulcer	49	95.9	43	91.5
534	Gastrojejunal ulcer	137	99.3	45	33.1
Overall site specific		245	98.8	127	52.5
Lesion specific					
533	Peptic ulcer	40	97.5	29	74.4
Nonspecific					
578.0	Hematemesis	439	99.3	43	9.9
578.1	Blood in stool (melena)	721	99.0	47	6.6
578.9	Hemorrhage of gastrointestinal tract, unspecified	610	97.2	66	11.1
Overall nonspecific		1,770	98.5	156	9.0

- The diagnosis of UGIC was confirmed in 81.8% by findings of endoscopy, surgery, radiology, and/or autopsy (Table 3).
- In 94.3%, clinical evidence of melena, hematemesis, and/or rectorrhagia was present. Among 663 cases (78.9%) confirmed by endoscopy, 315 (37.5%) had evidence of bleeding (Forrest I or Forrest II lesions).
- A low percentage of cases 18.2% (n = 153) were confirmed only by clinical evidence of melena, hematemesis, and/or rectorrhagia, corresponding to 15.6% (n= 116) in the case-control study, restricted to ages 20 to 89 years.

Table 3. Number and Distribution of Confirmed Cases of UGICs by Type of Evidence Used to Confirm the Diagnosis, FVG, Italy, 2001-2008

Type of Confirmation	All Ages (n = 840) n (%)	Age 20-89 (n = 743) n (%)
Endoscopy	663 (78.9)	605 (81.4)
With bleeding	315 (37.5)	293 (39.4)
Without bleeding	348 (41.4)	312 (42.0)
Surgery	32 (3.8)	28 (3.8)
Autopsy	9 (1.1)	9 (1.2)
Radiology	27 (3.2)	22 (3.0)
Any of the above[a]	687 (81.8)	627 (84.4)
Melena	626 (74.5)	556 (74.8)
Hematemesis	323 (38.5)	286 (38.5)
Rectorrhagia	61 (7.3)	45 (6.1)
Any of the above[b]	792 (94.3)	698 (93.9)
Clinical evidence only[c]	153 (18.2)	116 (15.6)

[a] Cases confirmed by endoscopy, surgery, autopsy, and/or radiology with or without melena, hematemesis, or rectorrhagia.
[b] Cases confirmed by melena, hematemesis, and/or rectorrhagia with or without another type of evidence.
[c] Cases confirmed by melena, hematemesis, and/or rectorrhagia without another type of evidence.

Codes in Secondary Position

- The PPVs for codes in secondary position were based on the abstraction of a random sample of 458 charts.
- A total of 449 charts (98.0%) were obtained; 156 were confirmed as cases of UGIC, with an overall PPV of 34.7%. The PPV ranged from 40.1% for codes 531 and 532 to 15.6% for code 578.0 (Table 4).

Table 4. PPV for UGCIs of Secondary Discharge Diagnosis Codes, FVG, Italy, 2001-2008

ICD-9-CM Code	Code Description	Medical Charts Requested n[a]	Medical Charts Retrieval %	Cases Confirmed n	PPV %
Site specific					
531	Gastric ulcer	168	99.4	67	40.1
532	Duodenal ulcer	158	96.2	61	40.1
534	Gastrojejunal ulcer	34	100.0	10	29.4
Lesion specific					
533	Peptic ulcer	26	96.2	6	24.0
Nonspecific					
578.0	Hematemesis	34	94.1	5	15.6
578.1	Blood in stool (melena)	46	97.8	12	26.7
578.9	Hemorrhage of gastrointestinal tract, unspecified	34	94.1	10	31.3

[a] The totals do not sum to the total number of charts because 41 charts requested and 38 charts obtained had more than one diagnosis for UGIC in secondary position. The total of medical charts requested corresponds to the total number of occurrences of UGIC codes.

- PPV was 88.9% for the secondary codes for UGIC with a primary code for peritonitis (codes 567.2 and 567.8) and 79.2% when the primary code was for acute post hemorrhagic anemia (285.1) (Table 5).
- When in combination with the other primary codes, PPVs for secondary codes were below 65%.
  - Overall, after excluding those with a primary discharge code for peritonitis or acute post hemorrhagic anemia, the PPV was 29.7%.

Table 5. PPV for Diagnosis Codes for UGICs in the Secondary Position According to the Most Frequent Primary Discharge Codes, FVG, Italy, 2001-2008

Primary Discharge ICD-9-CM Code	Code Description	Number of Potential Cases	Number of Confirmed Cases	PPV %
567.2	Other suppurative peritonitis	13	11	84.6
567.8	Other specified peritonitis	5	5	100.0
285.1	Acute post hemorrhagic anemia	24	19	79.2

Confirmed Cases Included in Cohort and Case-Control Analysis

- A total of 3,031 cases of UGIC were confirmed.
  - Of these, 72.1% were identified with specific primary discharge codes, 23.0% with nonspecific primary discharge codes and 4.9% with secondary discharge codes.
- The validation of a random sample of secondary codes allowed us to include 124 additional cases in the nested case-control analysis.
  - Full validation of secondary codes (n = 1,800) could lead to the inclusion of about 617 additional cases, a 20.3% increase over the current number of cases.
- Full validation of secondary codes would avoid a 16.9% underestimation of the incidence rate of UGICs in this cohort.

CONCLUSIONS

- In this study, the retrieval rate of hospital medical records for chart validation was 98.4%.
- The results are consistent with prior validation study of primary hospital discharge ICD-9-CM codes for UGICs in the FVG database.[1,2]
- PPVs were above 90% for site-specific codes in primary position 531 (gastric ulcer) and 532 (duodenal ulcer); these results allowed the inclusion of all cases identified with these codes.
- PPVs were 83.1% for code 534 (gastrojejunal ulcer), 79.5% for code 533 (peptic ulcer), and 40.2% for nonspecific code 578 (gastrointestinal hemorrhage) in primary position.
  - From the cases identified with these codes, only those confirmed through chart review were included.
- Secondary codes generally show low PPVs (from 40.1% of codes 531 and 532 to 15.6% of code 578.0), except when in combination with primary codes for peritonitis (from 100% to 84.6%) or acute post hemorrhagic anemia (79.2%).
  - All cases with these codes in primary position were included.
- Studies on UGICs are based on primary codes. In this study, the validation of a random sample of secondary codes increased the ascertainment of cases of UGICs by 20.3%.
- Incidence rates estimated without including confirmed cases identified with codes in secondary position underestimate the true incidence of UGICs.

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