SUPPLEMENTAL

Developing International Classification of Disease code definitions for the study of enteric infection sequelae in Canada

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Determining administrative case definitions for sequelae of enteric infections

Table S1: Search terms used in the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae

Sequela	Terms used
Acute kidney injury	Acute kidney failure OR acute renal failure
Hemolytic uremic syndrome (HUS)	Hemolytic uremic syndrome OR HUS OR haemolytic uraemic syndrome
Thrombotic thrombocytopenic purpura	Thrombotic thrombocytopenic purpura OR familial thrombotic thrombocytopenic purpura OR Upshaw-Schulman syndrome OR Moschcowitz disease OR microangiopathic hemolytic anemia OR thrombocytopenic purpura OR immune thrombocytopenic purpura OR familial thrombocytopenic purpura OR thrombotic microangiopathy
Guillain-Barré syndrome (including Miller Fisher Syndrome)	Guillain-Barré Syndrome (GBS) OR Miller Fisher syndrome (MFS) OR acute febrile polyneuritis OR acute idiopathic polyneuritis OR acute infectious polyneuritis OR acute postinfectious polyneuritis OR acute post-infectious polyneuritis
Chronic inflammatory demyelinating polyneuropathy	Chronic inflammatory demyelinating neuropathy OR chronic relapsing polyneuropathy OR CRP OR chronic inflammatory demyelinating polyradiculoneuropathy
Ankylosing spondylitis	Ankylosing spondylitis OR rheumatoid spondylitis OR spondyloarthropathy OR Bekhterev's disease OR Bechterew's disease OR morbus Bechterew OR Bekhterev Strumpell Marie disease OR Marie's disease OR Marie Strumpell arthritis OR Pierre Marie's disease
Reactive arthritis	Reactive arthritis OR Reiter's syndrome OR Reiter's disease OR Reiter's arthritis OR reactive arthropathies OR post infectious arthropath*
Anterior uveitis	Uveitis OR anterior uveitis OR iridocyclitis OR iritis
Crohn's disease	Crohn's disease OR Crohn's disease OR chronic colitis OR IBD OR inflammatory bowel disease
Ulcerative colitis	Ulcerative colitis OR chronic colitis OR IBD OR inflammatory bowel disease
Irritable bowel syndrome	Irritable Bowel Syndrome OR IBS
Celiac disease	Celiac disease OR gluten-sensitive enteropathy OR gluten-sensitive enteropathy OR coeliac OR sprue
Erythema nodosum	Erythema nodosum OR subacute migratory panniculitis of Vilanova AND Pinol
Neonatal listeriosis	Neonatal Listeriosis OR (listeriosis AND neonatal)
Graves' disease	Graves' disease OR Graves' disease OR toxic diffuse goiter

Table S2: Sequelae assessed during the chart review and their clinical criteria

Sequelae under review	Clinical criteria
Acute kidney injury	• Hematuria OR • Proteinuria OR • Elevated serum creatinine OR • eGFR less than 90
Hemolytic uremic syndrome	• Hemolytic anemia (hemolytic blood smear) AND • Acute kidney disease (as defined above) AND • Thrombocytopenia (platelets less than 150,000)
Thrombotic thrombocytopenic purpura	• Hemolytic anemia (hemolytic blood smear) AND • Acute kidney injury AND • Thrombocytopenia (platelets less than 150,000) AND • ADAMTS13 less than 10%
Guillain-Barré syndrome (GBS)	• Bilateral weakness AND • Decreased reflexes AND • Sensory changes AND • Monophasic/nadir less than 28 days AND • Nerve conduction study changes AND • No alternative diagnosis
Miller Fisher syndrome	• GBS AND • Ophthalmoplegia AND • Ataxia AND • Areflexia/hyporeflexia
Chronic inflammatory demyelinating polyneuropathy	• Sensory changes in more than two limbs AND • Ataxia lasting more than two months
Ankylosing spondylitis	Diagnosed by a rheumatologist

