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Differences in Total Healthcare Costs and Out-of-Pocket Costs for Non-Urgent Visits to Emergency Departments and Urgent Care Centers

J. Michael Mauldin
Medical University of South Carolina

DIFFERENCES IN TOTAL HEALTHCARE COSTS AND OUT-OF-POCKET COSTS FOR NON-URGENT VISITS TO EMERGENCY DEPARTMENTS AND URGENT CARE CENTERS

BY

J. Michael Mauldin

A doctoral project submitted to the faculty of the Medical University of South Carolina in partial fulfillment of the requirements for the degree Doctor of Health Administration in the College of Health Professions

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Approved by:

Chair, Project Committee	Annie Simpson, PhD	7/11/17 Date
Member, Project Committee	Kit Simpson, DrPH	7/11/17 Date
Member, Project Committee	John Peach, MD	6/14/17 Date
Interim Dean, College of Health Professions	James S Zoller, PhD	7/13/17 Date

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By

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Chairperson: Annie Simpson, PhD
Committee: Kit Simpson, DrPH
John Peach, MD

Objective: The 2014 Truven Health MarketScan® Commercial Claims and Encounters Database was used to determine the existence and magnitude of differences in total healthcare costs and patient out-of-pocket costs between urgent care centers and hospital emergency departments for the treatment of adult patients presenting with non-urgent conditions.

Methods: Propensity-score matching was used to eliminate, as much as possible, potential selection bias. Linear and logistic regression models were used to investigate

relationships between the outcome variables and location of service, controlling for age, gender, geographic location, commercial insurance plan type, and clinical comorbidities.

Results: Mean total adjusted episode costs of $1,240 for patients who presented at a hospital emergency department with a non-urgent condition were 4.8 times greater than costs of $257 for patients presenting at an urgent care center. Furthermore, the patient portion of the mean adjusted total episode costs of $351 was 3.5 times greater for patients presenting at a hospital emergency department.

Conclusion: The US healthcare system, and patients and families, could significantly reduce costs of care by selecting the most appropriate setting for treatment of non-urgent conditions.

Key Words: Emergency department, urgent care center, non-urgent conditions, unnecessary emergency room visits, emergency room costs, propensity-score matching, unnecessary costs.

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CHAPTER 1

INTRODUCTION

Background

The United States healthcare system is plagued by high costs and less than optimal outcomes. Unnecessary utilization of hospital emergency departments (EDs) has been identified as one significant cause of higher costs. Most studies find that at least 30% of all ED visits are non-urgent, meaning that a delay of treatment for several hours would not increase the likelihood of an adverse outcome (Uscher-Pines, L., Pines, J., Kellerman, A., Gillen, E. & Mehrota, A., 2013). One study estimated that 13-27% of ED visits could take place in an alternative care site such as a physician's office, retail clinic, or urgent care center (Weinick, Burns, & Mehrotra, 2010). Visiting an ED instead of an alternative care site for a non-urgent condition may lead to excessive healthcare spending and unnecessary testing and treatment. Furthermore, evidence suggests that emergency department overcrowding is associated with adverse clinical outcomes (Wharam, et al., 2007).

As a response to overcrowded EDs, the number of urgent care centers in the United States has grown dramatically since mid-1990, to more than 12,000 centers today, with estimates of two new centers opening weekly (Weinick & Betancourt, 2007). While some individuals are enthused about the potential of urgent care centers to improve patient access and reduce unnecessary ED visits, others express concerns about their impact on cost and quality. Provider groups, including the American Medical Association and American Academy of Family Physicians, have raised concerns about inappropriate

prescription patterns, lost opportunities for preventative care, less than optimal management of chronic conditions, and disruption of existing patient-physician relationships (Rand Corporation, 2009).

Concurrent with the growth in urgent care centers has been a dramatic increase in enrollment in high-deductible health plans (HDHPs). The percentage of covered workers enrolled in a HDHP has grown from 4% in 2006 to 29% in 2016 (The Kaiser Family Foundation and Health Research & Educational Trust, 2016). By definition, HDHPs increase the enrollee's personal financial responsibility for health expenditures, under the assumption that patients will reduce use of discretionary services if they share a greater proportion of healthcare costs (Wharam, et al., 2007). Early studies indicate that HDHPs do reduce low-severity, repeat emergency department visits without reducing first visits or high-severity visits (Wharam, et al., 2007).

