



Original Investigation | Emergency Medicine

Classification of Emergency Diagnosis–Sensitive Conditions
Among Medicare Beneficiaries

Laura G. Burke, MD, MPH; Ryan C. Burke, PhD, MPH; E. John Orav, PhD; Amber K. Sabbatini, MD, MPH, MBA; Adrian D. Haimovich, MD, PhD;
Jonathan A. Edlow, MD; Jose F. Figueroa, MD, MPH; Michelle P. Lin, MD, MPH

Abstract

IMPORTANCE Diagnostic accuracy is a key driver of emergency department (ED) quality, yet little consensus exists on which conditions to target.

OBJECTIVE To develop a list of emergency diagnosis–sensitive conditions (EDSCs) for measuring diagnostic error in the ED.

DESIGN, SETTING, AND PARTICIPANTS This retrospective cross-sectional study examined a national sample of claims for fee-for-service Medicare beneficiaries 65 years or older with nonelective hospitalizations from January 1, 2022, to December 31, 2024.

EXPOSURE Potential diagnostic errors in the ED.

MAIN OUTCOMES AND MEASURES A panel of 5 clinician investigators reviewed principal discharge *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* diagnosis codes and determined whether each met criteria for an EDSC—a disease that is emergency care sensitive, at risk of diagnostic error, and should be diagnosed in the ED or on admission. The percentage of each EDSC's admissions preceded within 9 days by a potential diagnostic error (ED discharge) was characterized. To account for background ED utilization, an adjusted potential diagnostic error percentage was calculated by subtracting the percentage of a comparison cohort with at least 1 ED visit in the 9 days preceding a randomly selected date. The incidence of potential diagnostic errors per 10 000 ED discharges was calculated. Thirty-day morbidity (number of healthy days at home [HDAH]) and mortality were characterized. High-priority EDSCs were those in the top half of diagnostic errors per 10 000 ED discharges and in the top quartile of either mortality or HDAH lost. For high-priority conditions, the 20 most frequent diagnoses on preceding ED discharges were tabulated.

RESULTS Of 19 973 diagnosis codes identified, 1802 were aggregated into 76 EDSC categories. Of 14 671 540 admissions, 2 852 901 (19.4%) were for EDSCs. Of these EDSC admissions, 713 601 (25.0%) occurred among adults 85 years or older, and 1 493 822 (52.4%) were among women. The EDSCs with the highest and lowest adjusted percentages of admissions preceded by a potential ED diagnostic error were Guillain-Barré syndrome (16.6%; 95% CI, 15.4%-17.9%) and acute appendicitis (1.4%; 95% CI, 1.3%-1.5%), respectively. Pneumonia had the highest adjusted incidence of potential diagnostic errors per 10 000 ED discharges (9.30; 95% CI, 9.18-9.42) despite a moderate adjusted potential diagnostic error percentage per 10 000 ED discharges (4.4%; 95% CI, 4.3%-4.5%). Symptom-based diagnoses were frequent on ED discharges preceding EDSC admissions.

(continued)

Key Points

Question Which emergency department (ED) visits and conditions should be targeted to measure potential diagnostic errors and improve diagnostic quality?

Findings In this cross-sectional study of fee-for-service Medicare beneficiaries with nonelective hospitalizations, 1802 diagnosis codes associated with 76 emergency diagnosis-sensitive conditions (EDSCs) were identified. Of these EDSCs, 16 were deemed high priority based on their combination of high rates of diagnostic error and condition-specific morbidity and mortality.

Meaning These findings suggest that EDSCs can be applied to administrative datasets to identify conditions in EDs that are at higher risk for diagnostic error and subsequent poor patient outcomes.

+ Supplemental content

Author affiliations and article information are listed at the end of this article.

Open Access. This is an open access article distributed under the terms of the CC-BY-NC-ND License, which does not permit alteration or commercial use, including those for text and data mining, AI training, and similar technologies.

Abstract (continued)

CONCLUSIONS AND RELEVANCE In this retrospective observational study of Medicare beneficiaries, EDSCs were used to characterize the population burden of potential diagnostic errors in emergency care and associated clinical presentations.

JAMA Network Open. 2026;9(10):e2637682. doi:10.1001/jamanetworkopen.2026.37682

Introduction

Diagnostic accuracy is a key driver of health care quality.¹ Characterizing diagnostic error is especially important in the emergency department (ED), given its pivotal role in the acute, unscheduled care for older adults and populations with barriers to care elsewhere.^{2,3} While urgent care centers have proliferated,⁴ they disproportionately serve wealthier, urban communities,⁵ treat a smaller range of conditions, and are not mandated to treat all patients. Thus, the ED remains the first line of treatment for individuals with high-acuity conditions and for those lacking alternative care access.

In 2022, the Agency for Healthcare Research and Quality (AHRQ) released a report on diagnostic errors in the ED, summarizing the existing evidence and generating initial estimates.⁶ Several emergency medicine organizations criticized the AHRQ report⁶ on methodologic grounds, including its reliance on malpractice claims, which may not generalize to broader practice.^{7,8} Administrative datasets offer distinct advantages for studying diagnostic error, including large, representative samples for measuring rare conditions and outcomes such as out-of-hospital mortality and return visits to other institutions.⁹⁻¹² Yet consensus is lacking on how to classify conditions to prioritize for investigation and intervention in the ED.

Prior work defined emergency care-sensitive conditions (ECSCs) as conditions requiring prompt and effective treatment in the ED to maximize outcomes and prevent harm.¹³ Not all ECSCs are ideally suited for measuring diagnostic error, as return visits for some conditions are likely to represent disease progression rather than a diagnostic error at the initial visit (eg, alcohol withdrawal). However, the conditions to target when examining the incidence of diagnostic error in the ED have not been previously explored.

To address this gap in the evidence, we sought to address the following questions in a nationwide sample of Medicare beneficiaries. First, which diagnoses are suitable for measuring and evaluating diagnostic error in the ED (hereinafter referred to as emergency diagnosis-sensitive conditions [EDSCs])? Second, which conditions have the highest incidence of potential diagnostic error as well as condition-specific morbidity and mortality? Finally, what are the most common diagnoses given during potential ED diagnostic errors preceding EDSC admissions?

Methods

The Rhode Island Hospital Institutional Review Board deemed this cross-sectional study exempt from review because there was minimal risk to human participants. Informed consent was waived. The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

Study Population and Data Sources

We used a national sample of fee-for-service traditional Medicare claims of beneficiaries 65 years or older from January 1, 2022, to December 31, 2024 (eAppendix in [Supplement 1](#)). Beneficiaries of Medicare Advantage were not included, given differences in data architecture and completeness.¹⁴

Beneficiary age, sex, race and ethnicity, Medicaid eligibility, and death date (if applicable) were identified from the Centers for Medicare & Medicaid Services Master Beneficiary Summary File. Race and ethnicity were identified to characterize the study population and provide an indicator of

generalizability to other cohorts. The Research Triangle Institute race and ethnicity variable¹⁵ in Medicare data uses administrative data, not self-report, and consists of the following categories: American Indian or Alaska Native, Asian or Native Hawaiian or Other Pacific Islander, Black, Hispanic, White, other race or ethnicity (all those not assigned to the other categories), and unknown race or ethnicity. Hispanic ethnicity is listed as a separate category that cannot be combined with race.

The prior-year hierarchical condition category (HCC) score was calculated as a proxy for baseline clinical complexity.¹⁰ For eligible beneficiaries, we identified nonelective, inpatient stays in nonfederal, acute care, or critical access hospitals in the US. ED discharges were identified from outpatient and professional claims files (eAppendix in [Supplement 1](#)). Principal discharge *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* (ICD-10) diagnosis codes and corresponding AHRQ Healthcare Cost and Utilization Project (HCUP) Clinical Classifications Software Refined (CCSR) single-level diagnosis categories¹⁶ were identified.

