Supplementary Table 1. Full electronic search strategy.

Item	Concept	Search terms	No. of studies
#1	Gastrointestinal	'gastrointestinal':ab,ti	326,277
#2	Bleeding	'hemorrhage':ab,ti OR 'haemorrhage':ab,ti OR 'bleeding':ab,ti	480,791
#3	Gastrointestinal bleeding	#1 AND #2	46,910
#4	Epidemiology	'incidence':ab,ti OR 'prevalence':ab,ti OR 'epidemiology':ab,ti OR 'mortality':ab,ti OR 'case fatality':ab,ti	2,786,642
#5	Epidemiology of gastrointestinal bleeding	#3 AND #4	12,875
#6	Limits	#5 AND ([article]/lim OR [review]/lim) AND [humans/lim AND [English]/lim AND ([embase]/lim OR [medline/lim)	4,793

Notes:

Terms restricted to abstract and title (ab:ti).

Results were excluded if conference abstract/paper/review, editorial, letter, note or short survey.

The search was conducted on September 17, 2019.

Supplementary Table 2. Assessment of risk of bias by Joanna Briggs Institute Critical Appraisal Checklist for Prevalence Studies with amendments.

Domain	Item	Question	Risk category	Explanation
D1	Target population	Was the sample frame appropriate to address the target population?	Low	Patient population is identified that would be susceptible to gastrointestinal bleeding. The region for which the estimated data will be applied to also needs to be specified.
			Unclear	Patient population is not clear; e.g. either the age range or setting is not addressed clearly.
			High	Target population is not identified.
D2	Sampling participants	Were study participants recruited in an appropriate way?	Low	All people are recruited in the sample frame which is appropriate. If there is sampling, this should be done at random and justified. In hospital surveys, the hospitals also need to be sampled randomly.
			Unclear	It is not clear whether the recruited patients are sampled from a larger population pool.
			High	Recruitment strategy indicates non-random sampling, susceptible to bias, or method of recruitment is not

				mentioned at all.
D3	Sample size	Was the sample size adequate?	Low	The study justifies the target population to be fully captured from a large enough database to provide population estimates, otherwise sample size calculation is conducted.
			Unclear	It is unclear whether the data source is adequately large to obtain population estimates.
			High	Information is not provided on sample size calculation when data source is not large enough or less participants are recruited than the calculated sample.
D4	Describing subjects and setting	Were the study subjects and setting described in detail?	Low	Population demographics and setting are provided in sufficient detail.
			Unclear	Some information on population demographics and setting are missing (e.g. age or gender characteristics not provided sufficiently, relevant information on the setting is not given)
			High	Population characteristics or setting are not mentioned at all or clearly demonstrate to be not corresponding to the target population.
Removed item		Was data analysis conducted with sufficient coverage of the identified sample?	*Since the study does not include patient-reported data, coverage bias will not be evaluated.*	

D5	Classification bias	Were valid methods used for the identification of the condition?	Low	Established diagnostic criteria or guidelines are used (e.g. ICD)
			Unclear	Accurate definition of the disease being provided with no established criteria.
			High	No disease definition or incorrect definition is present.
D6	Measurement method	Was the condition measured in a standard, reliable way for all participants?	Low	Data are collected by trained personnel or medical staff.
			Unclear	Information on the level of expertise on the data collectors is not clear.
			High	Data collection source is not mentioned or the method of measurement is not appropriate.
D7	Statistical analysis	Was there appropriate statistical analysis?	Low	Data of interest is reported; for studies which provide population estimates the number of events and population size are both adequately provided with confidence intervals.
			Unclear	Some data of interest is reported but there is missing information on population size and/or confidence intervals.
			High	Results of the study do not include information on necessary data and/or statistical analysis.
D8	Missing data	Was the response rate adequate, and if not, was the low response	Low	Missing data and how they are handled are mentioned.

rate managed appropriately?	Unclear	Investigation of quality or comprehensiveness or data is being considered, with no explicit mention of missing data.
	High	No information on the comprehensiveness of the response is provided.