Despite the increasing impact of urgent care centers and HDHPs, little research has been directed to determine the amount individual patients or insurance companies would save if common non-urgent conditions were treated in urgent care clinics rather than EDs. An extensive literature review identified a single study that analyzed the issue of cost of care for non-urgent ED visits in an urgent care center as compared to an ED, and this study was limited to a single health plan in Minnesota in 2005 – 2006 (Mehrotra et al., 2009).

Problem Statement

The objective of this study is to compare total cost of care and patient out-of-pocket cost of care for patients presenting at urgent care centers and hospital EDs for conditions commonly identified as non-urgent. While one assumes that urgent care centers offer a less costly alternative to hospital EDs, no published research has examined this question on a broad basis. Ascertaining the existence and magnitude of a cost differential between the two alternative treatment sites will provide clinicians, healthcare administrators, state and federal health policymakers, managed care plans, and patients and families with critical information for cost-effective healthcare decision-making.

Research Questions and Research Hypotheses

Are there differences in total cost of care and patient out-of-pocket cost of care between urgent care centers and hospital EDs for the treatment of patients presenting with non-urgent conditions? The null hypothesis is there is no difference in cost of treatment between the two alternative sites.

Population

An extensive collection of paid claims data is desirable to examine this research question on a retrospective basis. By identifying two cohorts of patients matched for demographic and clinical conditions, one cohort which presented at an urgent care center, and one which presented at a hospital ED, we can compare actual costs of treatment between the two alternative care sites. A large, geographically diverse database provides a rich source of data for this analysis. Accordingly, the 2014 Truven Health MarketScan® Commercial Claims and Encounters Database will be the population

database for the study. MarketScan data have been used by health researchers since 1988 to study disease progression, treatment patterns, health outcomes and related costs, and have been the basis for more than 300 peer-reviewed journal articles (Truven Health Analytics, 2015). This research database captures person-specific clinical utilization, expenditures, and enrollment data across inpatient, outpatient, prescription drug and carve out services obtained from a selection of large employers, health plans, and government and public organizations (Truven Health Analytics, 2015). In total, the Commercial Claims and Encounters Database contains private-sector health data from approximately 350 payers (Truven Health Analytics, 2015). This data includes the medical experience of insured employees and their dependents, early retirees, COBRA continuees, and Medicare-eligible retirees who are insured by employer-sponsored plans (Truven Health Analytics, 2015). As a commercial claims database, the data does not include Medicare or Medicaid claims data.

Assumptions

The study results are dependent upon the accuracy and completeness of the underlying claims data, including the proper collection of demographic data, the proper application of claims payment information, the consistent application of coding guidelines and standards, and the consistent appropriate utilization of location codes. The claims adjudication process among payors and providers includes numerous edits and reviews that provide confidence in the underlying data. In addition, construction of the MarketScan research database relies on rigorous testing to ensure that incomplete data are excluded and that validity checks are completed on selected fields (Truven Health Analytics, 2015). In addition, strict matching criteria are used to evaluate all financial

fields for inclusion in the database (Truven Health Analytics, 2015). The study assumes that variation in the application of guidelines is minimal and the detailed analysis of the claims data utilized would identify any material unusual items.

CHAPTER II

LITERATURE REVIEW

Methods

A systematic review of the literature on inappropriate ED utilization was conducted using PubMed searches. Keywords used included emergency department, utilization, overcrowding, wait times, inappropriate, frequent users, urgent care, and non-emergent care. Searches were limited to English language publications. Because of the large volume of papers identified, priority was given to papers that provided a systematic literature review and that focused broadly on the topic of interest. Papers that were narrowly focused on a particular disease, diagnosis, patient type or clinical pathway were excluded. In total, 16 papers were selected for review, representing more than 150 separate published papers.

Findings on the extent of inappropriate ED utilization

Estimates of the extent of inappropriate ED utilization vary from 8% to 62%, due in part to varying research methods and differing definitions of inappropriate or non-urgent care (Uscher-Pines, Pines, Kellerman, Gillen & Mehrotra, 2013). A systematic review of literature published in 2013 identified 26 studies that examined the factors influencing an individual's decision to visit an ED for a non-urgent reason (Uscher-Pines et al., 2013). Eleven of the 26 articles defined non-urgent through a retrospective review of medical records, 11 prospectively identified non-urgent visits at the time of triage, and 3 used a retrospective patient self-report (Uscher-Pines et al., 2013). The 11 retrospective

medical reviews used criteria including hospital admission, diagnosis, vital signs, complaint, procedures or tests ordered, triage evaluation, and referral as indicators of the appropriateness of the ED visit (Uscher-Pines et al., 2013). The 11 prospective determinations of the urgency of the ED visits at triage included criteria such as vital signs, symptoms, responsiveness, level of distress, medical history, referral, and complaint (Uscher-Pines et al., 2013). The 3 studies based on patient self-report used criteria including patient assessment of urgency, ability to be seen by a primary care provider, procedures performed, hospital admission, perceived seriousness of the condition, and timing of the visit (Uscher-Pines et al., 2013). Across these 26 relevant studies, the range of inappropriate ED visits ranged from 8% to 62%, with an average of 37% (Uscher-Pines et al., 2013).