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Acute kidney injury	584.5, 584.6, 584.7, 584.8, 548.9	≥1 of any of the codes in any listed diagnoses from patient hospital discharge records	US	18 y.o. or older, Massachusetts General, Brigham and Women's Hospital in 2004 (n=300)	Chart review & compared to the serum creatinine—based definition of: 100% change in serum creatinine	35.4	97.7	47.9	96.1	(1) Waikar, 2006
					Chart review & compared to the serum creatinine—based definition of: Variable change depending on nadir serum creatinine (0.5, 1.0, and 1.5 mg/dl for nadir serum creatinine 1.9, 2.0 to 4.9, and 5.0 mg/dl, respectively)	28.3	99	80.2	91	
	572.4, 580.xx, 584.xx, 580.0, 580.4, 580.89, 580.9, 582.4, 791.2, 791.3	ICD code primary diagnosis of acute renal failure from insurance claims and hospitalization records	US	Seniors (≥65 y.o.) who are Medicare beneficiaries in Pennsylvania and enrolled in that state's Pharmaceutical Assistance Contract for the Elderly (PACE) in 1999 or 2000 (n=1,852)	Only used lab reference of eGFR <60mL/min/1.73m^2 for definition of chronic kidney disease	5.4 (4.2–6.6)	99.7 (99.2–100.0)	97.3 (93.5–100.0)	33.2 (31.0–35.3)	(2) Winkelmayer, 2005
Hemolytic uremic syndrome	283.11	≥1 code assigned in the year 2003 from IP and OP records	US	Patients in 8 large North Carolina acute care healthcare systems (1995–1997, 2000–2006) (n=24)	CDC criteria (MMWR 1997;46: No. RR-10) via chart review by epidemiologist	NR	NR	92.57 (67.3–98.69)	NR	(3) Sickbert-Bennett, 2010
	283.11	≥1 code as primary or secondary diagnosis (diarrhea-associated HUS) from hospital admission and discharge records	US	New York Hospital admission database (1998–1999) (n=421)	Chart review all relevant reports (blood smear, etc.)	65	NR	NR	NR	(4) Chang, 2004

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Thrombotic thrombocytopenic purpura (TTP)	446.6X	Patients with at least 1 TTP code as a primary diagnosis during hospital stay from hospitalization records	US	Patients identified by the claims code in the HealthCore Integrated Research database in the US (n=189)	Chart review	NR	NR	45.5 (38.3–52.9)	NR	(5) Wahl, 2010
Guillain-Barré syndrome (including Miller Fisher syndrome)	357.0 (G61.0)	One IP and 1 OP medical encounter in any diagnostic position from hospitalization records	US	Military Service members (active and reserved) and medical encounters on military associated populations (n=all active duty and reserve members since 1990)	Chart review (reference to Brighton case definition)	100 (NR)	88 (NR)	86 (NR)	NR	(6) Military Health System, 2015
		One IP medical encounter in any diagnostic position from hospitalization records				100 (NR)	81 (NR)	78 (NR)	NR	
		One IP and 1 OP medical encounter (both in the primary diagnostic position) from hospitalization records				92 (NR)	92 (NR)	88 (NR)	NR	
	357	Primary or secondary diagnosis of GBS from hospital discharge records	Italy	Patients of all ages in the Lombardy region who were discharged in 1996 (n=228)	Chart review & discharge records	91 (NR)	NR	55 (NR)	NR	(7) Bogliun, 2002
		Primary or secondary diagnosis of GBS from the neurology department from hospital discharge records				81.9 (NR)	NR	76.4 (NR)	NR	
		Primary diagnosis of GBS from hospital discharge records				79.7 (NR)	NR	61.8 (NR)	NR	

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Guillain-Barré syndrome (including Miller Fisher syndrome) (*continued*)	357	Presence of both major criteria for GBS (acute, progressive skeletal muscle paralysis and decreased or absent deep tendon reflexes) or the MFS variant of GBS (ophthalmoplegia, ataxia and areflexia) or presence of one of the two major criteria for a confirmed case and a diagnosis of GBS by a physician from hospitalization records	US	Vermont hospital patients of all ages from 1980–1985 (n=130)	Chart review	71 (NR)	NR	NR	NR	(8) Koobatian, 1991
		Primary diagnosis of GBS from hospitalization records				75 (NR)	NR	NR	NR	
	354.01 and 357	Primary diagnosis of GBS from hospitalization records	Sweden	Patients discharged from all hospital institutions serving the South-West Stockholm County health area during the period January 1973–June 1992 (n=83)	Chart review by a neurologist	NR	NR	84 (NR)	NR	(9) Jiang, 1995
		Secondary diagnosis of GBS (up to fifth level) from hospitalization records				NR	NR	75 (NR)	NR	
	357	Hospitalization with primary or secondary diagnosis and no evidence of a prior diagnosis of GBS	US	Tennessee Department of Health patients from all hospitals in the state from January 1, 2000–March 31, 2010 (n=1,561)	Chart review	81 (NR)	NR	45 (NR)	NR	(10) Lee, 2012

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Guillain-Barré syndrome (including Miller Fisher syndrome) (*continued*)	357.0	Overall (principal or secondary) diagnosis of GBS from hospital admission records	US	Medicare population (≥65 y.o. and <65 y.o. with disability or end-stage renal disease) who 1) received 2009 monovalent H1N1 influenza vaccine between October 1, 2009–March 26, 2010; 2) were admitted to the hospital for GBS within 126 days after vaccination; and 3) had no prior GBS hospitalization in the 12 months preceding vaccination (n=95)	Chart review	NR	NR	35.8 (NR)	NR	(11) Polakowski, 2013
		Principal diagnosis of GBS from hospital admission records				NR	NR	68.2 (NR)	NR	
		Secondary diagnosis of GBS from hospital admission records				NR	NR	7.8 (NR)	NR	
	357	Definite, probable, or possible GBS from hospitalization records	US	Enrolled in fee-for-service, Part A and Part B Medicare, residing in the US, Puerto Rico, and Island Areas, with an allowed claim for influenza vaccination, during September through December 2000 or 2001 who was admitted to the hospital for GBS as a primary or secondary diagnosis within 18 weeks after vaccination (n=637)	Chart review	NR	NR	82 (NR) (definite=21, probable=36, possible=25)	NR	(12) Burwen, 2010

