

Improving antimicrobial prescribing for upper respiratory infections in the emergency department: implementation of behavioral feedback

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Objective

The main intent of this quality improvement project is to implement proven behavioral methods for reducing antibiotic prescribing rates for non-antibiotic appropriate upper respiratory infections (URIs).

Background

Upper respiratory infections (URIs) account for approximately 10% of all outpatient visits in the United States (1). Emergency departments (EDs), though accounting for fewer visits, have a per-visit antibiotic prescribing rate that is nearly double that of office-based clinicians (Figure 1). Despite clear, evidence-based guidelines for antibiotic prescribing for URIs, approximately 50% of all outpatient antibiotic prescriptions for URIs are considered unnecessary (2). The appropriateness of antibiotic prescribing varies widely in inpatient and outpatient settings both between practices/hospitals and between clinicians within those practices (2–7). A recent study of the antibiotic prescribing practices for URIs at the JHMI EDs (7) found high variability between clinicians (Figure 2).

Unnecessary antibiotic use places patients at risk for avoidable adverse events (8–10) while accelerating the emergence of antibiotic resistance, both for individual patients and for society as a whole (11–14). Interventions, such as physician and patient education, computerized clinical decision support, and financial incentives, have historically produced only modest reductions in antibiotic prescription rates (15,16). Technological interventions using electronic health records (EHRs), such as alerts and reminders, can contribute to information overload and are often disruptive and ignored (17). Several studies have shown the effectiveness of provider feedback to reduce inappropriate antibiotic prescribing in the outpatient setting (15,18,19). These results are in line with the large body of literature showing the effectiveness of peer comparison in medicine to effect changes in clinician behavior (20). To that end, we are attempting to implement a provider feedback intervention in the adult emergency departments of the Johns Hopkins Medical Institutions. This document describes the methods we used to generate the prescribing rates as well as the planned quality improvement intervention.

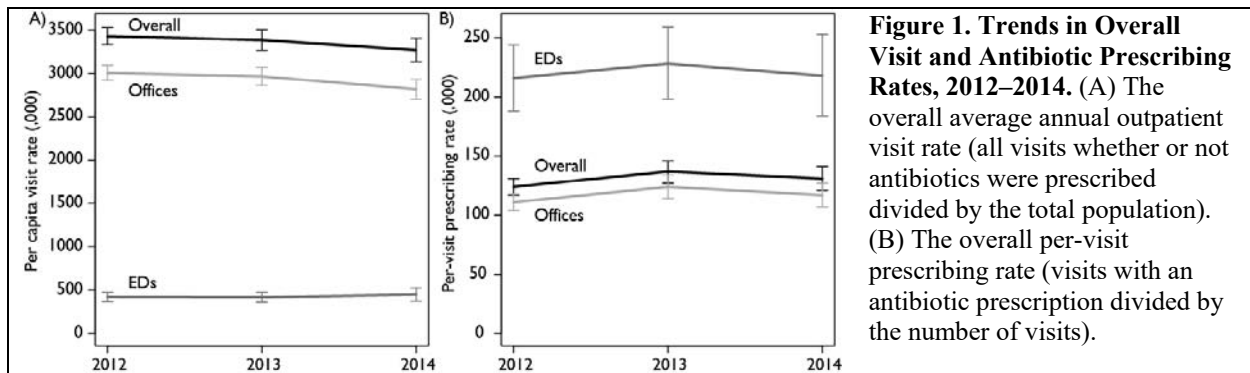


Figure 1. Trends in Overall Visit and Antibiotic Prescribing Rates, 2012–2014. (A) The overall average annual outpatient visit rate (all visits whether or not antibiotics were prescribed divided by the total population). (B) The overall per-visit prescribing rate (visits with an antibiotic prescription divided by the number of visits).

Methods

Following the methods of the behavioral intervention by Meeker et al (15), we have developed a list of upper respiratory diagnoses for which the prescription of antibiotics is considered inappropriate (Table 1). The list was compiled and vetted by several emergency department clinicians and infectious disease clinicians practicing in the Johns Hopkins system. Because patients can have multiple diagnoses for an encounter, we also compiled a list of exclusionary diagnoses for which the provision of antibiotics are or may be required. These diagnoses were split into respiratory related diagnoses (Table 2) and non-respiratory diagnoses (Table 3).