While each of the studies evaluated by Uscher-Pines et al. (2013) used hospital-based data as the sole criteria for estimating inappropriate ED utilization, a 2010 study (Weinick, Burns, & Mehrotra, 2010) used data from both urgent care centers and retail clinics to estimate the percentage of ED visits that could be safely managed in one of those alternative settings. Urgent care centers typically are freestanding clinics with extended hours, on-site x-ray machines and laboratory testing, and an expanded treatment range—including care for fractures and lacerations (Weinick, R., Burns, R., & Mehrotra, A., 2010). Retail clinics are typically located in retail stores or pharmacies, staffed by nurse practitioners, and treat a limited range of health conditions, such as minor infections and injuries (Weinick, R., Burns, R., & Mehrotra, A., 2010).

Weinick et al. (2010) obtained data from retail clinic operators representing 74% of all retail clinics nationwide, from urgent care centers in 35 states, and from the National Hospital Ambulatory Care Survey. Using diagnosis codes and drug prescription data, the study determined which diagnoses were most commonly treated in each setting (Weinick et al., 2010). The study proposed that any diagnosis that represented more than 2% of retail clinic or urgent care visits was potentially treatable in one of those alternative settings (Weinick et al., 2010). An algorithm was then applied to ED visits of the same diagnoses to estimate the percentage which were non-emergent and could be properly treated in an alternative setting (Weinick et al., 2010). The algorithm included allowances for the normal operating hours of urgent care and retail clinics (Weinick et al., 2010). Using these assumptions, the percentage of hospital ED visits that may be appropriately managed in an urgent care or retail clinic was estimated to be between 13.7% – 27.1% (Weinick et al., 2010).

Specifically, Weinick et al. (2010) identified several clinical conditions (Table 1) which, (1) represent greater than 2% of hospital ED patient volume, and (2) fail to require hospital ED care in 75% of visits or more, according to published clinical algorithms. These conditions collectively represent 36.4% of urgent care visits and 12.2% of hospital ED visits (Weinick et al, 2010).

TABLE 1 – CONDITIONS COMMONLY IDENTIFIED AS NON-URGENT

Condition	% of UCC Visits	% of ED Visits	% not Requiring ED Care
Upper Respiratory Infections	33.3%	9.8%	
Rhinosinusitis, Laryngitis	18.7%	5.0%	81.1%
Pharyngitis	8.1%	2.3%	93.9%
Ear Infections	6.5%	2.5%	95.7%
Urinary Tract Infections	3.1%	2.4%	75.6%

Source: Weinick et al., (2010)

Regardless of the methodology and definitions used, the studies regarding ED utilization are consistent in estimating that a significant portion of hospital ED visits can be treated in non-hospital settings including primary care offices, retail clinics, and urgent care centers. Estimates near and around 30% are common and defensible. Of this estimated volume of 30%, approximately 40% consist of common upper respiratory infections and urinary tract infections (Weinick et al, 2010).

Findings on the comparison of costs and quality among alternative sites of care

Urgent Care Centers and retail clinics have developed as alternative sites of care over the last twenty years. Research on costs and treatment patterns as compared to EDs has tended to focus on retail clinics, but has in some cases addressed urgent care centers

as well. Because these alternative sites are relatively new, the first research study appeared in 2008. The 2008 study was published to examine the types of patients and visits occurring in retail clinics as compared to primary care physician (PCP) offices and hospital EDs (Mehrotra, Wang, Lave, Adams, & McGlynn, 2008). The study used three data sources: industry data provided voluntarily from members of the Convenient Care Association on visits from 2000 – 2007; PCP office visit data from the National Ambulatory Medical Care Survey 2002 - 2005; and ED visit data from the National Hospital Ambulatory Care Survey 2002 – 2005 (Mehrotra et al., 2008). A cross-sectional comparison of these data found that over 90% of retail care clinic visits were for 10 simple acute conditions and preventative care (Mehrotra et al., 2008). These 10 common issues made up 18% of all PCP visits and 12% of all ED visits (Mehrotra et al., 2008).