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Guillain-Barré syndrome (including Miller Fisher syndrome) (*continued*)	357	At least 1 claim of GBS from hospitalization records	US	Adolescents ages 11–21 y.o., from five data environments (Aetna, HealthCore, Highmark Blue Cross Blue Shield of Pennsylvania, Kaiser Permanente Center for Health Research of Hawaii, and OptumInsight) from March 1, 2005–August 31, 2008 (n=361)	Chart review by a panel of neurologists	NR	NR	29 (25–34)	NR	(13) Funch, 2013
		At least 1 claim of GBS during an IP visit from hospitalization records				NR	NR	50 (42–57)	NR	
		Primary diagnostic code for GBS from hospitalization records				NR	NR	56 (47–64)	NR	
		Neurologist OP visit and primary diagnostic code for GBS from hospitalization records				NR	NR	70 (59–80)	NR	
		Neurologist OP visit associated with date of first GBS diagnosis from hospitalization records				NR	NR	38 (28–50)	NR	
	357	Hospital admissions records based on ICD-9-CM code 357.0 as their principal diagnosis	Spain	Spanish patients (≥20 y.o.) admitted from 2009–2011 (n=148)	Chart review	75 (67–82)	NR	82 (57–96)	NR	(14) Alcalde-Cabero, 2016

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Guillain-Barré syndrome (including Miller Fisher syndrome) (*continued*)	357	Presence of both major criteria for GBS (acute, progressive skeletal muscle paralysis and decreased or absent deep tendon reflexes) or the MFS variant of GBS (ophthalmoplegia, ataxia and areflexia) or presence of one of the two major criteria for a confirmed case and a diagnosis of GBS by a physician from hospitalization records	US	Vermont hospital patients of all ages from 1980–1985 (n=130)	Chart review	71 (NR)	NR	NR	NR	(8) Koobatian, 1991
Chronic inflammatory demyelinating poly-neuropathy	357.81 (G61.8)	One ICD code and received an ultrasound from a diagnostic neurology laboratory. Electrodiagnostic and ultrasound findings were reviewed for those with specific codes	US	Wake Forest Baptist Medical Center from January 2000–August 2017 (n=148)	Chart review	NR	NR	42 (definitive=56) (definitive + possible)	NR	(15) Crump, 2018
Ankylosing spondylitis	720.0	≥1 ICD code from OP medical clinic records	US	All patients seen at the Minneapolis VA Medical Center Rheumatology Clinic between January 1, 2001, and July 31, 2002 (n=184)	Chart review by rheumatologist	91 (87–95)	99 (97–100)	83 (78–89)	99 (98–100)	(16) Singh, 2007

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Ankylosing spondylitis (*continued*)	720.0 (*continued*)	≥1 ICD code + DMARD (disease-modifying antirheumatic drug) from OP medical clinic records	US (*continued*)	All patients seen at the Minneapolis VA Medical Center Rheumatology Clinic between January 1, 2001, and July 31, 2002 (n=184) (*continued*)	Chart review by rheumatologist (*continued*)	27 (21–34)	99 (98–100)	75 (69–81)	96 (93–98)	(16) Singh, 2007 (*continued*)
		≥2 ICD codes from OP medical clinic records				82 (76–87)	100	100	99 (97–100)	
		≥2 ICD codes + DMARD from OP medical clinic records				27 (21–34)	100	100	96 (93–99)	
	720	≥1 AS code from GP records, hospitalizations and prescription records	United Kingdom	18–59 y.o., at least one year enrollment in THIN both before and after the first AS diagnosis, and at least one GP visit after AS diagnosis (n=85)	GP-confirmed via questionnaire (also did with the gold standard being ASAS criteria or confirmed by rheumatologist yielding lower PPVs)	NR	NR	71.8 (61–81)	NR	(17) Dubreuil, 2016
		Two AS codes ≥7 days apart from GP records, hospitalizations and prescription records				63.9 (50.1–75.8)	NR	88.6 (75.4–96.2)	NR	
		≥1 AS code & absence of osteoarthritis code from GP records, hospitalizations and prescription records				95.1 (89.5–100)	NR	75.3 (76.0–97.3)	NR	
		≥1 AS code & absence of rheumatoid arthritis code from GP records, hospitalizations and prescription records				95.1 (89.5–100)	NR	72.5 (61.0–84.0)	NR	

