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Predictors of Potentially Avoidable Emergency Department Visits: A Systematic Review

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Abstract

Potentially avoidable, or primary care sensitive, emergency department (PCS ED) visits include non-emergencies and problems that potentially could have been prevented with better primary care. Our goal was to summarize the literature on the predictors of PCS ED visits. A total of 16 articles met all inclusion criteria. Characteristics found to predict PCS ED use included being female, African American, and/or covered by Medicaid. Studies defined a PCS ED visit in various ways, complicating the question of how best to prevent such visits. We identified several gaps in the literature, including lack of recent, nationally representative data; little clarity on modeling methods used; and wide variation in how PCS ED use was defined. If holding primary care providers accountable for reducing avoidable ED use is the goal, better tools for categorizing, recognizing, and predicting PCS ED visits will be needed.

INTRODUCTION

Converging events led the Institute of Medicine to describe emergency medicine as "at the breaking point" in 2007 (IOM Committee on the Future of Emergency Care in the US Health System 2007). Emergency department (ED) utilization is growing, while the number of EDs is shrinking. From 1998 to 2008, EDs saw a 30% increase in patient volume, while the number of EDs decreased by 3% (Hsia, Kellermann et al. 2011). Further, as the "safety net for the safety net," and as the only source of care guaranteed to all Americans regardless of ability to pay, EDs face a steady demand for uncompensated care (Delia and Cantor 2009).

Non-elderly, insured patients appear to be driving the increase in ED utilization (Delia and Cantor 2009; Tang, Stein et al. 2010). Areas of the country with the longest waiting times for ambulatory care appointments have the highest ED use rates (Cunningham 2006), and barriers to timely access to primary care are associated with increased ED use (Rust, Ye et al. 2008; Cheung, Wiler et al. 2012).

Why is reducing unnecessary ED use important? First, EDs have experienced severe overcrowding and long wait times over the past 10 years (IOM Committee on the Future of Emergency Care in the US Health System 2007; Horwitz and Bradley 2009). More than 90% of EDs report that overcrowding is a serious problem, and 40% report that the problem occurs daily (Kaskie, Obrizan et al. 2010). Second, care in the ED is more expensive than care in other settings. Reducing ED overuse represents an opportunity to save as much as $38 billion per year (New England Healthcare Institute 2010). Third, care in the ED is often associated with lack of coordination between providers, potentially resulting in unnecessary procedures and worse care (Carrier, Yee et al. 2011). Finally, ED use is often associated with problems in accessing primary care. In surveys, as many as half of patients presenting at the ED for nonurgent reasons cite an

inability to get a timely appointment with their healthcare provider as a reason for their visit (Gill and Riley 1996; Young, Wagner et al. 1996; Billings, Parikh et al. 2000; DeSalvo, Rest et al. 2000; Redstone, Vancura et al. 2008).

Researchers disagree how best to measure ED visits, and the measurement used is not always the method best suited to accomplishing a particular purpose.. While overall use is simplest, it is affected by more than the quality of care available or how accessible that care is, and it does not distinguish between appropriate and potentially avoidable ED use. The concept of a potentially avoidable, or primary care sensitive (PCS), ED visit was created to try to focus on that subset of ED visits that were for nonurgent complaints, could be seen in a less-acute setting, or could have been prevented with better primary care.

Another alternative to overall or PCS ED utilization is frequent visits to the ED (LaCalle and Rabin 2010). However, this measure also does not distinguish between appropriate and potentially avoidable visits. Moreover, many frequent ED visitors are also heavy utilizers of other types of care (Blank, Li et al. 2005; Althaus, Paroz et al. 2011; Doupe, Palatnick et al. 2012), suggesting both a high level of medical need and ready access to care in different settings (Weber 2012). In addition, some patients may only have one PCS visit in their lifetime; a focus on frequent users would miss these visits.

Our focus is on potentially avoidable, or PCS, visits to the ED. This review builds on previous work on the determinants of overall ED use and frequent ED use by reviewing the literature on patients who visit the ED with complaints that could potentially have been treated elsewhere, as well as those with nonemergent complaints and problems that could have been prevented from becoming emergent with better care.

PCS ED visits can be seen, in part, as a failure of the healthcare system to provide high-quality, coordinated care for chronic conditions and/or to offer timely access to care (e.g., extended hours, seeing urgent cases quickly, etc.) (Delia and Cantor 2009). Using data from the National Center for Health Statistics, the increase in total ED visits between 1997-98 and 1999-2000 was entirely attributed to visits classified as semi-urgent, nonurgent, or no/unknown triage (Cunningham 2006). In Massachusetts, about 1 in 3 people visit emergency departments (EDs) every year, and according to that state's Division of Health Care Finance and Policy, nearly half of outpatient ED visits in 2008 were potentially preventable or avoidable (Division of Health Care Finance and Policy 2010).

The PCS designation has been used by state officials in Utah (Utah Office of Health Care Statistics 2004), Blue Cross Blue Shield in Michigan (Blue Cross Blue Shield of Michigan 2012), and in the District of Columbia (Lurie, Gresenz et al. 2008), among others. The term is an alternative to "potentially avoidable", "unnecessary", or "inappropriate" and is meant to highlight the connection between this kind of utilization and primary care, without implying that every instance of such utilization is a mistake. The concepts of PCS or potentially avoidable ED visits are controversial, and there is no consensus on criteria for judging if a single visit is potentially avoidable (Lowe and Schull 2011).

According to Andersen's Behavioral Model of Health Services Use, health services utilization reflects the combined effects of need, predisposing, and enabling factors, as well as health behaviors and characteristics of the healthcare system.(Andersen 1995) Predisposing factors include sociodemographic factors (age, sex, race, education, etc.) as well as health beliefs (such as trust in the medical system). Predisposing variables presumably do not cause service use directly, but are included to acknowledge that some individuals have a greater propensity to use

services than do others. Enabling factors reflect the fact that, even when an individual is predisposed to use a service, certain conditions facilitate that use. Enabling conditions primarily include financial and community resources, such as income, health insurance, having a usual source of care, physician supply, and the patient's proximity to facilities. With the assumption of a predisposition to use services and the ability to do so, a potential service user must also see a need for the service. For medical services, need is generally assessed by the extent of illness or disease. For many social services, or what Andersen referred to as "discretionary services," the role of need is somewhat more complicated and interacts with predisposing factors. Some modifications are needed when applying the Andersen model to PCS ED use (Figure 1). For example, a patient with a usual source of care and close proximity to many primary care providers might have fewer PCS ED visits, rather than more.