While the 2008 study identified differences in patients and services, it did not address the issues of cost or quality. A study in 2009 by some of the same researchers compared costs and quality of care at retail clinics to other medical settings for three common illnesses (Mehrotra et al., 2009). This study used 2005-2006 claims data from a single, large Minnesota health plan to evaluate costs and quality for patients who received care for otitis media, pharyngitis, or urinary tract infection (UTI) at a retail clinic, urgent care center, PCP office, or hospital emergency department (Mehrotra et al., 2009). The unit of analysis was an episode of care, 6 months prior and post the visit date (Mehrotra et al., 2009). Costs were defined as the sum of payments made by the health plan and the patient, and were segregated by evaluation and management, pharmaceutical, lab and radiology, and other (Mehrotra et al., 2009). Quality was defined by the performance of

14 separate quality indicators specific to the three diagnoses and by the receipt of 7 preventative care services (Mehrotra et al., 2009). To compare across the different sites of service, the researchers first aggregated claims data into care episodes that included initial and follow-up visits, pharmaceuticals, and ancillary tests (Mehrotra, et al., 2009). Researchers then identified 700 claims for each diagnosis that were first treated at a retail clinic, and then matched them with an equal number of claims first treated in the alternative settings (Mehrotra et al., 2009). These matched sets were the primary unit of analysis. A comparison of the cost and quality measures using statistical measures concluded that the retail clinics were less costly than urgent care centers, physician offices and EDs, and that quality was similar at retail clinics, urgent care centers and PCP offices, but better than the ED (Mehrotra et al., 2009).

In 2014, a paper was published on quality of care in retail clinics that replicated the 2009 study using Aetna claims from 2009 – 2012 (Shrank et al., 2014). This study evaluated only the issue of quality at urgent care centers, retail clinics, and EDs using the identical 14 quality measures (Shrank et al., 2014). This study found that 91% of the claims for the three selected diagnoses (otitis media, pharyngitis, and UTI) were from urgent care centers, 6% from EDs, and 2% from retail clinics (Shrank et al., 2014). The authors selected claims from the retail clinics, then propensity score matched them with claims from the alternative sites, resulting in 20,153 matched episodes of care (Shrank et al., 2014). A comparison of quality indicators across these matched sets concluded that retail clinics outperformed urgent care clinics across 9 of 14 measures, and both outperformed hospital EDs across most measures (Shrank et al., 2014).

Finally, a 2016 study evaluated urgent care center utilization by Medicare beneficiaries (Corwin, Parker, & Brown, 2016). Using the non-urgent definitions from the 2009 study and CMS claims data from 2012, the authors evaluated the rates of utilization of urgent care centers and EDs for upper respiratory infections; musculoskeletal conditions, including strains, back pain, arthritis, and contusions; UTI; and bronchitis (Corwin et al., 2016). The authors found that ED utilization for non-urgent conditions was inversely correlated with the number of urgent care centers in the geographic area. (Corwin et al., 2016). The study concluded that encouraging the use of urgent care centers for treatment of non-urgent conditions when a primary care provider office is unavailable may be an effective way to reduce ED utilization by Medicare beneficiaries (Corwin et al., 2016).

Conclusions

Significant research has addressed the topic of inappropriate ED utilization. The Uscher-Pines et al. (2013) systematic review of 26 relevant studies using hospital-based data as the sole criteria for determination of appropriate setting of care concluded the range of inappropriate ED visits ranged from 8% to 62%, with an average of 37%. Weinick et al. (2010) built upon these previous hospital-based studies by analyzing the clinical conditions of patients presenting at alternative sites of care (retail clinics or urgent care centers) to determine which of the inappropriate ED visits may be appropriately managed in one of these alternative settings. Weinick et al. (2010) concluded the percentage of hospital ED visits that may be appropriately managed in an

urgent care or retail clinic was estimated to be between 13.7% and 27.1%, and defined the common clinical conditions that met this criteria.

With the recognition that certain clinical conditions may be appropriately managed in alternative settings, research has begun to address the question of costs and quality in these settings as compared to the ED. Substantially all of this research, however, has focused on retail clinics as opposed to urgent care centers. A single study has addressed the question of urgent care center costs compared to ED costs, based on 2005-2006 claims data from a single, large Minnesota health plan (Mehrotra et al., 2009). No study has yet been completed using a national sample of claims data from privately-funded health plans. Furthermore, since the time this research was completed, benefit designs of commercial healthcare plans have shifted dramatically toward HDHPs, substantially increasing the financial burden on patients and their families. The purpose of this study is to address this significant deficiency in research on urgent care costs as compared to the ED for conditions that can be treated in an urgent care center, to better inform clinicians, healthcare administrators, state and federal health policymakers, managed care plans, and patients.