Inclusion/Exclusion Criteria

Patient encounters with patients aged 18 or older which included a diagnosis on the inappropriate list (Table 1) were included if they did not also have a diagnosis on one of the exclusion lists (Tables 2 & 3). All encounters starting on October 1, 2015 to present were included. The 10/2015 date was due to the change in the diagnosis billing codes used from ICD9 to ICD10.

Measuring the Inappropriate Prescribing Rate

For every included encounter, prescribed medications were extracted and classified by therapeutic and pharmaceutical class. Only systemic antibiotics (J01 class) were included, i.e., topical antibiotics were not included. Only prescriptions written for discharged patients were included, antibiotics given in the department were excluded. For each clinician the inappropriate prescribing rate is calculated as the number of included encounters with an antibiotic prescription divided by the total number of included encounters. Because attendings often supervise residents, we provide their rate when they are working alone and with residents. For the former, this includes any encounter in which the clinician is the only clinician of record (i.e., no residents/physician assistants/fellows are on the chart, though the screening clinician may be different). For the latter, the rate includes both encounters in which they are the only clinician of record and where there was at least one resident on the chart that they were supervising (but no fellows or PA). Encounters in which there are multiple attendings on the chart (except for the screening provider) are excluded in all cases. For physician assistants (PA), similar logic to the attendings is used; they must be the only PA on the record and there cannot be any residents/fellows on the chart (by law there is an attending on the chart, but PAs largely practice independently). Nurse practitioners are included with the PAs. There must have been at least five encounters during the period in question to calculate a rate.

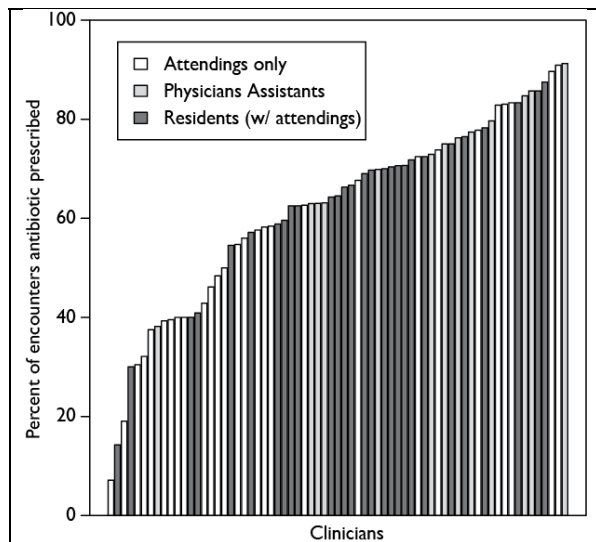


Figure 2. Variation in antibiotic prescribing rates among clinicians, separated by provider type.

Each bar represents the antibiotic prescribing rate for respiratory tract infections for an individual attending, resident, or physician assistant. Attendings are represented by white bars, physician assistants by grey bars, and residents by black bars. Antibiotic prescribing varied widely among clinicians for all three provider types. Adapted from Klein et al. (7).

In addition to the inappropriate prescribing rate, we also calculate the overall URI prescribing rate (all diagnoses in Table 1 and 2) and the prescribing rates for diagnoses that have clear evidence-based guidelines for when antibiotics are appropriate, specifically pharyngitis and sinusitis.