Identifying EDSCs

We first reviewed a previously published list of 4115 ICD-10 codes for ECSCs.¹³ We focused on ECSCs because they exclude nonemergent conditions, which are chronic, self-limiting, or lower-acuity^{7,8} problems whose definitive diagnosis is often deferred to other settings given ED time and resource constraints.⁸

The original ECSC list¹³ was derived from ED visits among all adults in 2016 HCUP data. We thus sought to identify additional ICD-10 codes that may not have been included as an ECSC due to changes in ICD-10 codes over time or different datasets. We reviewed the principal diagnosis codes associated with return admissions, defined as all nonelective inpatient stays in the 9 days following ED discharge. The 9-day period was chosen based on prior research.^{10,17}

A panel of 4 emergency physicians (L.G.B., A.K.S., J.A.E., and M.P.L.) and 1 internal medicine hospitalist (J.F.F.) first reviewed the original ECSC categories to determine which conditions were clinically appropriate for identifying diagnostic error. Each clinician investigator reviewed the list independently, and disagreements were adjudicated during panel discussion until consensus was reached. We then applied this framework to the additional ICD-10 codes identified in Medicare claims (eAppendix in [Supplement 1](#)). All included codes were aggregated into 76 EDSC categories (eAppendix in [Supplement 1](#)). Reasons for exclusion were as follows: nonemergent diagnosis (ie, conditions that were chronic, low acuity, or not requiring definite diagnosis in the ED), disease progression (ie, a repeat visit was more likely to represent disease progression than an error at the initial encounter), symptom-based diagnoses that were nondiagnostic (eg, chest pain), and diseases requiring refinement of the diagnostic process outside of the ED visit (eg, culture results for bacteremia) (excluded ICD-10 codes are provided in eTable 4 in [Supplement 2](#)). Of note, primary malignant neoplasm diagnoses were excluded from EDSCs, as they are generally preferred to occur in the ambulatory setting. However, cancer-related emergencies (eg, spinal cord compression, pathologic fracture, and tumor lysis syndrome) were included. The EDSC framework was developed through independent review and iterative discussions among the 5-member investigator panel (L.G.B., A.K.S., J.A.E., J.F.F., and M.P.L.) between August and December 2025, initially for the ECSC ICD-10 codes followed by those identified in Medicare data.

Statistical Analysis

Condition-Specific Rates of Diagnostic Error

We quantified the number of EDSC and non-EDSC ICD-10 diagnosis codes and the frequency of each exclusion criterion. We calculated the proportion of all nonelective inpatient hospitalizations for EDSCs. We summarized the volume of admissions over the 3-year period for each EDSC. We then pulled all ED discharges within the 9 days preceding the admission as indicators of potential diagnostic error, as per prior work.¹⁰ We removed ED discharges on the same day or prior day as the admission date to avoid misclassifying transfer or duplicate episodes as a separate ED visit. We also removed ED discharges with a primary discharge diagnosis in the same EDSC category as the

admission primary diagnosis, since the diagnosis in question was identified on the index visit and thus should not be classified as a diagnostic error. For each diagnosis, we calculated the percentage of emergency admissions that were preceded by 1 or more ED discharges within 9 days.^{10,17} We then subtracted the random, background 9-day ED discharge rate for a comparison cohort matched on HCC score to get the adjusted rate of diagnostic error.¹⁰ We applied this adjusted diagnostic error rate to the total number of index admissions to calculate the adjusted number of potential diagnostic errors. We divided this number by the total number of ED discharges during the study period ($N = 23\,776\,669$) and multiplied by 10 000 to yield the incidence of potential diagnostic errors per 10 000 ED discharges, reflecting both the relative likelihood of diagnostic error and the frequency with which the condition occurs (eAppendix in [Supplement 1](#)). Additionally, we calculated the condition-specific number and percentage of all admissions, as well as EDSC admissions with a potential diagnostic error.

Condition-Specific Mortality and Healthy Days at Home

We did not attempt to quantify excess morbidity and mortality due to diagnostic error, given the potential for confounding from unmeasured severity differences between misdiagnosed and correctly diagnosed patients, previously termed the “misdiagnosis is protective” paradox.⁶ We instead calculated 30-day mortality and number of healthy days at home (HDAH) from the time of admission for each EDSC, as indicators of condition severity,^{18–21} with the assumption that accurate diagnosis was particularly important for high-severity conditions. HDAH is a broad outcome measure that considers the total time spent alive and out of acute and post-acute care settings as an outcome that captures both morbidity and mortality.^{3,10,22} HDAH at 30 days^{3,10} was calculated by subtracting from 30 the number of days after the return EDSC admission date spent in inpatient, observation, rehabilitation, ED, and long-term hospital settings. If a beneficiary died during follow-up, days remaining after the death date were also subtracted from 30. To align the direction of the mortality and HDAH measures for condition ranking, we also defined the number of HDAH lost, calculated as the sum of mortality and facility days without subtracting from 30. Admissions after December 1, 2024, were excluded from the mortality and HDAH calculations given less than 30 days of follow-up.

Conditions With the Greatest Burden of Potential Diagnostic Error, Morbidity, and Mortality Among Older Adults

We defined high-priority EDSCs as those in the top half with respect to the adjusted incidence of potential diagnostic errors per 10 000 ED discharges and top quartiles with respect to 30-day mortality, HDAH lost, or both. These thresholds were subjectively chosen to identify a reasonable number of high-priority EDSCs; alternative choices are illustrated in the eAppendix in [Supplement 1](#). For high-priority EDSCs, we tabulated the 20 most frequent principal diagnoses (*ICD-10* codes aggregated into HCUP-CCSR categories) on ED discharges in the preceding 9 days.

Because analyses were descriptive, no statistical testing was performed. Beneficiary characteristics are presented as counts and rates. EDSC measures are reported as counts and rates for mortality, means (SDs) for HDAH, adjusted incidence rates (95% CIs), and proportions (95% CIs). Analysis was conducted using SAS, version 9.4 (SAS Institute).

Results

Identification of EDSCs

Of the 4115 *ICD-10* diagnosis codes for ECSCs,¹³ 509 were classified as EDSCs (eFigure in [Supplement 1](#)). We identified 15 858 additional *ICD-10* codes in the Medicare dataset for 2022 to 2024, of which 1293 were included as EDSCs. Of the 19 973 codes identified, the final EDSC condition list consisted of 1802 *ICD-10* codes aggregated into 76 EDSC categories. Two pregnancy-related EDSCs (ectopic pregnancy and preeclampsia or eclampsia) were not observed in the Medicare data. Of the 18 171 excluded *ICD-10* codes (eTable 4 in [Supplement 2](#)), the reasons for exclusion were as

follows: a repeat encounter was more likely due to disease progression than a diagnostic error on the initial visit (47.3%), the diagnosis was not emergency care sensitive (41.2%), the disease typically requires refinement of the diagnostic process outside the ED setting for diagnosis (6.7%), and the ICD-10 code was for a symptom or syndrome rather than a specific disease (4.8%).

Of the 14 671 540 eligible inpatient admissions, 2 852 901 (19.4%) were for one of the 74 EDSCs that appeared in Medicare data (Table 1). Of these EDSC admissions, 52.4% occurred among women and 47.6% occurred among men; 35.6% occurred among adults aged 65 to 74 years, 39.4% among those aged 75 to 84 years, and 25.0% among those aged 85 or older. The occurrence of EDSC admissions among racial and ethnic groups was 0.5% for American Indian or Alaska Native individuals, 2.2% for Asian or Native Hawaiian or Other Pacific Islander individuals, 6.7% for Black individuals, 4.6% for Hispanic individuals, 83.6% for White individuals, 0.7% for individuals of other race or ethnicity, and 1.6% for individuals with unknown race or ethnicity. Pneumonia was the most frequent EDSC admission category (501 974 [17.6%]) (eTable 1 in Supplement 1).

Condition Frequency, Potential Diagnostic Error Rate, and Incidence Per 10 000 ED Discharges

The EDSCs with the highest and lowest adjusted percentages of admissions preceded by a potential diagnostic error were Guillain-Barré syndrome (16.6%; 95% CI, 15.4%-17.9%) and acute appendicitis (1.4%; 95% CI, 1.3%-1.5%), respectively (Table 2). Pneumonia had the highest incidence of potential diagnostic errors per 10 000 ED discharges (9.30; 95% CI, 9.18-9.42), despite moderate adjusted potential diagnostic error of 4.4% (95% CI, 4.3%-4.5%), followed by ischemic stroke (7.08; 95% CI, 6.98-7.19), myocardial infarction (3.62; 95% CI, 3.54-3.69), biliary emergencies (3.29; 95% CI, 3.22-3.36), and bowel obstruction (2.78; 95% CI, 2.71-2.85) (Figure 1). These conditions also accounted for the greatest share of EDSC admissions with a potential diagnostic error (eTable 1 in Supplement 1).