OBJECTIVES AND RESEARCH QUESTIONS

The key to targeting unnecessary ED visits is being able to identify, accurately classify, and predict truly avoidable utilization. Therefore, the goal of this review is to summarize the literature on the methods used to predict such visits and the actual predictors themselves.

This review was designed to answer the following questions: How are PCS ED visits classified in the research literature? What are the predictors of such use among adults? And, how do these predictors differ from those for general ED use or frequent use?

NEW CONTRIBUTION

This paper comprehensively and systematically reviews the literature on the topic of the predictors of potentially avoidable ED use among adults in the United States, as well as systems used to identify such use. While one previous paper has reviewed the literature on the predictors of overall ED use among the elderly (McCusker, Karp et al. 2003) and another has reviewed the

predictors of frequent ED use (LaCalle and Rabin 2010), we are not aware of any previous reviews focusing on the determinants of potentially avoidable ED visits and methods used to identify these visits. This review adds to our understanding of what factors drive patients to visit EDs with nonurgent complaints and problems that could be seen in less acute settings.

METHODS

To identify relevant journal articles for this study, we systematically reviewed English-language articles published through September 2011. Search terms included in searches of PubMed. MeSH terms included: Emergency Medical Services/utilization, Emergency Service, Hospital/utilization, Patient Admission/statistics & numerical data* AND emergency [tiab], Health Services Misuse/statistics & numerical data* AND emergency [tiab], Health Services Needs and Demand AND emergency [tiab]. Keywords combined with the term "emergency" included: nonurgent OR non-urgent, nonemergent OR non-emergent, avoidable, primary care treatable, ambulatory care sensitive, low complexity OR low-complexity, lower acuity OR low acuity OR low-acuity, appropriateness, appropriate use, and inappropriate.

We hand-searched key journals, including *Academic Emergency Medicine*, *Annals of Emergency Medicine*, *Medical Care*, and *HSR: Health Services Research*, for relevant articles. We also reviewed bibliographies of relevant articles and conducted internet searches using Google Scholar to locate articles not indexed in PubMed.

INCLUSION AND EXCLUSION CRITERIA

To be included, we required articles to: be written in English, have an abstract available, be published in a peer-reviewed journal, and provide quantitative data on the predictors or determinants of PCS ED use among adults in the United States. We focused on adults because

they are the most policy-relevant population under health reform, since many children are already covered by Medicaid/SCHIP.

We excluded articles that provided data only on predictors of frequent use or general predictors of ED visits without characterizing the acuity of the visit (ie, articles that did not define PCS, preventable, inappropriate, or unnecessary visits). We also excluded literature reviews, commentary/opinion articles, letters to the editor, and editorials.

DATA ABSTRACTION AND QUALITY ASSESSMENT

We abstracted the following data from each study: author and year, setting, sample characteristics and patient population, study design and statistical methods, outcome measures, definition of PCS use, results and conclusions, accuracy of the algorithm or model used to predict visits, and strength of the evidence (ie, quality rating). Because the literature search to identify studies involving randomization or, in most cases, any intervention, we performed quality rating using a modified Downs & Black (Downs and Black 1998) checklist. The following 12 criteria were used: 1) clear descriptions of aims; 2) clear descriptions of outcomes; 3) clear descriptions of patient characteristics; 4) clear descriptions of principal confounders; 5) clear descriptions of main findings; 6) random variability for the main outcome provided; 7) actual *P* value reported; 8) appropriate statistical methods used; 9) accurate outcome measures used; 10) participants recruited from the same population; 11) participants recruited at the same time; and 12) adequate adjustment for confounders performed.

We classified the method of analysis in each study as univariate or multivariable. We noted variables that were statistically significant predictors ($P<.05$) of ED utilization. If both univariate and multivariable predictors were given in an article, we report only the multivariable results

here. We categorized significant factors derived from multivariable analyses as representing need, predisposing, or enabling factors.

RESULTS

We identified 533 articles using the search strategy described above. After eliminating 447 studies that were clearly not relevant based on their titles, we reviewed 86 abstracts for relevance. We eliminated 47 studies based on their abstracts and retrieved 39 studies for full-text review. Another 11 full-text articles were retrieved based on the bibliographies of these 39 articles. From the 50 articles reviewed in full, 16 articles met all inclusion criteria (**Figure 2**). All 16 articles described observational studies, published between 1993 and 2010. Seven studies reported only univariate estimates; these studies' quality ratings ranged from 50% to 83% (mean: 63%). The other 9 studies, which reported multivariable estimates, had quality ratings ranging from 83% to 100% (mean: 94%).

Four studies drew from nationally representative, population-based surveys, see Table 1. One article published results from a national study at 56 EDs across the US, which surveyed patients who were triaged as nonurgent by an ED nurse regarding their reasons for seeking care in the ED Another 5 studies reported on regional multi-site studies. For example, Wharam et al. used data from nonelderly enrollees in the Harvard Pilgrim Health Plan in Massachusetts, comparing nonurgent ED use between those in high-deductible health plans with those in more traditional plans (Wharam, Landon et al. 2007). Finally, 6 articles reported on single-site studies All 6 of these studies were single-hospital surveys of nonurgent patients regarding their reasons for seeking care in the ED.

Sample sizes (or number of ED visits studied) ranged from 94 to 135,723 (median: 3003). **Table 1** summarizes the characteristics of each included study, listing studies that used

multivariable analyses first, followed by those that used univariate analyses; within each section, studies are sorted from highest quality rating to lowest.