Table 1: Diagnostic Codes Used to Categorize Encounters Where Antibiotics are Inappropriate

ICD10		
Diagnosis Code	Diagnosis	Category
J00	Acute nasopharyngitis [common cold]	ARI
J04.0	Acute laryngitis	ARI
J04.2	Acute laryngotracheitis	ARI
J06.0	Acute laryngopharyngitis	ARI
J06.9	Acute upper respiratory infection, unspecified	ARI
J09.X2	Influenza due to identified novel influenza A virus	Influenza
J10.1	Influenza due to other identified influenza virus	Influenza
J10.2	Influenza due to other identified influenza virus	Influenza
J11.1	Influenza due to unidentified influenza virus with oth resp manifest	Influenza
J11.2	Influenza due to unidentified influenza virus with GI manifest	Influenza
J11.89	Influenza due to unidentified influenza virus with oth manifest	Influenza
J20.3	Acute bronchitis due to coxsackievirus	Bronchitis*
J20.4	Acute bronchitis due to parainfluenza virus	Bronchitis*
J20.5	Acute bronchitis due to respiratory syncytial virus	Bronchitis*
J20.6	Acute bronchitis due to rhinovirus	Bronchitis*
J20.7	Acute bronchitis due to echovirus	Bronchitis*
J20.8	Acute bronchitis due to other specified organisms	Bronchitis*
J20.9	Acute bronchitis, unspecified	Bronchitis*
J21.0	Acute bronchiolitis due to respiratory syncytial virus	Bronchitis*
J21.1	Acute bronchiolitis due to human metapneumovirus	Bronchitis*
J21.8	Acute bronchiolitis due to other specified organisms	Bronchitis*
J21.9	Acute bronchiolitis, unspecified	Bronchitis*
J40	Bronchitis, not specified as acute or chronic	Bronchitis*
J30.0	Vasomotor rhinitis	Other
J30.1	Allergic rhinitis due to pollen	Other
J30.2	Other seasonal allergic rhinitis	Other
J30.5	Allergic rhinitis due to food	Other
J30.81	Allergic rhinitis due to animal (cat) (dog) hair a	Other
J30.89	Other allergic rhinitis	Other
J30.9	Allergic rhinitis, unspecified	Other
J31.0	Chronic rhinitis	Other
J31.1	Chronic nasopharyngitis	Other
J33.0	Polyp of nasal cavity	Other
J33.1	Polypoid sinus degeneration	Other

J33.8	Other polyp of sinus	Other
J33.9	Nasal polyp, unspecified	Other
J34.1	Cyst and mucocele of nose and nasal sinus	Other
J34.2	Deviated nasal septum	Other
J34.3	Hypertrophy of nasal turbinates	Other
J34.81	Nasal mucositis (ulcerative)	Other
J34.89	Other specified disorders of nose and nasal sinuse	Other
J34.9	Unspecified disorder of nose and nasal sinuses	Other
J35.01	Chronic tonsillitis	Other
J35.02	Chronic adenoiditis	Other
J35.03	Chronic tonsillitis and adenoiditis	Other
J35.1	Hypertrophy of tonsils	Other
J35.2	Hypertrophy of adenoids	Other
J35.3	Hypertrophy of tonsils with hypertrophy of adenoid	Other
J35.8	Other chronic diseases of tonsils and adenoids	Other
J35.9	Chronic disease of tonsils and adenoids, unspecifi	Other
J37.0	Chronic laryngitis	Other
J37.1	Chronic laryngotracheitis	Other
J38.00	Paralysis of vocal cords and larynx, unspecified	Other
J38.01	Paralysis of vocal cords and larynx, unilateral	Other
J38.02	Paralysis of vocal cords and larynx, bilateral	Other
J38.1	Polyp of vocal cord and larynx	Other
J38.2	Nodules of vocal cords	Other
J38.3	Other diseases of vocal cords	Other
J38.4	Edema of larynx	Other
J38.5	Laryngeal spasm	Other
J38.6	Stenosis of larynx	Other
J38.7	Other diseases of larynx	Other
J39.2	Other diseases of pharynx	Other
J39.3	Upper respiratory tract hypersensitivity reaction, site unsp	Other
J39.8	Other specified diseases of upper respiratory tract	Other
J39.9	Disease of upper respiratory tract, unspecified	Other
B34.9	Viral infection, unspecified	Other
R09.81	Nasal congestion	Other
R09.82	Postnasal drip	Other
B97.4	Respiratory syncytial virus as the cause of disease classified elsewhere	Other
J12.9	Viral pneumonia, unspecified	Pneumonia
J45.20	Mild intermittent asthma, uncomplicated	Asthma
J45.21	Mild intermittent asthma with (acute) exacerbation	Asthma
J45.30	Mild persistent asthma, uncomplicated	Asthma
J45.31	Mild persistent asthma with (acute) exacerbation	Asthma
J45.40	Moderate persistent asthma, uncomplicated	Asthma
J45.41	Moderate persistent asthma with (acute) exacerbation	Asthma