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Ankylosing spondylitis (*continued*)	720 (*continued*)	≥1 AS code & DMARD or biological prescription from GP records, hospitalizations and prescription records	United Kingdom (*continued*)	18–59 y.o., at least one year enrollment in THIN both before and after the first AS diagnosis, and at least one GP visit after AS diagnosis (n=85) (*continued*)	GP-confirmed via questionnaire (also did with the gold standard being ASAS criteria or confirmed by rheumatologist yielding lower PPVs) (*continued*)	29.5 (18.5–42.6)	NR	85.7 (63.7–97.0)	NR	(17) Dubreuil, 2016 (*continued*)
		≥1 AS code & NSAID from GP records, hospitalizations and prescription records				98.4 (95.1–100)	NR	71.4 (60.0–82.9)	NR	
	720 (M45) **714 (M05, M06, M08)	One hospitalization or ≥2 diagnoses in 2 years by any provider ≥8 weeks apart from the paediatric rheumatology clinical database records	Canada (Manitoba)	Paediatric (≤15 y.o.) rheumatology clinical database from April 1, 1980–March 31, 2012 (n=1,122) **This study included codes for RA and juvenile arthritis	Chart review	89.2 (86.8–91.6)	86.3 (83–89.6)	90.6 (88.3–92.9)	NR	(18) Shiff, 2017
	720.x	≥2 diagnoses in primary care or ≥1 diagnosis in rheumatology from clinical encounter data including OP, hospitalization and lab records	US	≥18 y.o. with at least 12-month enrollment in Kaiser Permanente Northern California database from 1996–2009 (n=2,603)	Medical record abstraction + review	100	NR	62 (60–64)	NR	(19) Curtis, 2016
		≥2 diagnoses from any department from clinical encounter data including OP, hospitalization and lab records				96 (95–97)	NR	66 (64–68)	NR	
		≥1 diagnosis from rheumatology from clinical encounter data including OP, hospitalization and lab records				72 (70–74)	NR	73 (71–76)	NR	

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Ankylosing spondylitis (*continued*)	720.x (*continued*)	≥2 diagnoses from rheumatology from clinical encounter data including OP, hospitalization and lab records	US (*continued*)	≥18 y.o. with at least 12-month enrollment in Kaiser Permanente Northern California database from 1996–2009 (n=2,603) (*continued*)	Medical record abstraction + review (*continued*)	67 (64–69)	NR	81 (79–83)	NR	(19) Curtis, 2016 (*continued*)
	720A (M45)	≥1 diagnosis from a specialist in rheumatology or internal medicine from a visit with these professionals or from hospitalization records	Sweden	Swedish National Patient Register (1996–2009) who were alive and resided in Sweden in 2009 (n=499)	Chart review and fulfilment of mNY criteria	NR	NR	70.4 (NR)	NR	(20) Lindström, 2015
					Chart review and fulfilment of ASAS-axial/peripheral criteria	NR	NR	78.9 (NR)	NR	
					Chart review and fulfilment of Amor criteria	NR	NR	82.8 (NR)	NR	
Reactive arthritis	099.3, 711.11-711.19	≥1 ICD code from OP medical clinic records	US	All patients seen at the Minneapolis VA Medical Center Rheumatology Clinic between January 1, 2001, and July 31, 2002 (n=184)	Chart review by rheumatologist	71 (65–78)	100 (NR)	100 (NR)	99 (97–100)	(16) Singh, 2007
		≥1 ICD code + DMARD (disease-modifying antirheumatic drug) from OP medical clinic records				57 (50–64)	100 (NR)	100 (NR)	98 (96–100)	
		≥2 ICD codes from OP medical clinic records				57 (50–64)	100 (NR)	100 (NR)	98 (96–100)	
		≥2 ICD codes + DMARD from OP medical clinic records				57 (50–64)	100 (NR)	100 (NR)	98 (96–100)	
Anterior uveitis	364.x	≥1 billing of the relevant ICD code during the study period from physician billing records	US	Kaiser Permanente Hawaii EMR (January 1, 2006–December 31, 2007) (n=366)	Medical chart review	NR	NR	55 (50–60)	NR	(21) Pimentel, 2016
	364.00							30		
	364.01							60		
	364.02							96		
	364.04							36		