Table 1. Characteristics of Nonelective Admissions Among Traditional Medicare Beneficiaries, 2022-2024

Characteristic	No. (%)	
	All nonelective admissions (N = 14 671 540)	Nonelective admissions for an emergency diagnosis-sensitive condition (n = 2 852 901)
No. of unique beneficiaries	7 451 408	2 352 519
Age category, y		
65-74	4 864 958 (33.2)	1 016 018 (35.6)
75-84	5 736 831 (39.1)	1 123 280 (39.4)
≥85	4 069 751 (27.7)	713 601 (25.0)
Sex		
Female	8 003 734 (54.6)	1 493 822 (52.4)
Male	6 667 806 (45.4)	1 359 079 (47.6)
Race and ethnicity		
American Indian or Alaska Native	71 312 (0.5)	14 217 (0.5)
Asian or Native Hawaiian or Other Pacific Islander	340 848 (2.3)	63 649 (2.2)
Black	1 148 509 (7.8)	192 143 (6.7)
Hispanic	736 009 (5.0)	131 794 (4.6)
White	12 063 772 (82.2)	2 385 074 (83.6)
Other ^a	110 014 (0.7)	21 319 (0.7)
Unknown	201 076 (1.4)	44 705 (1.6)
Medicaid eligibility		
Not Medicaid eligible	11 647 198 (79.4)	2 382 902 (83.5)
Medicaid eligible	3 024 342 (20.6)	469 996 (16.5)

^a Other race or ethnicity is defined using the code value (other) in the Centers for Medicare & Medicaid Master Beneficiary Summary File beneficiary race code in Medicare claims, modified using the Research Triangle Institute algorithm.¹⁵

Table 2. Potential Diagnostic Error Rates Per 10 000 ED Discharges and 30-Day Mortality and 30-Day HDAH Among Medicare Beneficiaries Hospitalized for EDSCs, 2022-2024^a

Condition category	No. of admissions	No. of admissions with potential diagnostic error ^b	Adjusted potential diagnostic error rate, % (95% CI) ^c	Adjusted potential diagnostic error incidence per 10 000 ED discharges (95% CI) ^d	No. of admissions with ≥30 d of follow-up ^e	30-d Mortality, No. (%) of deaths ^f	30-d HDAH, mean (SD), d ^g
Pneumonia	501 974	28 916	4.4 (4.3-4.5)	9.30 (9.18-9.42)	487 970	52 515 (10.8)	17.4 (10.5)
Ischemic stroke and sequelae	447 824	21 596	3.8 (3.7-3.8)	7.08 (6.98-7.19)	437 841	56 642 (12.9)	14.2 (11.5)
Myocardial infarction	375 254	12 574	2.3 (2.2-2.3)	3.62 (3.54-3.69)	367 111	42 588 (11.6)	18.9 (10.3)
Bowel obstruction	215 949	9244	3.1 (3.0-3.1)	2.78 (2.71-2.85)	211 236	12 440 (5.9)	19.8 (9.4)
Biliary emergencies	145 134	9367	5.4 (5.3-5.5)	3.29 (3.22-3.36)	141 807	5703 (4.0)	20.9 (8.7)
Pulmonary embolism	140 665	7036	3.9 (3.8-4.0)	2.33 (2.27-2.39)	137 359	14 028 (10.2)	18.5 (10.5)
Angina or ischemic heart disease	111 404	5130	3.5 (3.4-3.7)	1.66 (1.61-1.71)	109 182	1948 (1.8)	23.1 (7.4)
Intracranial hemorrhage ^h	87 813	2903	2.2 (2.1-2.3)	0.82 (0.78-0.85)	85 981	28 515 (33.2)	8.6 (10.6)
Second- or third-degree heart block	68 803	2434	2.5 (2.4-2.6)	0.72 (0.68-0.75)	67 263	2940 (4.4)	21.0 (9.4)
Acute pancreatitis	68 533	2819	3.1 (2.9-3.2)	0.88 (0.84-0.92)	67 146	2465 (3.7)	21.4 (8.3)
Complicated intra-abdominal infection	67 624	4159	5.1 (4.9-5.3)	1.45 (1.40-1.50)	66 287	4854 (7.3)	17.2 (10.0)
Nonvertebral pathologic fracture ^h	62 709	2898	3.4 (3.3-3.5)	0.90 (0.86-0.93)	61 089	4490 (7.3)	7.9 (9.6)
Pyonephrosis and perinephric abscess	60 584	4735	6.6 (6.4-6.8)	1.68 (1.63-1.73)	59 008	2101 (3.6)	19.9 (9.7)
Venous thrombosis	58 276	3079	4.0 (3.9-4.2)	0.99 (0.95-1.03)	56 896	3685 (6.5)	18.4 (10.4)
Hernia with obstruction or gangrene	57 272	2791	3.7 (3.6-3.9)	0.90 (0.86-0.94)	56 002	2960 (5.3)	19.0 (9.9)
Ventricular dysrhythmias ^h	46 462	2000	3.1 (2.9-3.2)	0.60 (0.57-0.63)	45 392	6212 (13.7)	17.9 (10.4)
Acute appendicitis	29 698	663	1.4 (1.3-1.5)	0.17 (0.16-0.19)	29 029	310 (1.1)	23.4 (6.8)
Intestinal ischemia	22 705	1376	4.9 (4.6-5.2)	0.47 (0.44-0.50)	22 273	2876 (12.9)	18.2 (10.7)
Rhabdomyolysis ^h	21 507	1142	4.3 (4.0-4.5)	0.38 (0.36-0.41)	20 960	1244 (5.9)	10.6 (10.9)
Acute limb ischemia and sequelae ^h	17 454	1237	5.7 (5.4-6.0)	0.42 (0.39-0.44)	17 136	2335 (13.6)	11.4 (10.9)
Acute hepatic syndromes ^h	16 597	1131	5.4 (5.0-5.7)	0.38 (0.35-0.40)	16 442	4036 (24.5)	13.9 (11.0)
Osteomyelitis	16 097	971	4.6 (4.3-4.9)	0.31 (0.29-0.34)	15 747	753 (4.8)	13.8 (10.9)
Cardiomyopathy	14 531	634	3.3 (3.0-3.6)	0.20 (0.18-0.22)	14 225	923 (6.5)	20.3 (9.7)
Pneumothorax, nontraumatic	13 602	440	2.0 (1.8-2.2)	0.11 (0.10-0.13)	13 298	1548 (11.6)	16.6 (10.0)
Pericarditis	13 224	889	5.6 (5.2-6.0)	0.31 (0.29-0.33)	12 984	689 (5.3)	20.7 (8.7)
Aortic aneurysm ^h	13 034	564	3.3 (3.0-3.6)	0.18 (0.16-0.20)	12 745	2331 (18.3)	15.0 (11.3)
Septic arthritis or tenosynovitis	12 720	1573	11.1 (10.6-11.7)	0.60 (0.57-0.62)	12 437	384 (3.1)	13.8 (11.1)
Vertebral osteomyelitis or discitis ^h	12 262	1194	8.4 (7.9-8.9)	0.43 (0.41-0.46)	12 007	769 (6.4)	9.6 (10.3)
Pulmonary abscess or empyema ^h	10 428	676	5.2 (4.8-5.7)	0.23 (0.21-0.25)	10 234	1318 (12.9)	12.7 (10.0)
Airway or esophageal foreign body ^h	10 019	561	4.2 (3.9-4.6)	0.18 (0.16-0.20)	9760	1553 (15.9)	17.4 (11.6)
Other neurologic emergencies ^h	10 015	819	7.0 (6.5-7.5)	0.29 (0.27-0.31)	9773	1405 (14.4)	13.3 (11.0)
Meningitis or encephalitis ^h	9223	1345	13.4 (12.8-14.1)	0.52 (0.49-0.55)	9051	1185 (13.1)	10.8 (10.4)
Aortic dissection	9144	347	2.8 (2.5-3.1)	0.11 (0.09-0.12)	8950	2130 (23.8)	11.4 (10.8)
Myasthenia gravis	6066	376	4.9 (4.4-5.5)	0.13 (0.11-0.14)	5943	548 (9.2)	14.8 (10.2)
Peripheral artery aneurysm or dissection	5830	374	5.2 (4.6-5.8)	0.13 (0.11-0.14)	5700	408 (7.2)	17.6 (10.5)
Endocarditis ^h	5291	544	9.0 (8.2-9.8)	0.20 (0.18-0.22)	5201	805 (15.5)	8.9 (9.9)
Necrotizing soft tissue infection ^h	4870	417	7.2 (6.5-7.9)	0.15 (0.13-0.16)	4787	539 (11.3)	9.7 (10.4)
Anorectal abscess	4858	355	6.1 (5.4-6.8)	0.12 (0.11-0.14)	4737	161 (3.4)	19.9 (9.8)
Head or neck arterial aneurysm or dissection	4523	256	4.7 (4.1-5.3)	0.09 (0.08-0.10)	4421	197 (4.5)	21.0 (9.4)
Spinal and intracranial abscess ^h	4443	616	12.6 (11.6-13.6)	0.24 (0.22-0.25)	4353	403 (9.3)	7.6 (9.6)
Thyroid or adrenal crisis	4413	307	5.7 (5.0-6.4)	0.11 (0.09-0.12)	4287	483 (11.3)	15.6 (11.3)
Severe eye infections	3935	543	12.6 (11.5-13.6)	0.21 (0.19-0.23)	3842	141 (3.7)	18.2 (10.0)
Giant cell arteritis	3929	509	11.9 (10.9-12.9)	0.20 (0.18-0.21)	3826	78 (2.0)	22.2 (7.6)
Retinal artery or vein occlusion	3773	143	2.8 (2.3-3.3)	0.04 (0.04-0.05)	3683	35 (1.0)	25.3 (5.4)
Nonintestinal visceral ischemia	3772	272	6.1 (5.4-6.9)	0.10 (0.09-0.11)	3686	324 (8.8)	19.8 (9.4)
Guillain-Barré syndrome ^h	3514	619	16.6 (15.4-17.9)	0.25 (0.23-0.26)	3458	238 (6.9)	7.6 (9.5)