METHODS USED TO CATEGORIZE PCS ED USE

The methods used to categorize the acuity of ED visits in the literature can be classified into three categories: diagnosis-based, procedure-based, and triage-based. In this section, each method and studies using that method are briefly described.

DIAGNOSIS-BASED CLASSIFICATION

Retrospective classification based on diagnosis codes reflects the probability of a patient's underlying reason for the visit being emergent or nonemergent. This type of system is best exemplified by the algorithm developed at New York University (NYU EDA) (NYU Center for Health and Public Service Research 2011), which was designed to identify nonurgent ED visits, as well as those that could have been provided in a primary care setting or emergencies that are likely to have been avoided if primary care had been delivered earlier. Since detailed medical records are not available for most analyses, the algorithm classifies ED visits according to discharge diagnosis (i.e., ICD-9 code), which is routinely available to researchers in hospital billing records. The EDA includes 4 categories that address PCS ED visits: 1) non-emergent (immediate care not required within 12 hours); 2) emergent/primary care treatable (care required within 12 hours that could have been provided in a primary care setting); 3) emergent, ED care needed, possibly preventable/avoidable (ED required, but visit could possibly have been prevented with good primary care); and 4) emergent, ED care needed, not preventable/avoidable. The first three categories represent visits that may have been provided elsewhere or prevented altogether (PCS visits).

The NYU EDA has been adapted for use by the CDC to describe the characteristics of high safety-net burden EDs, has been validated as accurate in predicting future hospitalizations and mortality, and has been used by several states and municipalities to track ED visit patterns (Ballard, Price et al. 2010). However, some studies have not found the algorithm to be sensitive to changes in access to care, the use for which it was designed (Lowe and Fu 2008; Jones, Paxton et al. 2011), and it has not been updated since 2003 (Washington State Hospital Association 2010). Nevertheless, it is currently the only validated tool for evaluating the acuity of an ED visit.

This system was used by 2 studies in this review (Lowe, Localio et al. 2005; Wharam, Landon et al. 2007). Lowe et al (2005) modified the NYU EDA by collapsing the algorithm's 4 emergent/nonemergent categories into 2 (potentially avoidable and probably unavoidable). Wharam et al., used the NYU EDA to classify visits as high severity (at least 75% likelihood of being emergent), low severity (25% or less likelihood of being emergent), or indeterminant (26-74% chance of being emergent).

One other study in this review used a diagnosis-based classification system. In the study by Chiou et al., two experts in medical coding used ICD-9-CM codes to classify ED visits as urgent or nonurgent (Chiou, Campbell et al. 2010). No other information was provided in the article about the methods used.

PROCEDURE-BASED CLASSIFICATION

Procedure-based systems look primarily at what occurs during the episode of care, such as whether patients received imaging tests or were admitted to the hospital. The method developed by Cunningham et al., (1995) and used by Sarver et al., (2002) evaluates visits as urgent or nonurgent based on procedures and utilization that occur during and after the visit as well as the

patient-reported reason for the visit. In the original system developed by Cunningham et al. and applied to data from the 1987 National Medical Expenditure Survey, visits were classified as "urgent" if they 1) resulted in a hospitalization, 2) occurred within 3 days of an injury/accident, 3) included any surgical procedures, 4) involved a physician's referral, 5) involved an ambulance, or 6) were associated with a self-reported "very serious" condition.

Sarver et al. (2002) modified these criteria and applied them to the 1996 Medical Expenditure Panel Survey as follows: a visit was considered urgent if 1) it resulted in a hospital admission; 2) it included any imaging or surgical procedure and it was reported as for an accident or injury, diagnosis, or treatment and not the result of a referral; or 3) the reason for the visit was reported as accident/injury, diagnosis, or treatment and the visit was within 3 days of the accident/injury or symptom onset. All other visits were considered nonurgent. Sarver et al., validated the criteria by also applying them to outpatient hospital and physician office visits, finding that only 6% of visits in each setting were classified as urgent using these criteria. In contrast, about 60% of ED visits were classified as urgent in both Cunningham et al., (1995) and Sarver et al.

The American Medical Association's Current Procedural Terminology (CPT) codes, which assign a code to each procedure and are used by providers when submitting claims to insurance companies, could also be considered a procedure-based system of classification. One study, by Wolinsky et al. (2008), used CPT codes to classify ED visits, categorizing visits with the CPT codes of 99281 (self-limited problem) and 99282 (low to moderate severity problem) as "low intensity" visits. The authors validated the method against diagnosis codes and against the NYU EDA and reported good criterion validity.

TRIAGE-BASED CLASSIFICATION

In most emergency departments in the US, patients are assigned by a nurse or physician to one of three, four, or five triage categories based on how soon the patient needs to be seen, as judged by that clinician. This prospective classification is part of the medical record, subjectively reflects degree of urgency, and is done before definitive diagnoses are made. Unfortunately, ED triage acuity systems in the United States are not standardized (Agency for Healthcare Research & Quality 2012) and a number of studies have shown that their reliability varies widely (O'Brien, Shapiro et al. 1996; Lowe and Bindman 1997)A version of this system is currently used by the National Hospital Ambulatory Medical Care Survey (NHAMCS), in which survey respondents assign visits to urgency categories based on the triage category used by their hospital, which are then recoded to one of five categories: immediate (should be seen within 1 minute), emergent (should be seen in 1-14 minutes), urgent (should be seen in 15-60 minutes), semiurgent (should be seen in 61-120 minutes), and nonurgent (should be seen in 121 minutes to 24 hours). The study by Liu et al. relied on the classification system used by NHAMCS (Liu, Sayre et al. 1999). Five studies in this review used triage-based methods of classifying visit acuity that were developed by that study's authors (Grumbach, Keane et al. ; Schwartz ; Young, Wagner et al. ; Pilossoph-Gelb, Mower et al. ; Petersen, Burstin et al.).