Note: The checklist was amended where necessary for the use of this review. Explanations are presented for the adjusted criteria, considering the design and content of the studies included in this review.

Supplementary Table 3. Adaptation of *Strengthening The Reporting of Observational Studies in Epidemiology (STROBE)* guidelines for study assessment.

	Item #	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract* (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found*
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported*
Objectives	3	State specific objectives, including any prespecified hypotheses*
Methods		
Study design	4	Present key elements of study design early in the paper*
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection*
Participants	6	(*a*) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up* Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants* (*b*) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed Case-control study—For matched studies, give matching criteria and the number of controls per case

Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement*	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias*	9	Describe any efforts to address potential sources of bias*
Study size*	10	Explain how the study size was arrived at
Quantitative variables*	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods*	12	(*a*) Describe all statistical methods, including those used to control for confounding* (*b*) Describe any methods used to examine subgroups and interactions* (*c*) Explain how missing data were addressed* (*d*) Cohort study—If applicable, explain how loss to follow-up was addressed Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy (*e*) Describe any sensitivity analyses*
Results		
Participants	13	(a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed (b) Give reasons for non-participation at each stage

		(c) Consider use of a flow diagram
Descriptive data	14	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders* (b) Indicate number of participants with missing data for each variable of interest* (c) Cohort study—Summarize follow-up time (e.g., average and total amount)*
Outcome data	15	Cohort study—Report numbers of outcome events or summary measures over time* Cross-sectional study – Report numbers of outcome events or summary measures*
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included (*b*) Report category boundaries when continuous variables were categorized (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—e.g. analyses of subgroups and interactions, and sensitivity analyses*
Discussion		
Key results	18	Summarize key results with reference to study objectives*
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias*

Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence*
Generalizability	21	Discuss the generalizability (external validity) of the study results*
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based*

Note: STROBE checklist was altered such that criteria regarding interventional studies were disregarded. Five items were removed and marked with asterisks (*), since they were already covered by the risk of bias assessment.

Hierarchical order for exclusion	General reason for exclusion category (as presented in PRISMA flowchart)	Definition	No. of studies
1	Article not in English	Full-text article not in English, even if the abstract is translated	2
2	Review articles	Systematic and narrative reviews corresponding to the objectives of the current study; of which bibliographies will be reviewed	27
3	Overlapping study population	Different publications with the same or overlapping population of patients	9
4	Wrong diagnosis	Studies only including those with specific sites of GIB (e.g. peptic ulcer bleeding, Mallory-Weiss tears, Dieulafoy's lesion), undefined GIB or overall GIB	49
5	Wrong study design	Studies that are not population-based (e.g. single hospital studies, modelling studies, sub-sampling)	103
6	Wrong study population	Stringent exclusion criteria (e.g. drug use, in-patients), not covering all-cause bleeding	32
7	Wrong study	Not including all presenting with	24

	population	GIB, e.g. cases matched with controls, pediatric/geriatric population only	
8	Wrong study setting	Patients admitted to certain wards of the hospital or those treated in specialty hospitals only	8
9	Outcome related to intervention	Studies that involve specific diagnostic or treatment procedure, which is not otherwise in standard of care	14
10	Wrong study outcome	No epidemiological data of interest, i.e. incidence, mortality or case fatality for the general population not recorded	46
11	Wrong study outcome	Only patient-reported data	3

Supplementary Table 4. Hierarchical order of exclusion criteria presented in PRISMA flowchart.

Supplementary Table 5. Traffic light plot for risk of bias assessment of each study.