J45.901	Unspecified asthma with (acute) exacerbation	Asthma
J45.909	Unspecified asthma, uncomplicated	Asthma
J45.998	Other asthma	Asthma
R05	Cough	Cough

* No COPD indication (either in current visit or prior visit), ICD10 Codes: J44

Table 2: Diagnostic Codes for Respiratory Infections for which antibiotics are/may be appropriate

ICD10 Diagnosis		
Code	Diagnosis	Category
J20.0	Acute bronchitis due to Mycoplasma pneumoniae	Bacterial Bronchitis
J20.1	Acute bronchitis due to Hemophilus influenzae	Bacterial Bronchitis
J20.2	Acute bronchitis due to streptococcus	Bacterial Bronchitis
J22	Unspecified acute lower respiratory infection	Bacterial Bronchitis
J41.0	Simple chronic bronchitis	Chronic Bronchitis
J41.1	Mucopurulent chronic bronchitis	Chronic Bronchitis
J41.8	Mixed simple and mucopurulent chronic bronchitis	Chronic Bronchitis
J42	Unspecified chronic bronchitis	Chronic Bronchitis
J44.0	Chronic obstructive pulmon disease w acute lower resp infct	COPD
J44.1	Chronic obstructive pulmonary disease w (acute) exacerbation	COPD
J44.9	Chronic obstructive pulmonary disease, unspecified	COPD
J09.X1	Influenza due to ident novel influenza A virus w pneumonia	Influenza with Pneumonia
J09.X9	Flu due to ident novel influenza A virus w oth manifest	Influenza with Pneumonia
J10.00	Flu due to oth ident flu virus w unsp type of pneumonia	Influenza with Pneumonia
J10.01	Flu due to oth ident flu virus w same oth ident flu virus pn	Influenza with Pneumonia
J10.08	Influenza due to oth ident influenza virus w oth pneumonia	Influenza with Pneumonia
J10.81	Influenza due to oth ident influenza virus w encephalopathy	Influenza with Pneumonia
J10.82	Influenza due to oth ident influenza virus w myocarditis	Influenza with Pneumonia
J10.83	Influenza due to oth ident influenza virus w otitis media	Influenza with Pneumonia
J10.89	Influenza due to oth ident influenza virus w oth manifest	Influenza with Pneumonia
J11.00	Flu due to unidentified flu virus w unsp type of pneumonia	Influenza with Pneumonia
J11.08	Flu due to unidentified flu virus w specified pneumonia	Influenza with Pneumonia