Another 3 studies used the Emergency Severity Index (ESI) to classify ED visits (Northington, Brice et al. ; Matteson, Weitzen et al. ; Redstone, Vancura et al.). The ESI is a triage system developed by Wuerz et al for use by ED nurses and physicians, which has been validated against patients' subsequent resource needs (such as diagnostic testing and hospitalization) and for interrater reliability between nurses and physicians (weighted k = .80 [95% CI = 0.760.84]). The flowchart-based algorithm sorts patients into 5 categories (ESI-1

being the most acute) based on patient acuity (stability of vital functions, degree of distress), expected resource intensity (such as cardiac monitoring, specialty consultation, or diagnostic tests), and timeliness (expected staff response, time to disposition). Vital signs are used adjunctively to move patients from ESI-3 to ESI-2, but are not required for assignment to the other categories (Wuerz, Milne et al. 2000).

PREDICTORS OF PCS ED USE

In **Table 2**, we report adjusted odds ratios (ORs) for factors associated with PCS ED use in multivariable analyses, arranged by whether they represent need, predisposing factors, or enabling factors. As a category, enabling factors were most frequently described. The individual enabling factor most frequently reported to be associated with increased PCS ED use was having Medicaid coverage (4 studies) (Cunningham, Clancy et al. ; Liu, Sayre et al. ; Sarver, Cydulka et al. ; Chiou, Campbell et al.). In contrast, there were mixed findings for Medicare-only coverage: one study found a positive association (Chiou, Campbell et al.); one found a nonsignificant association (Cunningham, Clancy et al. 1995); and one study found a negative association between nonurgent visits and Medicare-only coverage (Liu, Sayre et al.).

Among predisposing factors, younger patients' ED visits were more likely to be PCS (Cunningham, Clancy et al. ; Petersen, Burstin et al. ; Liu, Sayre et al. ; Sarver, Cydulka et al.). Women had higher risk in 3 studies (Petersen, Burstin et al. ; Liu, Sayre et al. ; Sarver, Cydulka et al.). African Americans had a higher risk in 2 studies (Cunningham, Clancy et al. 1995; Liu, Sayre et al. 1999). Impaired cognitive function, as measured by immediate word recall, was also associated with higher risk (Wolinsky, Liu et al.); additional years of education were found to also be associated with greater risk (Cunningham, Clancy et al.). Few studies examined need

factors, but those that did found a predictable association between poorer health status and increased risk of PCS ED visits (Cunningham, Clancy et al. ; Sarver, Cydulka et al.).

Differentiating Between Predictors of General, Frequent, and PCS ED Use

To determine how predictors of PCS ED use differs from predictors of frequent or general use, we consulted two systematic reviews—one of frequent use,(LaCalle and Rabin) and one of determinants of any ED visits in elderly adults (McCusker, Karp et al.)— and compared their results with findings from this review. In general, the literature on ED use in elderly adults and frequent users has found need to be the greatest determinant of utilization. Frequent ED users tend to be sicker than occasional users, with greater overall health services utilization. Interestingly, in a study of people with diabetes, prior hospitalization was protective for PCS ED use (AOR: 0.84; 95% CI: 0.77-0.92),(Chiou, Campbell et al.) whereas frequent ED visitors are about 6 times more likely to have been hospitalized in the preceding 3 months (LaCalle and Rabin) and previous hospital or ED utilization, or both, were significant determinants of ED utilization in the elderly.(McCusker, Karp et al.)

LaCalle and Rabin found that the risk of frequent ED use is higher among women and African Americans. However, frequent use has a bimodal age distribution, with peaks around age 25 to 44 and over 65 years, whereas the odds of PCS ED use appear elevated only for younger patients. (2010) In contrast, McCusker et al found that older age was an independent predictor of ED utilization in three studies.(McCusker, Karp et al.)

As with PCS ED use, frequent ED use is more common among those with public insurance.(LaCalle and Rabin) Whether this reflects greater medical need among the elderly and disabled or the enabling effect of having a third-party payor is not clear.

DISCUSSION

SUMMARY OF MAIN FINDINGS

This systematic review of 16 studies found that significant positive predictors of PCS ED use (those reported by more than one study) include Medicaid coverage, younger age, female , and African American. Several studies also reported that problems with access to care, such as not having a regular doctor, predicted PCS ED visits. Conversely, there were no consistently reported negative predictors of this type of utilization. PCS ED visits and frequent ED use share a few predictive factors: female, African American, and poor health.

The methods used to define PCS ED visits ranged from complex, diagnosis-based algorithms to simple rating by an ED nurse. Few of the methods had been validated for reliability or validity, and few were used by more than one study. Exceptions to this methodological heterogeneity include the triage-based Emergency Severity Index, used by 3 studies; the diagnosis-based NYU EDA, used by 2 studies; and the procedure-based Cunningham et al. method, used by 2 studies.

LIMITATIONS OF INCLUDED STUDIES AND DIRECTIONS FOR FUTURE STUDY

None of the reviewed studies reported any model fit statistics, meaning that a thorough review of the accuracy of methods used to predict ED visits was not possible. Thus, we have no basis for knowing what the best method or model would be for predicting PCS ED visits at the patient or population level.

Many of the studies were fairly old. For example, 6 had “reasons for seeking care in the ED” as an outcome; of these, 4 used data from the 1990s, and only one used multivariable analytic methods. Moreover, none of these survey-based studies used a validated survey instrument. Therefore, our current understanding of why patients choose the ED over some other setting is

based on rather weak studies using data from as much as 20 years ago. A more accurate and current understanding would be useful.

All 3 studies that examined population-based, nationally representative samples used data from 1996 or earlier. This lack of current knowledge about national trends in PCS ED use is a key barrier to understanding how many PCS visits might be expected in a given year.

None of the studies included any geospatial variables, meaning that we have no national picture of the relationship between the supply of providers (such as primary care providers) and PCS ED use. Attempts to compare results from different studies focusing on different geographic areas are stymied by the lack of uniform methods used to characterize PCS visits. A geographic analysis of primary care availability and its correlation with "hot spots" of PCS ED use would be helpful in identifying underserved areas.