(continued)

Table 2. Potential Diagnostic Error Rates Per 10 000 ED Discharges and 30-Day Mortality and 30-Day HDAH Among Medicare Beneficiaries Hospitalized for EDSCs, 2022-2024^a (continued)

Condition category	No. of admissions	No. of admissions with potential diagnostic error ^b	Adjusted potential diagnostic error rate, % (95% CI) ^c	Adjusted potential diagnostic error incidence per 10 000 ED discharges (95% CI) ^d	No. of admissions with ≥30 d of follow-up ^e	30-d Mortality, No. (%) of deaths ^f	30-d HDAH, mean (SD), d ^g
Acute airway-threatening infections	2877	268	8.2 (7.2-9.2)	0.10 (0.09-0.11)	2808	83 (3.0)	22.6 (8.0)
Dermatologic emergencies	2629	308	10.4 (9.3-11.6)	0.12 (0.10-0.13)	2571	265 (10.3)	14.2 (11.0)
Severe genitourinary infection	2472	208	7.2 (6.2-8.2)	0.07 (0.06-0.09)	2413	74 (3.1)	18.3 (9.7)
Paralysis	2449	209	7.3 (6.2-8.3)	0.07 (0.06-0.09)	2387	124 (5.2)	16.4 (11.2)
Hematologic emergencies	1803	133	6.0 (4.9-7.1)	0.05 (0.04-0.05)	1758	582 (33.1)	10.3 (10.2)
Mastoiditis and malignant otitis externa	1693	186	9.8 (8.4-11.2)	0.07 (0.06-0.08)	1647	61 (3.7)	18.5 (10.1)
Hemothorax	1407	92	5.2 (4.1-6.4)	0.03 (0.02-0.04)	1381	214 (15.5)	13.7 (10.1)
Inflammatory bowel disease with other complications	1407	109	6.5 (5.2-7.8)	0.04 (0.03-0.05)	1387	80 (5.8)	18.9 (9.7)
Myocarditis	1286	68	4.2 (3.1-5.3)	0.02 (0.02-0.03)	1263	165 (13.1)	18.2 (10.4)
Varicella and disseminated herpes simplex virus	1271	204	14.7 (12.8-16.7)	0.08 (0.07-0.09)	1247	89 (7.1)	17.1 (10.2)
Retroperitoneal hematoma	1249	76	4.8 (3.6-6.0)	0.03 (0.02-0.03)	1190	183 (15.4)	12.9 (11.3)
Myelitis	1216	140	10.5 (8.8-12.2)	0.05 (0.04-0.06)	1192	55 (4.6)	10.5 (10.8)
Severe tickborne illness	865	120	13.0 (10.8-15.3)	0.05 (0.04-0.06)	858	16 (1.9)	21.5 (7.7)
Toxicologic emergencies	385	40	9.1 (6.2-12.0)	0.01 (0.01-0.02)	368	50 (13.6)	13.7 (11.4)
Tendon or bursal abscess	335	45	12.2 (8.7-15.7)	0.02 (0.01-0.02)	325	NR ⁱ	17.2 (10.1)
Cardiac tamponade or hemopericardium	274	21	6.4 (3.5-9.3)	0.01 (0.004-0.01)	264	43 (16.3)	14.6 (10.6)
Retinal detachment	260	11	3.2 (1.0-5.3)	0.003 (0.001-0.01)	251	NR	23.6 (9.2)
Muscle or tendon rupture or infarction	221	20	7.8 (4.3-11.4)	0.01 (0.004-0.01)	219	NR	11.4 (10.8)
Acute angle closure glaucoma	201	21	9.2 (5.2-13.2)	0.01 (0.004-0.01)	196	NR	19.4 (10.9)
Nontraumatic compartment syndrome	200	28	12.7 (8.1-17.3)	0.01 (0.01-0.01)	197	14 (7.1)	12.2 (10.6)
Ovarian torsion	141	16	10.7 (5.6-15.8)	0.01 (0.003-0.01)	136	NR	24.1 (6.1)
Acute valvular or structural heart disease	119	NR	NR	NR	117	18 (15.4)	14.8 (10.5)
Mediastinitis	116	13	10.1 (4.6-15.6)	0.005 (0.002-0.01)	115	18 (15.7)	13.6 (10.7)
Testicular torsion	81	14	16.2 (8.2-24.2)	0.01 (0.003-0.01)	78	NR	21.8 (9.8)
Reportable infectious diseases	64	NR	NR	NR	62	NR	18.2 (10.1)
Malaria	44	NR	NR	NR	42	NR	23.1 (7.0)
Hyphema	43	NR	NR	NR	43	NR	16.4 (11.8)
Periodic paralysis	36	NR	NR	NR	36	NR	16.9 (11.0)

Abbreviations: ED, emergency department; EDSC, emergency diagnosis-sensitive condition; HDAH, healthy days at home; NR, not reported.

^a EDSCs are the 76 conditions deemed by a panel of clinician investigators to be amenable to evaluating diagnostic error using administrative datasets. The 2 categories not shown are ectopic pregnancy and preeclampsia or eclampsia, which were not observed in Medicare claims.

^b ED discharge for a different diagnosis in the 9 days preceding the admission.

^c Percentage of EDSC admissions preceded by an ED discharge for a different diagnosis in the prior 9 days minus the baseline rate of ED utilization among a comparison population.

^d Adjusted percentage of diagnostic errors was multiplied by the total number of EDSC admissions, divided by the total number of ED discharges during the study period (N = 23 776 669), and then multiplied by 10 000.

^e Calculations for mortality and HDAH were limited to EDSC admissions with 30 or more days of follow-up.

^f Unadjusted mortality within 30 days of admission.

^g Total time spent alive and out of acute and post-acute care facility settings within 30 days of the admission date. Lower values indicate higher condition severity.

^h High-priority condition, ie, those in the top half with respect to diagnostic error incidence and the top quartile with respect to either raw 30-day mortality or HDAH lost.

ⁱ Cell sizes less than 11 are NR.