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Crohn's disease	555.x	Patients with IBD, defined as having at least 3 diagnoses of CrD within 2 years (or ≥5 diagnoses over 2 years) from physician billing and hospitalization records	Canada (Manitoba)	All Manitoba residents from April 1, 1984–March 31, 1995 (n= 5,182)	Chart review	89.2 (84.2–92.8)	89.8 (84.9–93.3)	NR	NR	(22) Bernstein, 1999
	555.x	Combined CrD model from OP and hospitalization records	US	Massachusetts General Hospital and Brigham and Women's Hospital patients (n=600)	Chart review	69 (65–74)	97 (96–100)	98 (97–100)	NR	(23) Ananthakrishnan, 2013
		Five separate CrD ICD-9 codes from OP and hospitalization records				66 (61–71)	88 (82–92)	91 (88–94)	NR	
		Patients with 1 OP/IP CrD ICD-9 code and 1 endoscopy from OP and hospitalization records				53 (48–58)	81 (75–86)	85 (80–89)	NR	
		Patients with 4 OP or 2 IP CrD ICD-9 codes from OP and hospitalization records				65 (60–70)	88 (83–92)	92 (88–95)	NR	
	555.x	Patients diagnosed with at least 1 code from OP and hospitalization records	US	Ann Arbor and Houston Medical Centres from 1999–2009 (n=1,871)	Chart review	NR	NR	0.6	NR	(24) Hou, 2014

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Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Crohn's disease (*continued*)	555.x (*continued*)	Patients diagnosed with 5 codes from OP and hospitalization records	US (*continued*)	Ann Arbor and Houston Medical Centres from 1999–2009 (n=1,871) (*continued*)	Chart review (*continued*)	NR	NR	91	NR	(24) Hou, 2014 (*continued*)
		Patients diagnosed with 2 codes, ≥1 OP from OP and hospitalization records				NR	NR	84	NR	
		Patients diagnosed with 2 OP or 1 IP from OP and hospitalization records				NR	NR	82	NR	
		Patients with 2 OP and 1 IP from OP and hospitalization records				NR	NR	91	NR	
Ulcerative colitis	556.x	Patients with IBD, defined as having at least 3 diagnoses of UC within 2 years (or ≥5 diagnoses over 2 years) from physician billing and hospitalization records	Canada (Manitoba)	All Manitoba residents from April 1, 1984–March 31, 1995 (n=5,182)	Chart review	74.4 (67.3–80.5)	93.7 (89.9–96.1)	NR	NR	(22) Bernstein, 1999
	556.x	Patients diagnosed with at least 1 code from OP and hospitalization records	US	Ann Arbor and Houston Medical Centres from 1999–2009 (n=1,871)	Chart review	NR	NR	67	NR	(32) Hou, 2014
		Patients diagnosed with 5 codes from OP and hospitalization records				NR	NR	94	NR	

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Ulcerative colitis (*continued*)	556.x (*continued*)	Patients with 2 codes, at least 1 OP from OP and hospitalization records	US (*continued*)	Ann Arbor and Houston Medical Centres from 1999–2009 (n=1,871) (*continued*)	Chart review (*continued*)	NR	NR	91	NR	(32) Hou, 2014 (*continued*)
		Patients with 2 OP or 1 IP from OP and hospitalization records				NR	NR	83	NR	
		Patients with 2 OP and 1 IP from OP and hospitalization records				NR	NR	94	NR	
	556.x	Combined UC model from OP and hospitalization records	US	600 randomly selected Massachusetts General Hospital and Brigham and Women's Hospital patients (n=600)	Chart review	79 (75–83)	97 (95–100)	97 (97–100)	NR	(23) Ananthakrishnan, 2013
		Patients with 5 separate UC ICD-9 codes from OP and hospitalization records				67 (62–71)	88 (83–92)	90 (86–94)	NR	
		Patients with 1 OP/IP UC ICD-9 code and 1 endoscopy from OP and hospitalization records				51 (46–56)	85 (79–89)	85 (80–89)	NR	
		Patients with 4 OP or 2 IP UC ICD-9 codes from OP and hospitalization records				66 (61–72)	86 (81–91)	89 (85–93)	NR	

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Inflammatory bowel disease	555.X, 556.X (K50.0, K50.1, K50.8, K50.9, K51)	Patients with at least 1 hospitalization or 4 physician claims with an IBD diagnostic code within a two-year period from physician billing, OP and hospitalization records	Canada (Alberta)	Endoscopy database patients in Calgary from May 2000–March 2004 (n=1,399)	Chart review + endoscopy	77.98 (75.72–80.13)	99.8 (99.72–99.86)	97.24 (96.10–98.12)	98.04 (97.81–98.25)	(25) Rezaie, 2012
	555, 556 (K50, K51)	MS patients with ≥1 code for IBD from physician billing and hospitalization records	Canada (Nova Scotia)	Patients attending Dalhousie Multiple Sclerosis Research Unit in Nova Scotia from 1990–2010 (n=1,923)	Self-reported data	59 (41–76)	100	90 (90.7–99)	99 (99–1.0)	(26) Marrie, 2014
		MS patients with ≥3 codes for IBD from physician billing and hospitalization records				60 (41–76)	100	91 (90.7–99)	100 (99–1.0)	
	555.x, 556.x (K50.x, K51.x)	Patients with 4 physician contacts or 2 hospitalizations (with ICD codes) within 3 years if they underwent colonoscopy and 7 contacts or 3 hospitalizations within 3 years in those without colonoscopy from physician billing and hospitalization records	Canada (Ontario)	Patients less than 18 years of age from a database of 12 participating medical practices from 1991–2008 (n=1,710,212)	Chart review at several practice settings	<12 y.o. (90.5)	<12 y.o. (>99.9)	<12 y.o. (66.7)	<12 y.o. (>99.9)	(27) Benchimol, 2009
						<15 y.o. (89.6)	<15 y.o. (>99.9)	<15 y.o. (51.2)	<15 y.o. (>99.9)	
						<18 y.o. (91.1)	<18 y.o. (99.5)	NR	NR	