IMPLICATIONS FOR HEALTH REFORM

In a patient-centered medical home (PCMH) primary care providers provide continuous and coordinated care for patients and are held accountable for the overall care of their patients. This idea has received considerable attention as a potential way to improve primary care quality and limit cost growth based on results from numerous demonstration projects.(Bitton, Martin et al. 2010; Grumbach 2010) As implementation of PCMHs spreads, the question of how to reward providers for decreasing undesirable utilization looms large. Should providers be rewarded only for ED visits that fall into the PCS category, or should overall ED utilization be the target? Would targeting the small number of frequent visitors yield more payback, or would it be better to focus prevention efforts on the large number of patients with one-time inappropriate visits?

If a patient-centered system is desirable, some way of incorporating the patient's perception of need for emergency care should be included in whatever algorithm is used to categorize PCS

ED visits. However, patients may not be able to accurately judge whether a complaint is a true emergency, with many relatively trivial complaints being perceived as emergencies and vice versa.(Brown, Hernandez et al.) For example, in one study, among patients who self-rated their problem as nonurgent, 5% required hospitalization and 35% were assessed by an emergency physician as requiring emergency care.(Caterino, Holliman et al.) Similarly, the "prudent layperson" standard used in some state and federal legislation attempts to clarify the necessity for emergency care, but many symptoms that are generally accepted by clinicians as reasonable prompts for an ED visit, such as abnormal gait and loss of coordination, may not signify an emergency situation to the typical layperson.(Li, Galvin et al.) On the other hand, triage nurses and emergency medicine specialists frequently disagree with each other; completely accurate prospective classification may be impossible.

As mentioned, this review identified little current information on why patients with nonemergent complaints sought care in the ED. If patients had access to a 24-hour nurse hotline and those with nonemergencies could be referred to a less acute setting, it seems likely that many would choose that option over the ED. In the case of a PCS visit arising from neglected chronic conditions, better access to primary care could help, although some patients will avoid going to the doctor even if they have good insurance. For example, some patients do not trust the system or have had negative experiences in the past. For these patients, in an ideal PCMH, a trip to the ED could be an opportunity to build trust and deliver high-quality, coordinated care that includes adequate follow-up from their primary care provider. Such follow-up could include targeted surveys of patients with PCS ED visits, using a validated and reliable instrument, to better understand what led to the visit and identify future needs.

CONCLUSIONS

The problem of predicting and measuring PCS ED visits has multiple dimensions. Methods for predicting such utilization have not been clearly described, and it is not clear which variables and models predict best. A few characteristics have been found in more than one study to predict this type of use, including being female, African American, and covered by Medicaid. Studies have used a wide variety of methods for defining what constitutes a PCS ED visit, which complicates the question of how best to prevent such visits.

In the coming age of patient-centered medical homes, accountable care organizations, and other approaches to bundling or capitating payment and paying bonuses for better-than-expected performance, reducing undesirable types of healthcare utilization (including PCS ED use) will require the ability to define, measure, predict, and manage such use at the population level. Better tools are needed to help practices understand their population's usage patterns and identify ways to reduce visits to the ED that are unnecessary or could have been prevented.

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Figure 1. Conceptual Model of PCS ED Visits