Condition-Specific Mortality and HDAH

EDSCs with the highest raw 30-day mortality (ie, No. of deaths/No. of admissions with 30-day follow-up; irrespective of potential diagnostic error) were intracranial hemorrhage (28 515/85 981 [33.2%]), hematologic emergencies (582/1758 [33.1%]), acute hepatic syndromes (4036/16 442

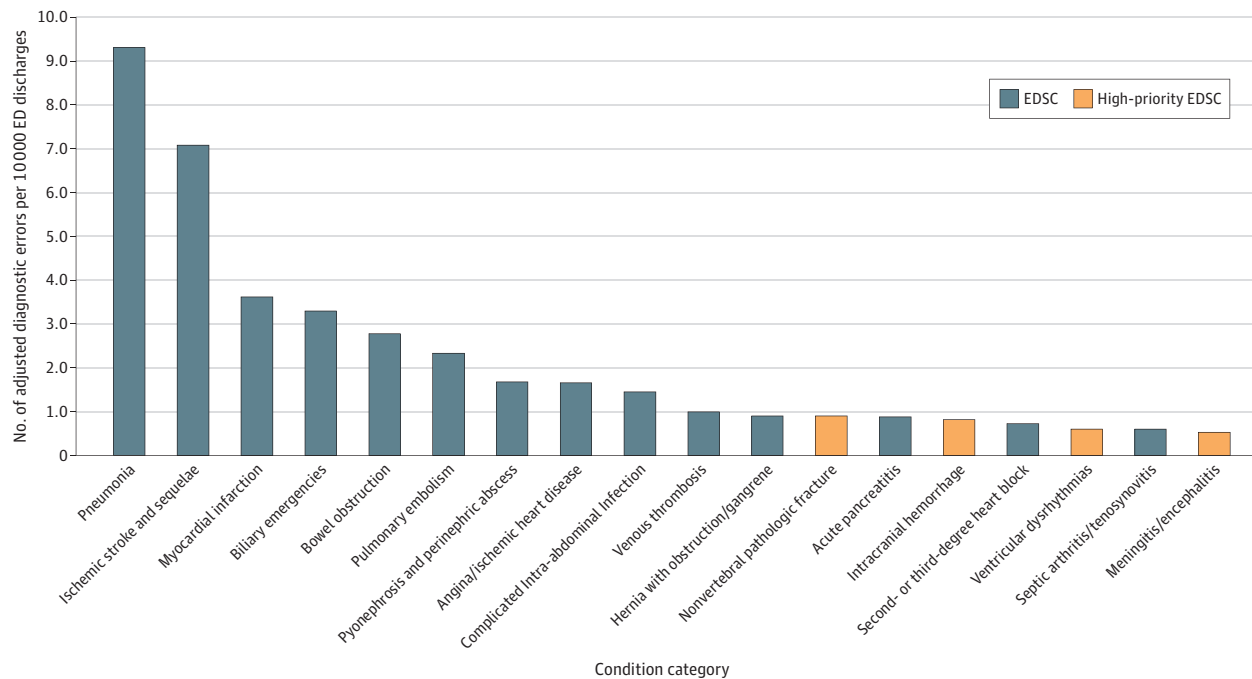
[24.5%]), aortic dissection (2130/8950 [23.8%]), and aortic aneurysm (2331/12 745 [18.3%]) (Table 2). The highest-morbidity EDSCs (ie, with the fewest mean [SD] HDAH at 30 days) were Guillain-Barré syndrome (7.6 [9.5] days), spinal and intracranial abscess (7.6 [9.6] days), nonvertebral pathologic fracture (7.9 [9.6] days), intracranial hemorrhage (8.6 [10.6] days), and endocarditis (8.9 [9.9] days).

High-Priority EDSCs Among Older Adults

The 16 high-priority EDSCs are listed in Table 2. A scatterplot of condition-specific 30-day mortality and HDAH lost for high-priority vs other EDSCs is presented in Figure 2. The most frequent diagnoses given at ED discharges preceding admissions for all EDSCs as well as high-priority EDSCs are presented in Table 3 and eTable 2 in Supplement 1.

For each of the 16 high-priority EDSCs, the most common diagnosis associated with prior ED discharges was a typical, symptom-based diagnosis. For example, for meningitis or encephalitis with a potential diagnostic error, the most frequent principal diagnosis category for prior ED discharges was headache (including migraine) (177 [11.6% of all preceding visits]). The most common diagnosis category for ED visits preceding an admission for acute limb ischemia and sequelae was musculoskeletal pain (not low back pain) (161 [12.1% of all preceding visits]). However, atypical presentations were seen for every EDSC category. For example, urinary tract infection was among the top 20 most frequent preceding ED diagnoses across all 16 high-priority EDSCs, including ventricular dysrhythmias (37 [1.7%]), pulmonary abscess or empyema (13 [1.8%]), and rhabdomyolysis (63 [4.9%]). Musculoskeletal pain (not low back pain) was also a top preceding diagnosis for every high-priority EDSC category. The following diagnosis categories were among the most frequent given prior to 15 of 16 high-priority EDSCs: abdominal pain and other digestive or abdominal signs and symptoms, fluid and electrolyte disorders, nonspecific chest pain, and malaise

Figure 1. Bar Graph of Emergency Diagnosis–Sensitive Condition (EDSC) Categories in the Top Quartile With Respect to Potential Diagnostic Errors, 2022–2024



EDSCs are 76 conditions deemed by a panel of clinician investigators to be amenable to evaluating diagnostic error using administrative datasets. The adjusted percentage of EDSC admissions preceded by an emergency department (ED) discharge for a different diagnosis in the prior 9 days was subtracted from the baseline rate of ED utilization among a comparison population. The adjusted percentage of diagnostic errors was then

multiplied by the total number of EDSC admissions, divided by the total number of ED discharges during the study period (N = 23 776 669), and then multiplied by 10 000. High-priority EDSCs are those in the top half of diagnostic error and top quartile of either 30-day mortality or lost healthy days at home at 30 days among Medicare beneficiaries.

and fatigue. The EDSCs that would be identified as high priority using alternative thresholds are presented in eTable 3 in Supplement 1.

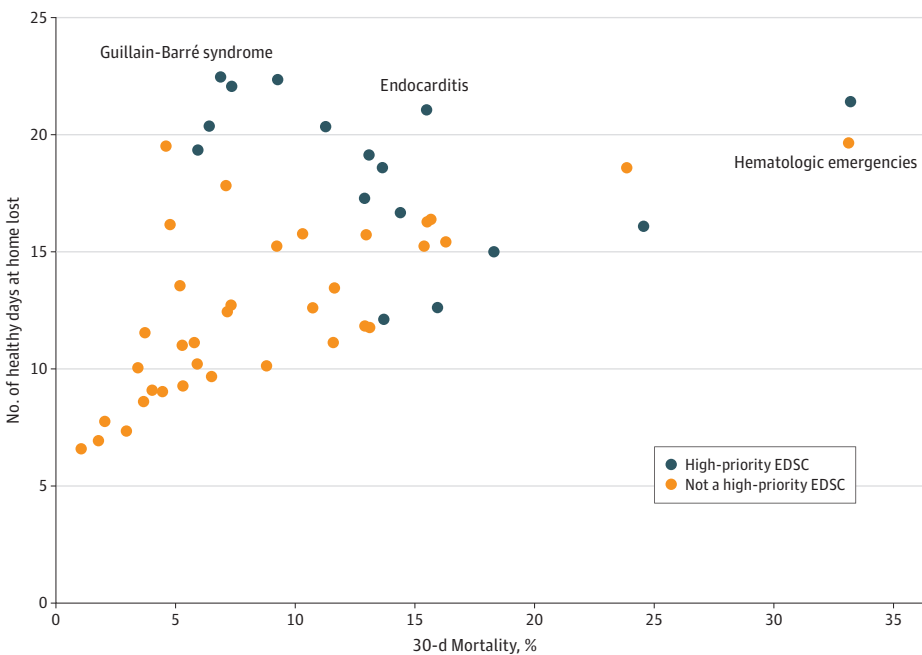
Discussion

In this study of 14 671 540 nonelective Medicare hospitalizations from 2022 to 2024, we identified 76 EDSCs for studying ED diagnostic error in administrative data. While EDSCs accounted for nearly one-fifth of nonelective hospitalizations among Medicare beneficiaries, the incidence of diagnostic error and associated morbidity and mortality varied across conditions. For example, while we estimated that fewer than 5% of pneumonia admissions had a preceding diagnostic error, the high disease incidence means that small reductions in diagnostic error rates may be associated with meaningful reductions in total population burden. In contrast, the adjusted rate of potential diagnostic error among patients hospitalized for Guillain-Barré syndrome was 16.6%; yet its relative rarity results in lower population-level impact.