J11.81	Flu due to unidentified influenza virus w encephalopathy	Influenza with Pneumonia
J11.82	Influenza due to unidentified influenza virus w myocarditis	Influenza with Pneumonia
J11.83	Influenza due to unidentified influenza virus w otitis media	Influenza with Pneumonia
J04.10	Acute tracheitis without obstruction	Other ARI
J04.11	Acute tracheitis with obstruction	Other ARI
J04.30	Supraglottitis, unspecified, without obstruction	Other ARI
J34.0	Abscess, furuncle and carbuncle of nose	Other ARI
J39.0	Retropharyngeal and parapharyngeal abscess	Other ARI
J39.1	Other abscess of pharynx	Other ARI
J02.0	Streptococcal pharyngitis	Pharyngitis
J02.8	Acute pharyngitis due to other specified organisms	Pharyngitis
J02.9	Acute pharyngitis, unspecified	Pharyngitis
J03.00	Acute streptococcal tonsillitis, unspecified	Pharyngitis
J03.01	Acute recurrent streptococcal tonsillitis	Pharyngitis
J31.2	Chronic pharyngitis	Pharyngitis
J13	Pneumonia due to Streptococcus pneumoniae	Pneumonia
J14	Pneumonia due to Hemophilus influenzae	Pneumonia
J15.0	Pneumonia due to Klebsiella pneumoniae	Pneumonia
J15.1	Pneumonia due to Pseudomonas	Pneumonia
J15.20	Pneumonia due to staphylococcus, unspecified	Pneumonia
J15.21	Pneumonia due to staphylococcus aureus	Pneumonia
J15.211	Pneumonia due to methicillin suscep staph	Pneumonia
J15.212	Pneumonia due to Methicillin resistant Staphylococcus aureus	Pneumonia
J15.29	Pneumonia due to other staphylococcus	Pneumonia
J15.3	Pneumonia due to streptococcus, group B	Pneumonia
J15.4	Pneumonia due to other streptococci	Pneumonia
J15.5	Pneumonia due to Escherichia coli	Pneumonia
J15.6	Pneumonia due to other aerobic Gram-negative bacteria	Pneumonia
J15.7	Pneumonia due to Mycoplasma pneumoniae	Pneumonia
J15.8	Pneumonia due to other specified bacteria	Pneumonia
J15.9	Unspecified bacterial pneumonia	Pneumonia
J16.0	Chlamydial pneumonia	Pneumonia
J16.8	Pneumonia due to other specified infectious organisms	Pneumonia
J17	Pneumonia in diseases classified elsewhere	Pneumonia
J18.0	Bronchopneumonia, unspecified organism	Pneumonia
J18.1	Lobar pneumonia, unspecified organism	Pneumonia
J18.2	Hypostatic pneumonia, unspecified organism	Pneumonia
J18.8	Other pneumonia, unspecified organism	Pneumonia
J18.9	Pneumonia, unspecified organism	Pneumonia

J01.00	Acute maxillary sinusitis, unspecified	Sinusitis
J01.01	Acute recurrent maxillary sinusitis	Sinusitis
J01.10	Acute frontal sinusitis, unspecified	Sinusitis
J01.11	Acute recurrent frontal sinusitis	Sinusitis
J01.20	Acute ethmoidal sinusitis, unspecified	Sinusitis
J01.21	Acute recurrent ethmoidal sinusitis	Sinusitis
J01.30	Acute sphenoidal sinusitis, unspecified	Sinusitis
J01.31	Acute recurrent sphenoidal sinusitis	Sinusitis
J01.40	Acute pansinusitis, unspecified	Sinusitis
J01.41	Acute recurrent pansinusitis	Sinusitis
J01.80	Other acute sinusitis	Sinusitis
J01.81	Other acute recurrent sinusitis	Sinusitis
J01.90	Acute sinusitis, unspecified	Sinusitis
J01.91	Acute recurrent sinusitis, unspecified	Sinusitis
J32.0	Chronic maxillary sinusitis	Sinusitis
J32.1	Chronic frontal sinusitis	Sinusitis
J32.2	Chronic ethmoidal sinusitis	Sinusitis
J32.3	Chronic sphenoidal sinusitis	Sinusitis
J32.4	Chronic pansinusitis	Sinusitis
J32.8	Other chronic sinusitis	Sinusitis
J32.9	Chronic sinusitis, unspecified	Sinusitis
J03.80	Acute tonsillitis due to other specified organisms	Tonsillitis
J03.81	Acute recurrent tonsillitis due to other specified organisms	Tonsillitis
J03.90	Acute tonsillitis, unspecified	Tonsillitis
J03.91	Acute recurrent tonsillitis, unspecified	Tonsillitis
J36	Peritonsillar abscess	Tonsillitis

Table 3: Diagnostic Codes for Non-Respiratory Infections for which antibiotics are/may be appropriate

ICD10	
Diagnosis Code	Diagnosis
A04	Other bacterial intestinal infections
A05	Other bacterial foodborne intoxications, not elsewhere classified
A06.2	Amebic nondysenteric colitis
A09	Infectious gastroenteritis and colitis, unspecified
A15	Respiratory tuberculosis
A17	Tuberculosis of nervous system
A18	Tuberculosis of other organs
A19	Miliary tuberculosis
A20	Plague