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Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Inflammatory bowel disease (*continued*)	555.x, 556.x (K50.x, K51.x) (*continued*)	Patients with any contact or hospitalization for IBD from physician billing and hospitalization records	Canada (Ontario) (*continued*)	Patients less than 18 years of age from a database of 12 participating medical practices from 1991–2008 (n=1,710,212) (*continued*)	Chart review at several practice settings (*continued*)	<12 y.o. (99.3)	<12 y.o. (99.8)	<12 y.o. (7.7)	<12 y.o. (>99.9)	(27) Benchimol, 2009 (*continued*)
						<15 y.o. (99.5)	<15 y.o. (99.8)	<15 y.o. (7.9)	<15 y.o. (>99.9)	
						<18 y.o. (98.5)	<18 y.o. (89.2)	NR	NR	
	555.x, 556.x,	Patients with any of the following: 1) ≥1 diagnostic code of 555 (CrD) 2) ≥1 diagnostic codes of 556 (UC), 3) mixed CrD + UC codes, 4) dispensing for mesalamine, olsalazine, or balsalazide without a diagnosis code indicating CrD or UC from OP or hospitalization records	US	HMORN CERT core dataset participants (contains a representative sample of about 200,000 health plan members who had prescription coverage during the 30-month period) from January 1, 1999, through June 30, 2001 (n=400)	Chart review	Plan C: 91	NR	Plan C: 81	NR	(28) Herrinton, 2007
		Patient with ≥2 recorded diagnosis codes from OP or hospitalization records				Plan H: 99		Plan H: 84		
	555.x, 556.x	Patients diagnosed with at least 1 code from OP and hospitalization records	US	Ann Arbor and Houston Medical Centres from 1999–2009 (n=1,871)	Chart review	NR	NR	6	NR	(24) Hou, 2014
		Patients diagnosed with at least 5 codes from OP and hospitalization records				NR	NR	6	NR	

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Inflammatory bowel disease (*continued*)	555.x, 556.x (*continued*)	Patients with 2 codes, at least 1 OP from OP and hospitalization records	US (*continued*)	Ann Arbor and Houston Medical Centres from 1999–2009 (n=1,871) (*continued*)	Chart review (*continued*)	NR	NR	6	NR	(24) Hou, 2014 (*continued*)
		Patients with 2 OP or 1 IP from OP and hospitalization records				NR	NR	6	NR	
		Patients with 2 OP and 1 IP from OP and hospitalization records				NR	NR	6	NR	
	555, 555.1-2, 555.9, 556, 556.1-6, 556.8 -9, 686.01, 695.2, 528.2, 713.1, 537.4, 569.81, 569.49, 569.89, 560.9, 558.9	Patients diagnosed with an UC ICD code from OP, IP and prescription records	US	Veterans with IBD are referred to this center from VA facilities across the southeastern US in 2007 (n=3,827)	Chart review by gastroenterologist and a trained clinician	84	99	82	NR	(29) Thirumurti, 2010
		Patients diagnosed with CrD ICD code from OP, IP and prescription records				92	99	91	NR	
	555.x, 556.x	IP or OP visits to primary care or gastroenterology coded 555 or 556 from OP and IP records	US	All patients of Kaiser Permanente between 1996–2002 (n=2,906)	Chart review	100	NR	81 (80–83)	NR	(30) Liu, 2009
		OP visits coded 555 or 556 from OP and IP records				94 (93–95)	NR	85 (83–86)	NR	