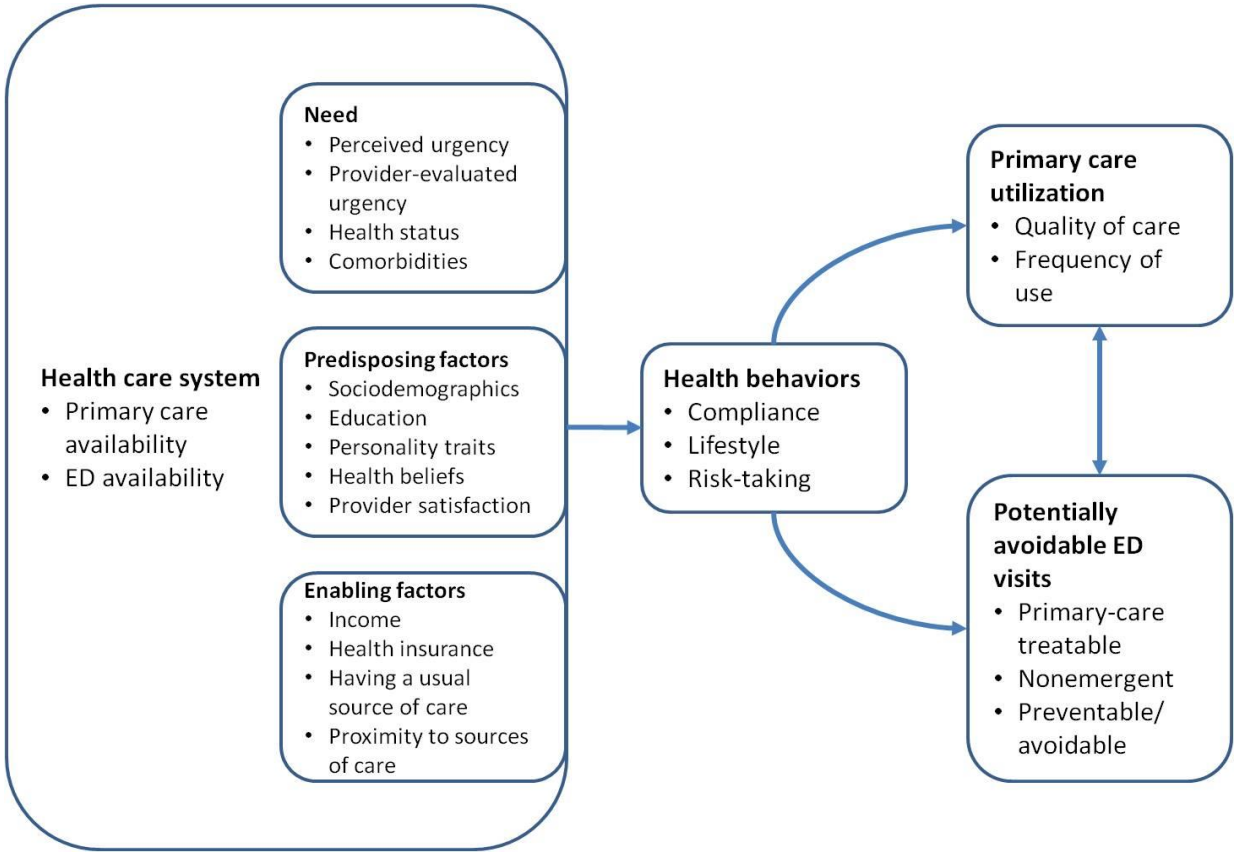

Figure 2. Flow chart of article selection process

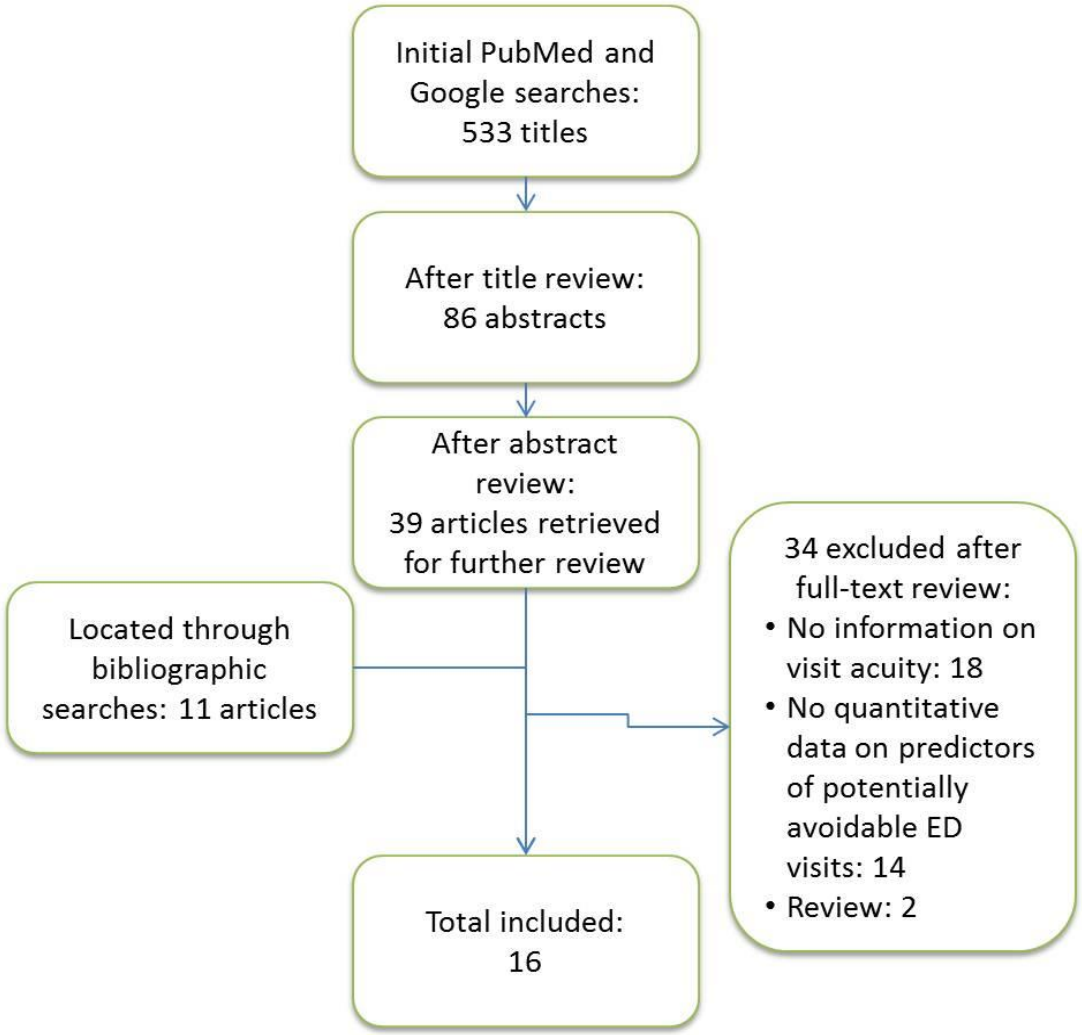

Table 1. Characteristics of included studies

Citation	Population & Setting;	Sample Size & Sampling	Definition of	Outcome Measure(s)	Quality

	Time Period	Method	PCS ED Visits		Rating
		Multivariable Studies			
Liu et al. 1999	All ED visits reported in the National Hospital Ambulatory Medical Care Survey (~400 different hospitals); 1992-1996	n=135,723 ED visits; 4-stage probability sampling used to generate nationally representative estimates	Nonurgent visits were defined as ones in which the patient "does not require attention immediately or within a few hours"	Nonurgent ED visits	100%
Lowe et al. 2005	Nonelderly Medicaid patients assigned to 353 primary care practices affiliated with a Medicaid HMO in Pennsylvania; August 1998 to July 1999	n=57,850; practices randomly selected from database provided by HMO, and patients included if assigned to one of the eligible practices and under age 65	"Potentially avoidable": there was a high probability that a prompt appointment in a primary care practice could have averted the ED visit (using an early version of the NYU ED algorithm by Billings et al)	ED use overall, potentially avoidable ED use	100%
Sarver et al. 2002	Noninstitutionalized civilian adult respondents to the Medical Expenditure Panel Survey with a usual source of care other than the ED who had 1+ health system contact; 1996	n=9,146; nationally representative sample	Using modified Cunningham et al criteria, a visit was considered urgent if 1) it resulted in an admission; 2) it included any imaging or surgical procedure and it was reported as for an accident or injury, diagnosis, or treatment and not the result of a referral; or 3) the reason for the visit was reported as accident/injury, diagnosis, or treatment and the visit was within 3 days of the	Nonurgent ED visits	100%