Our findings underscore the extent to which undifferentiated symptoms common to high-severity conditions make ED diagnosis challenging. We found that while preceding symptom-based diagnoses were common (eg, headache for ED discharges preceding admissions for meningitis or encephalitis), the distribution of symptoms varied, with no single diagnosis or symptom accounting for a large share of prior visits. These diagnostic challenges are likely exacerbated by factors such as ED boarding and crowding, clinician burnout and attrition, and pressure to maintain throughput, which have worsened since the COVID-19 pandemic.²³⁻²⁹ Strategies to improve diagnostic quality may include strengthening diagnostic reasoning in graduate and continuing medical education and clinical decision support. Careful incorporation of artificial intelligence has the potential to reduce diagnostic error but also risks interrupting clinical workflows, introducing bias, or eroding clinicians' diagnostic reasoning skills.^{30,31}

This study provides national evidence on ED diagnostic error for older adults in the US, as well as detailed methodology for further study using administrative data. Pneumonia was the EDSC with the greatest number of potential diagnostic errors among Medicare beneficiaries. While it is

Figure 2. Scatterplot Comparing Mortality and Healthy Days at Home (HDAH) Lost at 30 Days for Emergency Diagnosis-Sensitive Conditions (EDSCs)



HDAH lost is the total time during the 30-day follow-up period from index admission in which the Medicare beneficiary had died or spent time in the inpatient or post-acute care settings. EDSCs are conditions deemed by a panel of clinician investigators to be amenable to evaluating diagnostic error using administrative datasets. High-priority EDSCs were in the top half of conditions with respect to incidence of potential diagnostic errors per 10 000 and the top quartile with respect to either 30-day mortality or lost HDAH at 30 days. Select EDSCs outliers are labeled.

unknown how many of these events represent a true diagnostic error vs disease progression, this finding may reflect the fact that pneumonia is both common and challenging to diagnose among older adults, with variable signs and symptoms and limited radiographic sensitivity.^{32,33} As scientific advances generate better diagnostics,³³ administrative datasets may inform whether such innovations improve potential diagnostic error across health systems and populations. As an extension, EDSCs can be used to assess hospital-level quality of care, including the extent to which institutions are effectively implementing interventions to mitigate system-level contributors to diagnostic error, such as boarding and crowding. Proponents of improving diagnostic accuracy have

Table 3. Five Most Frequent Principal Diagnosis Categories for Prior ED Discharges for Selected High-Priority EDSCs^a

Category	Value
All EDSCs	
No. of prior ED discharges	157 634
Most frequent diagnoses	
Abdominal pain and other digestive or abdominal signs and symptoms	10 996 (7.0)
Nonspecific chest pain	9031 (5.7)
Urinary tract infection	6519 (4.1)
Respiratory signs and symptoms	6491 (4.1)
Musculoskeletal pain (not low back pain)	5596 (3.5)
Guillain-Barré syndrome	
No. of prior ED discharges	742
Most frequent diagnoses	
Malaise and fatigue	65 (8.8)
Skin or subcutaneous signs and symptoms	60 (8.1)
Musculoskeletal pain (not low back pain)	59 (8.0)
Spondylopathies or spondyloarthropathy (including infective)	47 (6.3)
Low back pain	34 (4.6)
Meningitis or encephalitis	
No. of prior ED discharges	1522
Most frequent diagnoses	
Headache (including migraine)	177 (11.6)
Nervous system signs and symptoms	114 (7.5)
Viral infection	108 (7.1)
Malaise and fatigue	73 (4.8)
Fluid and electrolyte disorders	64 (4.2)
Spinal and intracranial abscess	
No. of prior ED discharges	723
Most frequent diagnoses	
Spondylopathies or spondyloarthropathy (including infective)	118 (16.3)
Low back pain	117 (16.2)
Musculoskeletal pain (not low back pain)	83 (11.5)
Sprains and strains (initial encounter)	38 (5.3)
Urinary tract infection	32 (4.4)

Abbreviations: ED, emergency department; EDSC, emergency diagnosis-sensitive condition.

^a Unless indicated otherwise, values are presented as the No. (%) of discharges. Prior ED visit diagnoses were aggregated into Agency for Healthcare Research and Quality Healthcare Cost and Utilization Project Clinical Classification Software Refined diagnosis categories.¹⁶ The 5 most frequent diagnoses are shown for each EDSC. EDSCs within the top half with respect to incidence of potential diagnostic errors per 10 000 ED discharges and top quartile of raw 30-day mortality or healthy days at home lost are listed.

emphasized that more diagnostic testing is not necessarily the goal; patient physical, psychological, and financial harm³⁴ from overtesting must be considered and may also be examined using claims data.^{35,36}

Our findings are consistent with and extend prior work on diagnostic error focused on high-risk¹⁰ and cardiovascular conditions.³⁷ Notably, high-priority EDSCs identified in this study accounted for 6 of 15 conditions highlighted in the AHRQ report⁶: meningitis or encephalitis, endocarditis, aortic aneurysm, spinal and intracranial abscess, stroke or intracranial hemorrhage, and nonvertebral pathologic fractures. The AHRQ report⁶ relied heavily on malpractice claims in the US and an incident reporting system in the UK, which generated concern regarding potential attribution bias.^{7,8} Our study did not attempt to quantify excess morbidity and mortality due to diagnostic error, given the “misdiagnosis is protective” paradox⁶ mentioned earlier. Instead, we focused on disease severity and population burden, with the assumption that timely and accurate ED diagnosis is most crucial for the highest-severity conditions. For example, lung cancer was included among the 15 conditions highlighted in the AHRQ report.⁶ However, malignant neoplasms without acute complications were excluded from EDSCs, as non-ED ambulatory settings are preferred for cancer diagnoses.^{38,39}

Limitations

This study is limited to beneficiaries of traditional Medicare 65 years or older; Medicare Advantage beneficiaries were not considered. The population burden of diagnostic error for individual diseases is likely to vary for younger populations. Ectopic pregnancy and preeclampsia or eclampsia are EDSCs that were predictably not observed among older Medicare beneficiaries but may be evaluated using other datasets (eg, Medicaid claims or HCUP data). Our approach to defining EDSCs excluded diseases for which a repeat visit is more likely to represent disease progression rather than a misdiagnosis. However, our decision to prioritize sensitivity over specificity for marginal diagnosis codes nevertheless may have led to an overestimate of the incidence of potential diagnostic error for some diseases. Additionally, while claims datasets can identify a potential diagnostic error, they generally cannot confirm its presence or establish preventability. Medical record review is the gold standard for adjudicating individual encounters but is subject to interrater reliability, is time-intensive, and is impractical for generating national estimates across a range of conditions. Nascent evidence suggests that the use of electronic trigger tools, particularly those enhanced by large language models, may improve efficiency of screening for diagnostic errors, but these tools have not yet replaced expert adjudication.⁴⁰⁻⁴²

Conclusions

In this cross-sectional study, we identified 76 EDSCs accounting for nearly 1 in 5 nonelective hospitalizations among Medicare beneficiaries in 2022 to 2024, while varying in prevalence, morbidity, and mortality. These findings suggest that EDSCs can serve as a framework for estimating the population burden associated with ED diagnostic error and for future research, quality improvement, and policy interventions to improve diagnostic safety.

ARTICLE INFORMATION

Accepted for Publication: August 12, 2026.

Published: October 6, 2026. doi:10.1001/jamanetworkopen.2026.37682

Open Access: This is an open access article distributed under the terms of the [CC-BY-NC-ND License](#), which does not permit alteration or commercial use, including those for text and data mining, AI training, and similar technologies. © 2026 Burke LG et al. *JAMA Network Open*.

Corresponding Author: Laura G. Burke, MD, MPH, Department of Emergency Medicine, Rhode Island Hospital, 55 Claverick St, Providence, RI 02903 (lburke6@brownhealth.org).