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Inflammatory bowel disease (*continued*)	555.x, 556.x (*continued*)	OP visits to gastroenterology coded 555 or 556 from OP and IP records	US (*continued*)	All patients of Kaiser Permanente between 1996–2002 (n=2,906) (*continued*)	Chart review (*continued*)	74 (72–76)	NR	89 (87–90)	NR	(30) Liu, 2009 (*continued*)
		IP or OP visits coded 555 or 556 plus IBD-related drugs from OP and IP records				83 (82–85)	NR	90 (89–91)	NR	
		IP or OP visits coded 555 or 556 plus endoscopy from OP and IP records				77 (76–79)	NR	83 (82–85)	NR	
		≥2 visits coded 555 or 556, or 1 such visit with either IBD-related drug or endoscopy from OP and IP records				97 (97–98)	NR	84 (83–86)	NR	
Irritable bowel syndrome	564.1	Any service associated with IBS excluding any prior physician service code for CrD, UC, etc. (see below)	US	20 years or older, part of four health plans from January 1995–December 1999 (n=120)	Chart review + endoscopy/ laboratory studies	98.9 (94.3–100)	NR	91.3 (84.1–95.9)	NR	(31) Sands, 2006
	564.1	Patients diagnosed with IBS or had been given a code of 564.1 with no prior history from OP clinic records	US	Wisconsin residents that were patients from 1993–2003 (n=890)	Clinic notes and electronic medical records	NR	NR	67	NR	(32) Yale, 2008

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Inflammatory bowel syndrome (*continued*)	(K58.9)	Patients receiving 1 code for IBS during hospital-based OP care in 2005, according to Rome II criteria from OP medical records. Individuals diagnosed with predefined diagnoses incompatible with IBS, during a time span of 6 months before or after the IBS diagnosis was excluded	Sweden	18 years or older, Sweden based outpatients during 2005 and 2010 that were in the Swedish National Patient Register (n=248)	Chart review using Rome II criteria (2005 cohort) or Rome III criteria (2010 cohort)	68	NR	NR	NR	(33) Jossan, 2014
		Patients receiving 1 code for IBS during hospital-based OP care in 2010, according to Rome III criteria from OP medical records. Individuals diagnosed with predefined diagnoses incompatible with IBS, during a time span of 6 months before or after the IBS is diagnosis was excluded				72	NR	NR	NR	

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Inflammatory bowel syndrome (*continued*)	564.1	≥1 diagnosis of IBS (ICD-9 564.1) identified from OP or IP-derived administrative data	US	18 years or older, patients enrolled in nine geographically dispersed health plans participating in the HMO Research Network Center for Education and Research on Therapeutics between May 1, 2002, and September 15, 2002 (n=321)	Medical record abstraction + review	NR	NR	63 (53–73)	NR	(34) Goff, 2008
		≥1 diagnosis of IBS and at least one dispensing of a laxative available by prescription (lactulose, PEG-electrolyte, and sorbitoldalone or in combination), antidiarrheals (diphenoxylate, kaolin, and pectindalone or in combination), antispasmodics (belladonna, scopolamine hydrobromide, opium, paregoric, dicyclomine hydrochloride, and hyoscamine sulfatedalone or in combination), 5-HT3 receptor antagonist (alosetron), or a 5-HT4 receptor agonist (tegaserod) from OP or hospitalization records				NR	NR	67 (57–77)	NR	

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Inflammatory bowel syndrome (*continued*)	564.1 (*continued*)	≥2 IBS diagnoses occurring at least 6 months apart identified from OP or IP data from OP or hospitalization records	US (*continued*)	18 years or older, patients enrolled in nine geographically dispersed health plans participating in the HMO Research Network Center for Education and Research on Therapeutics between May 1, 2002, and September 15, 2002 (n=321) (*continued*)	Medical record abstraction + review (*continued*)	NR	NR	75 (66–84)	NR	(34) Goff, 2008 (*continued*)
		≥1 diagnosis of IBS identified from OP or IP data, at least 1 diagnosis of abdominal pain (ICD-9 789.0), and one other GI symptom (either diarrhea [ICD-9 564.5, 787.91] or constipation [ICD-9 564.0]) from OP or hospitalization records				NR	NR	83 (75–91)	NR	
		Patients with at least 1 diagnosis of IBS and 1 diagnosis of abdominal pain with at least one other GI symptom and at least 1 dispensing of any medication listed in criterion 2nd criterion: above from OP or hospitalization records				NR	NR	76 (67–85)	NR	

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Inflammatory bowel syndrome (*continued*)	564.1	Patients enrolled in a large health maintenance organization between January 1, 1997–June 30, 1999, who had ≥1 claim with ICD 564.1 in 1998 from insurance claims records	US	18 years or older enrolled in a health maintenance organization in California from January 1, 1997–June 30, 1999	NR (abstract only)	NR	NR	70 (18–100)	NR	(35) Legorreta, 2002
	564.1	1 code for IBS (564.1) with 1) no clinical or objective evidence of organic intestinal pathology including malignancy, IBD, GI infection, or celiac sprue; 2) no alarm signs of symptoms, including unintended weight loss, GI bleeding, or evidence of anemia; and 3) reported symptoms consistent with Rome criteria for IBS including recurrent abdominal pain/discomfort and repeated defecatory symptoms for a minimum duration of 6 months	US	All patients with diverticulitis from the Veterans Affairs Greater Los Angeles Healthcare System. Patients with prior IBS, functional bowel, or mood disorders were excluded.	Chart review of random sample of subjects	95.8	99.2	92	99.6	(36) Cohen 2013