			accident/injury or symptom onset. All other visits were considered nonurgent.		
Wharam et al. 2007	Nonelderly Massachusetts enrollees in Harvard Pilgrim Health Plan; March 1, 2001 to June 30, 2005	n=68,281; high-deductible health plan group included those with 1+ years' continuous enrollment in traditional HMO followed by 6+ months in a high-deductible health plan, while control group included those with traditional HMO plans (groups randomly matched 8:1)	NYU ED Algorithm (Billings et al): visits were classified as low severity if the probability of needing ED care was less than 25% using the algorithm, which assigns probabilities based on ICD-9 codes	Total ED visits, first visits, and repeat visits, as well as low-, indeterminate-, and high-severity first and repeat visits, comparing the two study groups to determine the effect of high-deductible health plans on each type of visit	100%
Petersen et al. 1998	Adults with chest pain, abdominal pain, or asthma presenting to 1 of 5 urban EDs in the Northeast; 1 month in 1993	n=1696; convenience sample	Triage criteria developed by Baker et al. Patients were classified as urgent if they had abnormal vital signs, urgent chest pain (taking risk factors into account), asthma symptoms present for less than 1 week, abdominal pain present for less than 48 hours AND patient was either older than 65,	Nonurgent ED visits	92%

			pregnant, or was experiencing bleeding. All other presentations were classified as nonurgent.		
Chiou et al. 2010	Type 2 diabetics enrolled in a disease management program in Louisiana; 1999-2006	n=8596; all patients meeting inclusion criteria were selected	ICD-9 codes for visits occurring on weekdays were classified by 2 expert coders as either urgent or less urgent.	Inappropriate use of the ED	92%
Cunningham et al. 1995	Civilian non-institutionalized US respondents to the National Medical Expenditure Survey (NMES); 1987	n=35,000; all respondents were included in the analysis	Visits were classified as urgent if they 1) resulted in a hospitalization. 2) occurred within 3 days of an injury/accident, 3) included any surgical procedures, 4) involved a physician's referral, 5) involved an ambulance, or 6) were associated with a self-reported "very serious" condition. All other ED visits were considered nonurgent.	Nonurgent ED visits	92%
Grumbach et al. 1993	All patients in the ED waiting area at San Francisco General Hospital who were not assigned to the immediate care triage category; one week in July 1990	n=700; all patients meeting inclusion criteria were asked to participate	Acuity score assigned by ED triage nurse: 1 - needs immediate care 2 - needs urgent care 3 - needs care within 3 hours (possibly inappropriate) 4 - needs nonurgent care (inappropriate)	Appropriate ED use	92%

Wolinsky et al. 2008	Elderly (age 70+) respondents to the Survey on Assets and Dynamics Among the Oldest Old; 1991-1996	n=4,310; nationally representative sample	Current Procedural Terminology (CPT) codes 99281-99282 were considered "low intensity" visits.	Low-intensity, mixed-intensity, and high-intensity ED visits	83%
Young et al. 1996	Ambulatory patients at 56 EDs across the US; 1 day in 1994	n=6187; all ambulatory patients presenting during the 24-hour period were eligible	A triage nurse performed a brief, directed examination to determine the urgency of each patient's condition. Nonurgent was defined as "treatment can be safely delayed" 12-24 hours.	Reasons for seeking care in the ED	83%
		Univariate Studies			
Gill and Riley 1996	Adults and children at an urban teaching hospital; one week in January 1993	n=268; convenience sample	Considered nonurgent by the ED triage nurse	Patient-perceived urgency, self-reported reasons for using the ED	67%
Matteson et al. 2008	Women who visited a specialty OB/GYN ED in Rhode Island for a nonemergency; May-Oct. 2005	n=287; convenience sample of women with nonemergent complaints visiting the ED during the study period	Nurses assessed patients according to the Emergency Severity Index (Wuerz et al), with patients in categories 3-5 considered low acuity.	Reasons for seeking care in the ED	67%
Redstone et al. 2008	Adults with a primary care provider presenting with a nonurgent complaint to the University of	n=240; convenience sample with 60 surveys collected during 4	Nurses assessed patients according to the Emergency Severity Index (Wuerz et al), with patients in categories 3-5 considered	Reasons for seeking care in the ED; comparison between	67%

	Colorado Hospital ED; June-Nov. 2006	different time frames	low acuity.	weekday daytime visitors and non-weekday daytime visitors	
Northington et al. 2005	Adults presenting at the University of North Carolina Hospital between 9am and 1am; June 23, 1999, to August 8, 1999	n=279; convenience sample excluding intoxicated, pregnant, mentally impaired, non-English speakers, suspected abuse victims, those referred by their physicians, and those who refused participation	Low-acuity patients in Emergency Severity Index (Wuerz et al) triage categories of 4 or 5 as assessed by triage nurse. These patients were responsive, oriented, in no acute distress, had stable vital signs, and were estimated to require no more than one resource (lab, test, or consult).	Reasons for seeking care in the ED	50%
Pilossoph-Gelb et al. 1997	Ambulatory, noncritical patients at a university-based private ED and a public county hospital ED in the Los Angeles area; Dec. 1994-Dec. 1995	n=700; convenience sample, with attempts made to survey patients at all hours to be representative of ambulatory triage patients	Three ED physicians rated each complaint as 1) life- or limb-threatening if not immediately treated; 2) neither life- nor limb-threatening, but appropriate for ED treatment; 3) neither life- nor limb-threatening and appropriate for treatment in a primary care setting. The majority opinion was used to classify patients.	Occurrence of psychosocial difficulties among emergent/ nonemergent ED visitors	58%
Schwartz	Patients at the Family Practice	n=94;	Visits for non-life-threatening illnesses, such	Reasons for seeking	50%

1995	Center, Augusta, GA, with non-life-threatening illnesses who either sought care at the ED or in the clinic during a 1-month period; early 1990s	all eligible patients invited to participate	as bronchitis, cold, flu, sprains	care in the ED vs. the clinic