Author Affiliations: Department of Emergency Medicine, Rhode Island Hospital, Providence (L. G. Burke, R. C. Burke); Department of Emergency Medicine, Warren Alpert Medical School of Brown University, Providence, Rhode Island (L. G. Burke, R. C. Burke); Division of General Internal Medicine, Brigham and Women's Hospital, Boston, Massachusetts (Orav); Harvard Medical School, Boston, Massachusetts (Orav, Haimovich, Edlow, Figueroa); Department of Emergency Medicine, University of Washington, Seattle (Sabbatini); Department of Emergency Medicine, Beth Israel Deaconess Medical Center, Boston, Massachusetts (Haimovich, Edlow); Department of Health Policy and Management, Harvard T. H. Chan School of Public Health, Boston, Massachusetts (Figueroa); Department of Emergency Medicine, Stanford University, Palo Alto, California (Lin).

Author Contributions: Drs L. G. Burke and R. C. Burke had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Concept and design: L. G. Burke, R. C. Burke, Sabbatini, Haimovich, Figueroa, Lin.

Acquisition, analysis, or interpretation of data: All authors.

Drafting of the manuscript: L. G. Burke, Sabbatini, Edlow, Lin.

Critical review of the manuscript for important intellectual content: All authors.

Statistical analysis: L. G. Burke, R. C. Burke, Orav.

Obtained funding: L. G. Burke.

Administrative, technical, or material support: L. G. Burke, Figueroa, Lin.

Supervision: L. G. Burke.

Conflict of Interest Disclosures: Dr L. G. Burke reported receiving grants from the American Board of Medical Specialties (ABMS), the US Department of Veterans Affairs, and the National Institute of General Medical Sciences outside the submitted work. Dr Orav reported receiving grants from the National Institutes of Health (NIH) during the conduct of the study. Dr Haimovich reported receiving personal fees from MBO Partners outside the submitted work. Dr Edlow reported reviewing medical malpractice cases for both defense and plaintiff firms outside the submitted work. Dr Figueroa reported receiving grants from the Agency for Healthcare Research and Quality (AHRQ) during the conduct of the study. In addition, Dr Figueroa reported receiving grants from the Commonwealth Fund, the SCAN Foundation, the NIH, the Robert Wood Johnson Foundation, and Arnold Ventures, as well as receiving personal fees from Project HOPE for editorial services for *Health Affairs* outside the submitted work. Dr Lin reported receiving grants from the AHRQ and the ABMS during the conduct of the study. In addition, Dr Lin reported receiving grants from the National Institute on Aging; the National Heart, Lung, and Blood Institute; the Advanced Research Projects Agency for Health; the National Institute on Minority Health and Health Disparities; and the Emergency Medicine Foundation outside the submitted work. No other disclosures were reported.

Funding/Support: This work was funded by grant R01HS029781 from the AHRQ (Dr L. G. Burke).

Role of the Funder/Sponsor: The funder had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Data Sharing Statement: See [Supplement 3](#).

Additional Contributions: Alexander S. Hoxha, BS (Computer Ally Inc), assisted with table creation and editing. No compensation was provided for this contribution.

REFERENCES

1. Newman-Toker DE, Nassery N, Schaffer AC, et al. Burden of serious harms from diagnostic error in the USA. *BMJ Qual Saf*. 2024;33(2):109-120. doi:[10.1136/bmjqs-2021-014130](https://doi.org/10.1136/bmjqs-2021-014130)
2. Venkatesh AK, Mei H, Shuling L, et al. Cross-sectional analysis of emergency department and acute care utilization among Medicare beneficiaries. *Acad Emerg Med*. 2020;27(7):570-579. doi:[10.1111/acem.13971](https://doi.org/10.1111/acem.13971)
3. Burke LG, Burke RC, Duggan CE, Figueroa JF, Orav EJ, Marcantonio ER. Trends in healthy days at home for Medicare beneficiaries using the emergency department. *J Am Geriatr Soc*. 2023;71(10):3122-3133. doi:[10.1111/jgs.18464](https://doi.org/10.1111/jgs.18464)
4. Mantilla JJ, Burke RC, Orav EJ, et al. Trends in urgent care utilization among Medicare beneficiaries from 2012 to 2019. *JAMA Netw Open*. 2026;9(1):e2555345. doi:[10.1001/jamanetworkopen.2025.55345](https://doi.org/10.1001/jamanetworkopen.2025.55345)
5. Le ST, Hsia RY. Community characteristics associated with where urgent care centers are located: a cross-sectional analysis. *BMJ Open*. 2016;6(4):e010663. doi:[10.1136/bmjopen-2015-010663](https://doi.org/10.1136/bmjopen-2015-010663)
6. Newman-Toker DE, Peterson SM, Badihan S, et al. *Diagnostic Errors in the Emergency Department: A Systematic*

- Review. AHRQ Comparative Effectiveness Reviews. Agency for Healthcare Research and Quality; 2022. doi:[10.23970/AHRQEPCCER258](https://doi.org/10.23970/AHRQEPCCER258)
7. Multi-organizational letter regarding AHRQ report on diagnostic errors in the emergency department. Emergency Medicine Residents' Association. December 14, 2022. Accessed August 26, 2026. <https://www.emra.org/news/ahrq-all-em-statement>
8. Carpenter CR, Jotte R, Griffey RT, Schwarz E. A critical appraisal of AHRQ's "Diagnostic Errors" report. *Mo Med*. 2023;120(2):114-120.
9. Dubosh NM, Edlow JA, Goto T, Camargo CA Jr, Hasegawa K. Missed serious neurologic conditions in emergency department patients discharged with nonspecific diagnoses of headache or back pain. *Ann Emerg Med*. 2019;74(4):549-561. doi:[10.1016/j.annemergmed.2019.01.020](https://doi.org/10.1016/j.annemergmed.2019.01.020)
10. Lin MP, Burke RC, Sabbatini AK, et al. Potential diagnostic error for emergency conditions, mortality, and healthy days at home. *JAMA Netw Open*. 2025;8(6):e2516400. doi:[10.1001/jamanetworkopen.2025.16400](https://doi.org/10.1001/jamanetworkopen.2025.16400)
11. Sharp AL, Pallegadda R, Baecker A, et al. Are mental health and substance use disorders risk factors for missed acute myocardial infarction diagnoses among chest pain or dyspnea encounters in the emergency department? *Ann Emerg Med*. 2022;79(2):93-101. doi:[10.1016/j.annemergmed.2021.08.016](https://doi.org/10.1016/j.annemergmed.2021.08.016)
12. Vermeulen MJ, Schull MJ. Missed diagnosis of subarachnoid hemorrhage in the emergency department. *Stroke*. 2007;38(4):1216-1221. doi:[10.1161/01.STR.0000259661.05525.9a](https://doi.org/10.1161/01.STR.0000259661.05525.9a)
13. Vashi AA, Urech T, Carr B, et al. Identification of emergency care-sensitive conditions and characteristics of emergency department utilization. *JAMA Netw Open*. 2019;2(8):e198642. doi:[10.1001/jamanetworkopen.2019.8642](https://doi.org/10.1001/jamanetworkopen.2019.8642)
14. Meyers DJ, Werner RM. Studying Medicare Advantage with existing data-pitfalls, challenges, and opportunities. *JAMA Netw Open*. 2025;8(7):e2522833. doi:[10.1001/jamanetworkopen.2025.22833](https://doi.org/10.1001/jamanetworkopen.2025.22833)
15. Jarrin OF, Nyandeghe AN, Grafova IB, Dong X, Lin H. Validity of race and ethnicity codes in Medicare administrative data compared with gold-standard self-reported race collected during routine home health care visits. *Med Care*. 2020;58(1):e1-e8. doi:[10.1097/MLR.0000000000001216](https://doi.org/10.1097/MLR.0000000000001216)
16. Agency for Healthcare Research and Quality Healthcare Cost and Utilization Project. *Clinical Classifications Software Refined (CCSR) for ICD-10-CM Diagnoses*. Agency for Healthcare Research and Quality; 2026.
17. Rising KL, Victor TW, Hollander JE, Carr BG. Patient returns to the emergency department: the time-to-return curve. *Acad Emerg Med*. 2014;21(8):864-871. doi:[10.1111/acem.12442](https://doi.org/10.1111/acem.12442)
18. Jones S, Moulton C, Swift S, et al. Association between delays to patient admission from the emergency department and all-cause 30-day mortality. *Emerg Med J*. 2022;39(3):168-173. doi:[10.1136/emermed-2021-211572](https://doi.org/10.1136/emermed-2021-211572)
19. Burke LG, Epstein SK, Burke RC, Orav EJ, Jha AK. Trends in mortality for Medicare beneficiaries treated in the emergency department from 2009 to 2016. *JAMA Intern Med*. 2020;180(1):80-88. doi:[10.1001/jamainternmed.2019.4866](https://doi.org/10.1001/jamainternmed.2019.4866)
20. Roussel M, Teissandier D, Yordanov Y, et al; FHU IMPEC-IRU SFMU Collaborators; FHU IMPEC-IRU SFMU Collaborators. Overnight stay in the emergency department and mortality in older patients. *JAMA Intern Med*. 2023;183(12):1378-1385. doi:[10.1001/jamainternmed.2023.5961](https://doi.org/10.1001/jamainternmed.2023.5961)
21. Woodworth L. Swamped: emergency department crowding and patient mortality. *J Health Econ*. 2020;70:102279. doi:[10.1016/j.jhealeco.2019.102279](https://doi.org/10.1016/j.jhealeco.2019.102279)
22. Burke LG, Orav EJ, Zheng J, Jha AK. Healthy days at home: a novel population-based outcome measure. *Healthc (Amst)*. 2020;8(1):100378. doi:[10.1016/j.hjdsi.2019.100378](https://doi.org/10.1016/j.hjdsi.2019.100378)
23. Oskvarek JJ, Zocchi MS, Black BS, et al; US Acute Care Solutions Research Group. Emergency department volume, severity, and crowding since the onset of the coronavirus disease 2019 pandemic. *Ann Emerg Med*. 2023;82(6):650-660. doi:[10.1016/j.annemergmed.2023.07.024](https://doi.org/10.1016/j.annemergmed.2023.07.024)
24. Janke AT, Melnick ER, Venkatesh AK. Hospital occupancy and emergency department boarding during the COVID-19 pandemic. *JAMA Netw Open*. 2022;5(9):e2233964. doi:[10.1001/jamanetworkopen.2022.33964](https://doi.org/10.1001/jamanetworkopen.2022.33964)
25. Smulowitz PB, O'Malley AJ, Khidir H, Zaborski L, McWilliams JM, Landon BE. National trends in ED visits, hospital admissions, and mortality for Medicare patients during the COVID-19 pandemic. *Health Aff (Millwood)*. 2021;40(9):1457-1464. doi:[10.1377/hlthaff.2021.00561](https://doi.org/10.1377/hlthaff.2021.00561)
26. Smulowitz PB, O'Malley AJ, McWilliams JM, Zaborski L, Landon BE. Emergency department visits and hospital capacity in the US: trends in the Medicare population during the COVID-19 pandemic. *Health Aff (Millwood)*. 2024;43(7):970-978. doi:[10.1377/hlthaff.2023.01153](https://doi.org/10.1377/hlthaff.2023.01153)
27. Menon NK, Shanafelt TD, Sinsky CA, et al. Association of physician burnout with suicidal ideation and medical errors. *JAMA Netw Open*. 2020;3(12):e2028780. doi:[10.1001/jamanetworkopen.2020.28780](https://doi.org/10.1001/jamanetworkopen.2020.28780)