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Celiac disease	579	Patients with OHIP endoscopy billing claim follow by ≥1 adult or paediatric gastroenterologist encounter after the endoscopic procedure from physician billing records	Canada (Ontario)	Biopsy proven CeD diagnoses from 2005–2011 in Ottawa	Chart review + endoscopy	70.4 (61.1–78.4)	99.9 (>99.9–>99.9)	53.3 (45.1–61.4)	99.9 (>99.9–>99.9)	(37) Chan, 2017
		Patients with scope (presence of endoscopy code indicated for CeD) and ≥1 GI OP contacts from physician billing records				71.3 (62.0–79.2)	99.9 (>99.9–>99.9)	92.1 (83.9–96.5)	(>99.9–>99.9)	
	579	Patient met diagnosis criteria from OP and hospitalization records	US	Active duty US military personnel between 2005–2011 (n=250)	Chart review + abstraction	NR	NR	63 (56–69)	NR	(38) Hall, 2016
		Patients diagnosed by a gastroenterologist from OP and hospitalization records				NR	NR	76	NR	
		Patient was not diagnosed by a gastroenterologist from OP and hospitalization records				NR	NR	47	NR	
		Patients with ≥3 encounters from OP and hospitalization records				NR	NR	77	NR	

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Celiac disease (*continued*)	579	Patients with an ICD-9-CM diagnosis code from laboratory records at the hospital	US	18 years or older, patients of Massachusetts General Hospital, Brigham and Women's Hospital, and Beth Israel Deaconess Medical Centre between January 2000–December 2010 (n=1,200)	Medical record abstraction + review	15 (13–17)	NR	4 (2–7)	NR	(39) Tanpowpong, 2013
		Patients with an ICD-9-CM diagnosis code with the presence performed serology from laboratory records at the hospital				NR	NR	11 (8–15)	NR	
		Patients with an ICD-9-CM diagnosis code(s) with the performance of endoscopy code from laboratory records at the hospital				NR	NR	12 (9–17)	NR	
		Patients with an ICD-9-CM diagnosis code(s) with the presence of both performed serology and UGIE from laboratory records at the hospital				NR	NR	49 (43–55)	NR	
	(K90.0)	Registered children in the Danish National Patient Register as having celiac disease from pathology records at the hospital	Denmark	Danish patients in the Danish National Patient Register that were born between 1995–2012 (n=1,555)	Chart review (pathology report + CeD-specific antibodies)	NR	NR	62 (only definite diagnoses)	NR	(40) Sander, 2016

Table S3: Results of the literature review to identify International Classification of Diseases code-based case definitions for enteric infection sequelae (*continued*)

Sequelae	ICD-9/ICD-10 codes	Administrative case definition	Country	Eligible population (n)	Reference/gold standard	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Reference
Celiac disease (*continued*)	(K90.0) (*continued*)	Registered children in the Danish National Patient Register as having celiac disease (excluding tentative diagnoses) from pathology records at the hospital	Denmark (*continued*)	Danish patients in the Danish National Patient Register that were born between 1995–2012 (n=1,555) (*continued*)	Chart review (pathology report + CeD-specific antibodies) (*continued*)	NR	NR	66 (only definite diagnoses)	NR	(40) Sander, 2016 (*continued*)
		Registered children in the Danish National Patient Register as having celiac disease (≥2 registrations) from pathology records at the hospital				NR	NR	74 (only definite diagnoses)	NR	
		Registered children in the Danish National Patient Register as having celiac disease (no registrations) from pathology records at the hospital				NR	NR	64 (only definite diagnoses)	NR	

Abbreviations: AS, ankylosing spondylitis; ASAS, Assessment of Spondyloarthritis International Society; CDC; Centers for Disease Control; CeD, celiac disease; CI, confidence interval; CIDP, chronic inflammatory demyelinating polyneuropathy; CM, clinical modification; CrD; Crohn's disease; DMARD, disease-modifying antirheumatic drugs; eGFR, estimated glomerular filtration rate; EMR, electronic medical record; GI, gastrointestinal; GBS, Guillain-Barré syndrome; GP, general practitioner; HMO, Health Maintenance Organization; HMORN CERT, Health Maintenance Organization Research Network Center for Education and Research Therapeutics; HUS, hemolytic uremic syndrome; ICD, International Classification of Diseases; IBD, inflammatory bowel disease; IBS, irritable bowel syndrome; IP, inpatient; MFS, Miller-Fisher syndrome; MMWR, Morbidity and Mortality Weekly Report; MS, multiple sclerosis; NPV, negative predictive value; NR, not reported; NSAID, non-steroidal anti-inflammatories; OP, outpatient; PEG, polyethylene-glycol; PPV, positive predictive value; RA, reactive arthritis; UC, ulcerative colitis; UGIE, upper gastrointestinal endoscopy; US, United States; y.o., years old

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