A21	Tularemia
A22	Anthrax
A23	Brucellosis
A24	Glanders and melioidosis
A25	Rat-bite fevers
A26	Erysipeloid
A27	Leptospirosis
A28	Other zoonotic bacterial diseases, not elsewhere classified
A30	Leprosy [Hansen's disease]
A31	Infection due to other mycobacteria
A32	Listeriosis
A33	Tetanus neonatorum
A34	Obstetrical tetanus
A35	Other tetanus
A36	Diphtheria
A37	Whooping cough
A38	Scarlet fever
A39	Meningococcal meningitis
A40	Streptococcal sepsis
A41	Other sepsis
A42	Actinomycosis
A43	Nocardiosis
A44	Bartonellosis
A46	Erysipelas
A48	Other bacterial diseases, not elsewhere classified
A49	Bacterial infection of unspecified site
A50	Congenital syphilis
A51	Early syphilis
A52	Late syphilis
A53	Other and unspecified syphilis
A54	Gonococcal infection
A55	Chlamydial lymphogranuloma (venereum)
A56	Other sexually transmitted chlamydial diseases
A57	Chancroid
A58	Granuloma inguinale
A59	Trichomoniasis
A64	Unspecified sexually transmitted disease
A65	Nonvenereal syphilis
A66	Yaws
A67	Pinta [carate]
A68	Relapsing fevers
A69	Other spirochetal infections
A70	Chlamydia psittaci infections

A71	Trachoma
A74	Other diseases caused by chlamydiae
A75	Typhus fever
A77	Spotted fever [tick-borne rickettsioses]
A78	Q fever
A79	Other rickettsioses
B58.2	Toxoplasma meningoenzephalitis
B95	Streptococcus, Staphylococcus, and Enterococcus as the cause of diseases classified elsewhere
B96	Other bacterial agents as the cause of diseases classified elsewhere
G00	Bacterial meningitis, not elsewhere classified
G01	Meningitis in bacterial diseases classified elsewhere
G02	Meningitis in other infectious and parasitic diseases
G03	Meningitis due to other and unspecified causes
G04	Encephalitis, myelitis and encephalomyelitis
G05	Encephalitis, myelitis and encephalomyelitis in diseases classified elsewhere
G06	Intracranial and intraspinal abscess and granuloma
H00.03	Abscess of eyelid
H05.01	Cellulitis of orbit
H05.02	Osteomyelitis of orbit
H05.03	Periostitis of orbit
H60	Otitis externa
H65	Nonsuppurative otitis media
H66	Suppurative and unspecified otitis media
I00	Rheumatic fever without heart involvement
I01	Rheumatic fever with heart involvement
I02	Rheumatic chorea
I33	Acute and subacute endocarditis
I96	Gangrene, not elsewhere classified
J47	Bronchiectasis
J95.851	Ventilator associated pneumonia
K02	Dental caries
K04.4	Acute apical periodontitis of pulpal origin
K04.6	Chronic apical periodontitis
K04.6	Periapical abscess with sinus
K04.7	Periapical abscess without sinus
K05.2	Aggressive periodontitis
K05.3	Chronic periodontitis
K05.4	Periodontosis
K11.2	Sialoadenitis
K12.2	Cellulitis and abscess of mouth
K35	Acute appendicitis
K50	Crohn's disease