28. Sexton JB, Adair KC, Proulx J, et al. Emotional exhaustion among US health care workers before and during the COVID-19 pandemic, 2019-2021. *JAMA Netw Open*. 2022;5(9):e2232748. doi:10.1001/jamanetworkopen.2022.32748
29. Lasater KB, Aiken LH, Sloane DM, et al. Chronic hospital nurse understaffing meets COVID-19: an observational study. *BMJ Qual Saf*. 2021;30(8):639-647. doi:10.1136/bmjqs-2020-011512
30. Brunyé TT, Mitroff SR, Elmore JG. Artificial intelligence and computer-aided diagnosis in diagnostic decisions: 5 questions for medical informatics and human-computer interface research. *J Am Med Inform Assoc*. 2026;33(2):543-550. doi:10.1093/jamia/ocaf123
31. Jabbour S, Fouhey D, Shepard S, et al. Measuring the impact of AI in the diagnosis of hospitalized patients: a randomized clinical vignette survey study. *JAMA*. 2023;330(23):2275-2284. doi:10.1001/jama.2023.22295
32. Vaughn VM, Dickson RP, Horowitz JK, Flanders SA. Community-acquired pneumonia: a review. *JAMA*. 2024;332(15):1282-1295. doi:10.1001/jama.2024.14796
33. Reyes LF, Conway Morris A, Serrano-Mayorga C, Derde LPG, Dickson RP, Martin-Loeches I. Community-acquired pneumonia. *Lancet*. 2025;406(10517):2371-2388. doi:10.1016/S0140-6736(25)01493-X
34. Ganguli I, Simpkin AL, Lupo C, et al. Cascades of care after incidental findings in a US national survey of physicians. *JAMA Netw Open*. 2019;2(10):e1913325. doi:10.1001/jamanetworkopen.2019.13325
35. Ganguli I, Lupo C, Mainor AJ, et al. Prevalence and cost of care cascades after low-value preoperative electrocardiogram for cataract surgery in fee-for-service Medicare beneficiaries. *JAMA Intern Med*. 2019;179(9):1211-1219. doi:10.1001/jamainternmed.2019.1739
36. Ganguli I, Keating NL, Thakore N, Lii J, Raza S, Pace LE. Downstream mammary and extramammary cascade services and spending following screening breast magnetic resonance imaging vs mammography among commercially insured women. *JAMA Netw Open*. 2022;5(4):e227234. doi:10.1001/jamanetworkopen.2022.7234
37. Waxman DA, Kanzaria HK, Schriger DL. Unrecognized cardiovascular emergencies among Medicare patients. *JAMA Intern Med*. 2018;178(4):477-484. doi:10.1001/jamainternmed.2017.8628
38. Thompson CA, Sheridan P, Metwally E, et al. Emergency department involvement in the diagnosis of cancer among older adults: a SEER-Medicare study. *J Natl Cancer Inst Cancer Spectr*. 2024;8(3):pkae039. doi:10.1093/jncics/pkae039
39. Kang S, McLeod SL, Walsh C, Grewal K. Patient outcomes associated with cancer diagnosis through the emergency department: a systematic review. *Acad Emerg Med*. 2023;30(9):955-962. doi:10.1111/acem.14671
40. Vaghani V, Gupta A, Mir U, et al. Implementation of electronic triggers to identify diagnostic errors in emergency departments. *JAMA Intern Med*. 2025;185(2):143-151. doi:10.1001/jamainternmed.2024.6214
41. Vaghani V, Wei L, Mushtaq U, Sittig DF, Bradford A, Singh H. Validation of an electronic trigger to measure missed diagnosis of stroke in emergency departments. *J Am Med Inform Assoc*. 2021;28(10):2202-2211. doi:10.1093/jamia/ocab121
42. Marks CM, Gibney S, Stenson B, et al. Screening for missed opportunities for diagnosis in the ED using eTriggers and large language models. *JAMA Netw Open*. 2026;9(6):e2620939. doi:10.1001/jamanetworkopen.2026.20939

SUPPLEMENT 1.

eAppendix. Technical Appendix and International Statistical Classification of Diseases, Tenth Revision (ICD-10) Diagnosis Codes for Emergency Diagnosis-Sensitive Conditions (EDSCs)

eFigure. Number of Included and Excluded International Statistical Classification of Diseases, Tenth Revision (ICD-10) Codes for Emergency Diagnosis-Sensitive Conditions

eTable 1. Admission Frequency and Share of Potential Diagnostic Errors for Each Emergency Diagnosis-Sensitive Condition Among Fee-for-Service Medicare Beneficiaries Aged 65 or Older, 2022-2024

eTable 2. Twenty Most Frequent Principal Diagnosis Categories Given for Emergency Department Discharges Preceding Admissions for High-Priority Emergency Diagnosis-Sensitive Conditions

eTable 3. High-Priority Emergency Diagnosis-Sensitive Conditions by Outcome Threshold

SUPPLEMENT 2.

eTable 4. ICD-10 Codes Excluded from EDSCs

SUPPLEMENT 3.

Data Sharing Statement