First author, publication year	D1	D2	D3	D4	D5	D6	D7	D8
Schlup, 1984	+	+	X	-	-	X	-	X
Katschinski, 1989	+	+	X	X	-	-	-	X
Longstreth, 1995	+	+	-	+	+	-	+	-
Bramley, 1996	+	+	X	X	X	-	+	X
Masson, 1996	+	+	X	-	X	-	+	X
Blatchford, 1997	+	+	-	+	X	X	+	+
El Bagir, 1997	-	+	X	+	-	+	+	X
Longstreth, 1997	+	+	-	+	+	-	+	-
Soplepmann, 1997	+	-	X	+	-	-	-	+
Vreeburg, 1997	-	+	-	+	-	+	+	+
Czernichow, 2000	+	+	+	+	-	+	+	+
Paspatis, 2000	+	+	+	+	-	+	+	X
Tenias Burillo, 2001	-	+	-	X	X	-	+	X

Lewis, 2002	-	+	-	X	+	-	-	X
van Leerdam, 2003	-	+	-	-	-	+	+	+
Targownik, 2006	+	+	+	-	-	-	+	X
Theocharis, 2008	+	+	X	+	-	-	+	+
Kapsoritakis, 2009	+	+	+	+	-	-	+	X
Lanas, 2009	+	+	+	X	+	+	-	+
Loperfido, 2009	+	+	X	+	-	+	+	X
Åhsberg, 2010	-	+	X	+	+	+	+	-
Button, 2011	+	+	+	+	+	+	+	-
Langner, 2011	X	+	+	X	+	-	-	-
Crooks, 2012	+	+	+	X	+	+	-	+
Laine, 2012	-	+	+	X	+	+	-	-
Miyamoto, 2012	-	-	+	-	-	-	-	X
Mungan, 2012	+	-	+	+	+	+	-	X
Nahon, 2012	+	+	-	+	-	+	+	+

Sangchan, 2012	+	+	-	+	+	-	-	X
Del Piano, 2013	+	-	-	+	-	+	-	-
Hreinsson, 2013a	+	-	-	+	+	+	+	-
Hreinsson, 2013b	-	-	-	+	+	+	+	-
Cavallaro, 2014	+	+	+	+	+	-	-	X
Marmo, 2014	+	-	-	+	-	+	+	-
O'Byrne, 2014	+	+	+	+	+	+	+	-
Abougergi, 2015	+	+	+	+	+	+	+	+
Niikura, 2015	+	X	-	+	-	-	+	-
Taha, 2015	+	+	-	-	-	+	-	-
Lu, 2018	+	+	-	-	-	-	+	-
Park, 2018	+	+	-	+	-	-	+	+
Wuerth, 2018	+	+	+	+	+	+	+	+