K52.1	Toxic gastroenteritis and colitis
K57.2	Diverticulitis of large intestine with perforation
K57.3	Diverticulitis of large intestine without perforat
K61	Abscess of anal and rectal regions
K65.0	Generalized (acute) peritonitis
K65.1	Peritoneal abscess
K65.2	Spontaneous bacterial peritonitis
K65.9	Peritonitis, unspecified
K68.1	Retroperitoneal abscess
K75.0	Abscess of liver
K80.0	Calculus of gallbladder with acute cholecystitis
K80.18	Calculus of gallbladder with other cholecystitis w
K80.19	Calculus of gallbladder with other cholecystitis w
K80.42	Calculus of bile duct with acute cholecystitis wit
K80.44	Calculus of bile duct with chronic cholecystitis w
K81.0	Acute cholecystitis
K83.0	Cholangitis
K91.850	Pouchitis
L00	Staphylococcal scalded skin syndrome
L01.00	Impetigo, unspecified
L01.09	Other impetigo
L02	Cutaneous abscess, furuncle and carbuncle
L03	Cellulitis and acute lymphangitis
L04	Acute lymphadenitis
L05.01	Pilonidal cyst with abscess
L05.91	Pilonidal cyst without abscess
L08.89	Other specified local infections of the skin and s
L08.9	Local infection of the skin and subcutaneous tissu
M00	Pyogenic arthritis
M01	Direct infections of joint in infectious and parasitic diseases classified elsewhere
M46.20	Osteomyelitis of vertebra, site unspecified
M46.30	Infection of intervertebral disc (pyogenic), site
M60.0	Infective myositis
M86	Osteomyelitis
N10	Acute pyelonephritis
N12	Tubulo-interstitial nephritis, not specified as ac
N28.84	Pyelitis cystica
N30.0	Acute cystitis
N30.20	Other chronic cystitis without hematuria
N30.80	Other cystitis without hematuria
N30.90	Cystitis, unspecified without hematuria
N34.1	Nonspecific urethritis
N34.2	Other urethritis

N35.111	Postinfective urethral stricture, not elsewhere cl
N39.0	Urinary tract infection, site not specified
N41.0	Acute prostatitis
N41.1	Chronic prostatitis
N41.9	Inflammatory disease of prostate, unspecified
N43.1	Infected hydrocele
N45.1	Epididymitis
N51	Disorders of male genital organs in diseases class
N61	Inflammatory disorders of breast
N72	Inflammatory disease of cervix uteri
N73.0	Acute parametritis and pelvic cellulitis
N73.3	Female acute pelvic peritonitis
N73.9	Female pelvic inflammatory disease, unspecified
N75.0	Cyst of Bartholin's gland
N75.1	Abscess of Bartholin's gland
N76.0	Acute vaginitis
N76.4	Abscess of vulva
N77.1	Vaginitis, vulvitis and vulvovaginitis in diseases
O23	Infections of genitourinary tract in pregnancy
O41.1010	Infection of amniotic sac and membranes, unspecifi
O41.1090	Infection of amniotic sac and membranes, unspecifi
O85	Puerperal sepsis
O86	Other puerperal infections
O91	Infections of breast associated with pregnancy, the puerperium and lactation
P36	Bacterial sepsis of newborn
P39.0	Neonatal infective mastitis
P39.2	Intra-amniotic infection affecting newborn, not el
P39.3	Neonatal urinary tract infection
P39.4	Neonatal skin infection
P39.8	Other specified infections specific to the perinatal period
P39.9	Infection specific to the perinatal period, unspecified
P77	Necrotizing enterocolitis of newborn
R09.1	Pleurisy
R50.81	Fever presenting with conditions classified elsewh
R50.9	Fever, unspecified
R78.81	Bacteremia
R82.71	Bacteriuria
S01	Open wound of head
S11	Open wound of neck
S21	Open wound of thorax
S31	Open wound of abdomen, lower back, pelvis and external genitals
S41	Open wound of shoulder and upper arm

S51	Open wound of elbow and forearm
S61	Open wound of wrist, hand and fingers
S71	Open wound of hip and thigh
S81	Open wound of knee and lower leg
S91	Open wound of ankle, foot and toes
T80.2	Infections following infusion, transfusion and therapeutic injectio
W54.0XXA	Bitten by dog, initial encounter
Z20.1	Contact with and (suspected) exposure to tuberculosis
Z20.2	Contact with and (suspected) exposure to infections with a predominantly sexual mode of transmission
Z20.81	Contact with and (suspected) exposure to other bacterial communicable diseases
Z20.89	Contact with and (suspected) exposure to other communicable diseases Contact with and (suspected) exposure to unspecified communicable disease
Z20.9	
Z22.3	Carrier of other specified bacterial diseases
Z22.8	Carrier of other infectious diseases
Z22.9	Carrier of infectious disease, unspecified
Z76.0	Encounter for issue of repeat prescription