ED: Emergency department; HMO: health maintenance organization

Table 2. Significant, Multivariable Positive and Negative Predictors of PCS ED Visits

	Factor	Reference Group	AOR*	Population (n)	Study
Need					
+	More than 5 bed days	5 or fewer	1.03	General (n=30,038)	Cunningham 1995
+	More than 5 reduced activity days	5 or fewer	1.02	General (n=30,038)	Cunningham 1995
+	Fair health	Excellent/ v. good/ good	2.12	Adults with USC (n=9,146)	Sarver 2002
+	Poor health	Excellent/ v. good/ good	2.94	Adults with USC (n=9,146)	Sarver 2002
-	Excellent health	Poor health	0.46	General (n=30,038)	Cunningham 1995
-	Good health	Poor health	0.66		Cunningham 1995
-	Hospitalization in prior year	No prior year hosp.	0.84	T2 diabetics (n=8,596)	Chiou 2010
Predisposing factors					
+	Age 18-24	Age 45+	2.79	Adults with USC (n=9,146)	Sarver 2002
+	Age 25-44	Age 45+	1.66	Adults with USC (n=9,146)	Sarver 2002
+	Age 16-30	Age > 60	4.80	Adults (n=1,696)	Petersen 1998
+	Age 31-40	Age > 60	6.50	Adults (n=1,696)	Petersen 1998
+	Age 41-50	Age > 60	2.40	Adults (n=1,696)	Petersen 1998
+	Age 51-60	Age > 60	2.00	Adults (n=1,696)	Petersen 1998
+	Black	White	1.68	General (n=30,038)	Cunningham 1995
+	African American	White	1.08	General (n=135,723 visits)	Liu 2003
+	Female	Male	1.30	Adults (n=1,696)	Petersen 1998
+	Female	Male	1.44	Adults with USC (n=9,146)	Sarver 2002
+	More education	N/A (continuous)	1.05	General (n=30,038)	Cunningham 1995
+	Lower immediate word recall score	Higher immediate word recall score	1.55	Elderly (n=4.135)	Wolinsky 2008
-	White race	Black race	0.82	T2 diabetics (n=8,596)	Chiou 2010

	Factor	Reference Group	AOR*	Population (n)	Study
-	Older age	N/A (continuous)	0.95	General (n=30,038)	Cunningham 1995
-	Age 65 or older	Under age 65	0.56	General (n=135,723 visits)	Liu 2003
-	Male	Female	0.89	General (n=135,723 visits)	Liu 2003
-	Larger family	N/A (continuous)	0.92	General (n=30,038)	Cunningham 1995
Enabling factors					
+	Dissatisfaction with USC score	N/A (continuous)	1.13	Adults with USC (n=9,146)	Sarver 2002
+	No regular doctor	Regular doctor	1.60	Adults (n=1,696)	Petersen 1998
+	Household income < 125% of FPL Household income 125-399% of FPL	Income 400%+ of FPL	1.70 1.39	Adults with USC (n=9,146)	Sarver 2002
+	Large facility (100+ beds)	Small facility	1.44	T2 diabetics (n=8,596)	Chiou 2010
+	Commercial insurance	Uninsured	1.28	T2 diabetics (n=8,596)	Chiou 2010
+	Medicaid insurance	Uninsured Uninsured all year Privately insured Privately insured	1.28 1.47 1.54 1.14	T2 diabetics (n=8,596) General (n=30,038) Adults with USC (n=9,146) General (n=135,723 visits)	Chiou 2010 Cunningham 1995 Sarver 2002 Liu 2003
+	Clinic had more Medicaid patients	N/A (ordinal)	1.04	Nonelderly HMO enrollees (n=57,850)	Lowe 2005
+	Medicare insurance	Uninsured	1.32	T2 diabetics (n=8,596)	Chiou 2010
+	Medicare + other insurance	Uninsured all year	1.61	General (n=30,038)	Cunningham 1995
+	Living in an area with more EDs	N/A (continuous)	1.37	General (n=30,038)	Cunningham 1995
+	Living in an urbanized non-metro area	Rural area	1.53	General (n=30,038)	Cunningham 1995
+	Living in a small city Living in a rural county	Major city	2.92 2.29	Elderly (n=4.135)	Wolinsky 2008
+	Living in the Northeast	South	1.45	General (n=30,038)	Cunningham 1995
+	Living in the Midwest South West	Northeast	1.25 1.27 1.28	General (n=135,723 visits)	Liu 2003
-	More time in disease mgmnt program	N/A (continuous)	0.98	T2 diabetics (n=8,596)	Chiou 2010
-	Middle income High income	Poor	0.83 0.72	General (n=30,038)	Cunningham 1995
-	Living in area with higher per-capita income	N/A (continuous)	0.74	General (n=30,038)	Cunningham 1995
-	Working more weeks in the year	N/A (continuous)	0.96	General (n=30,038)	Cunningham 1995
-	Having a regular source of care				Grumbach 1993
-	Living in an urban area	Rural area	0.90	General (n=135,723 visits)	Liu 2003

	Factor	Reference Group	AOR*	Population (n)	Study
-	For-profit hospital	Nonprofit hosptial	0.89	General (n=135,723 visits)	Liu 2003
-	Medicare insurance	Private	0.75	General (n=135,723 visits)	Liu 2003
-	PCP had 5-7 weekday evening hours PCP had 8-11 weekday evening hours PCP had 12+ weekday evening hours	No evening hours	0.82 0.83 0.80	Nonelderly HMO enrollees (n=57,850)	Lowe 2005

*All adjusted odds ratios (AORs) in this table were significant at P < .05

ED: Emergency department; FPL: Federal poverty line; HMO: health maintenance organization; PCP: primary care provider; USC: usual source of care

APPENDIX: EXCLUDED STUDIES

No information on visit acuity

1 Adekoya N. Reasons for visits to emergency departments for Medicaid and State Children's Health Insurance Program patients: United States, 2004. North Carolina Medical Journal. 2010;71(2):123-30.

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No quantitative data on predictors

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Review/opinion/commentary

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