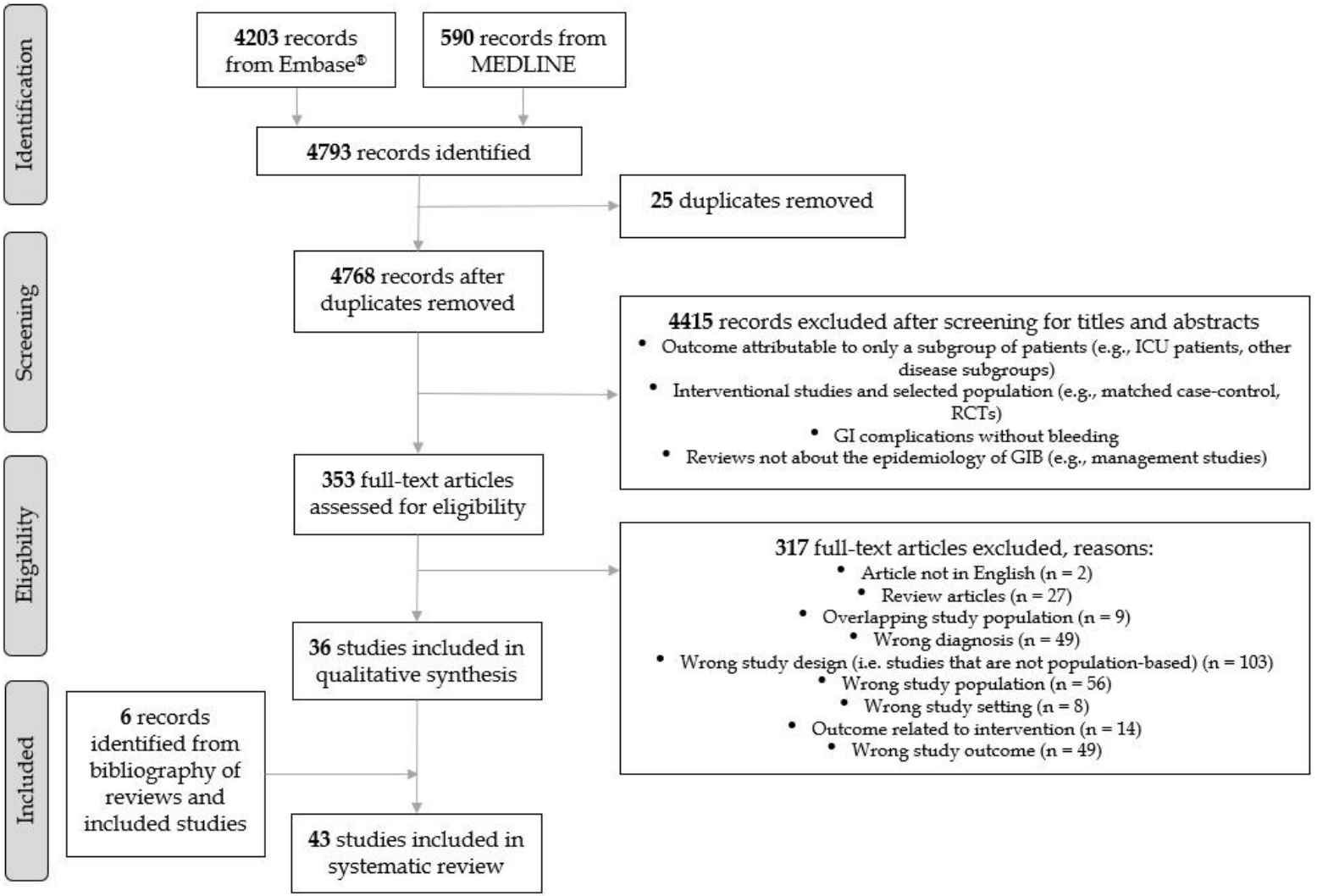
Supplementary Table 6. Summary of findings from STROBE assessment upon reporting guidelines.

Item #		Number of studies (%)		
		Fully reported	Partially reported	Not reported
1	Title and abstract	24 (58.6)	14 (34.1)	3 (7.3)
Introduction				
2	Background/rationale	38 (92.7)	2 (4.9)	1 (2.4)
3	Objectives	37 (90.2)	4 (9.8)	-
Methods				
4	Study design	31(75.6)	5 (12.2)	5 (12.2)
5	Setting	30 (73.2)	7 (17.1)	4 (9.8)
6	Participants	26 (63.4)	9 (22.0)	6 (14.6)
7	Variables	30 (73.2)	7 (17.1)	4 (9.8)
Results				
13	Participants	16 (39.0)	20 (48.8)	5 (12.2)
14	Descriptive data	17 (41.5)	18 (43.9)	6 (14.6)
15	Outcome data	36 (87.8)	2 (4.9)	3 (7.3)
16	Main results	27 (65.9)	9 (22.0)	5 (12.2)
17	Other analyses	33 (80.5)	1 (2.4)	7 (17.1)
Discussion				
18	Key results	41 (100.0)	-	-

19	Limitations	29 (70.7)	1 (2.4)	11 (26.8)
20	Interpretation	41 (100.0)	-	-
21	Generalizability	11 (26.8)	14 (34.1)	16 (39.0)
Other information				
22	Funding	30 (73.2)	-	11 (26.8)

Note: Items 8-12 removed due to repetition of items in risk of bias assessment.

Supplementary Figure 1. PRISMA flowchart of literature search.



Supplementary Figure 2. Summary of risk of bias scoring on each item across studies.