Data Set Considerations

A large national claims data set is necessary to appropriately address this research question. “The Truven Health MarketScan® Research Databases capture person-specific clinical utilization, expenditures, and enrollment across inpatient, outpatient, prescription drug, and carve out services. The data come from a selection of large employers, health plans, and government and public organizations. The MarketScan Research Databases

link paid claims and encounter data to detailed patient information across sites and types of providers and over time. The annual medical databases include private-sector health data from approximately 350 payers. Historically, more than 20 billion service records are available in the MarketScan databases. These data represent the medical experience of insured employees and their dependents for active employees, early retirees, Consolidated Omnibus Budget Reconciliation Act (COBRA) continuees, and Medicare-eligible retirees with employer-provided Medicare Supplemental plans" (Truven Health Analytics, 2015, p. 1).

The specific database is the 2014 MarketScan® Commercial Claims and Encounters Database. This research database includes data related to "individuals in plans or product lines with fee-for-service plans and fully capitated or partially capitated plans" (Truven Health Analytics, 2015, p. 2). These individuals include active employees and dependents, early (non-Medicare) retirees and dependents, and COBRA continuees (Truven Health Analytics, 2015).

Data Set Exclusions

Certain patients were excluded from the dataset in order to reduce the potential confounding effects of age and comorbid conditions on the study results. First, the study excluded all patient data related to individuals under the age of 18 and over the age of 50 as of the date of service. Second, the study excluded all data related to patients that have comorbid conditions that may materially impact the measured cost outcomes.

The Charlson Comorbidity Index (CCI) was used to identify patients for exclusion. The CCI was designed to measure the severity of patients' comorbid conditions for the purpose of identifying those patients that should be excluded from longitudinal studies (Charlson, Pompei, Ales, & MacKenzie, 1987). Patients with a CCI > 0 are individuals whose existing comorbid conditions are significant enough to impact 1-year mortality, and were excluded from the study (Charlson, Pompei, Ales, & MacKenzie, 1987).

Statistical Analysis Considerations

This study is a comparison of outcomes, as measured by the total cost of care and patient out-of-pocket costs of care, between two groups each sharing common characteristics other than the location of service. The research design is rigorous to produce two cohorts as closely matched as possible: one cohort of individuals who sought care at an urgent care center and a second cohort who sought care at a hospital ED. The research design's goal is to eliminate, as much as possible, potential selection bias—or the possibility that any observed difference in total costs of care is attributable to differences in the types of individuals or clinical conditions who selected the location of care, rather than in differences between the two alternative care sites themselves.

To achieve this goal, the first technique was to exclude from the dataset those patients with a CCI greater than 0. The second technique was to propensity-score match the remaining patients based on their underlying demographic and clinical data. The goal of propensity-scored matching is to replicate, to the extent possible, a randomized controlled experiment using retrospective data. The benefit of this technique is that the

two groups are as similar as possible in the distribution of observed covariates. "When estimating causal effects using observational data, it is desirable to replicate a randomized experiment as closely as possible by obtaining treated and control groups with similar covariate distributions. This goal can often be achieved by choosing well-matched samples of the original treated and control groups, thereby reducing bias due to the covariates" (Stuart, 2010, p. 1). Achieving well-matched cohorts ensures that the outcome measure, costs, will be reflective of the location of service difference, rather than any observed or unobserved differences in the composition of the cohorts (Rubin, 2004).

Matching was used for determining membership in the two cohorts prior to any outcome analysis. Matching was made based on the information available in the database, including patient demographics (age, gender, geographic location, and health plan design) and patient clinical data. The Elixhauser algorithm was utilized to identify patients with comorbid conditions for matching purposes. The Elixhauser method was developed as a research tool to assist in the analysis of administrative datasets by identifying comorbid conditions that are predictive of hospital charges, length-of-stay, and in-hospital mortality (Elixhauser, Steiner, Harris, & Coffey, 1998). Analysis of a large data set of California hospital claims resulted in a comprehensive set of 31 comorbidity measures found to be associated with substantial increases in costs, length-of-stay and in-hospital mortality (Elixhauser, Steiner, Harris, & Coffey, 1998). Matching of patients based on these 31 comorbid conditions resulted in a dataset inclusive of adults aged 18 – 50 who are as clinically similar as possible. Stratification of the patients into

groups provides assurance that any measured differences are attributable to the location of service rather than “the confounding influence of comorbid disease” (Charlson, Pompei, Ales, & MacKenzie, 1987, p. 373). Only after selection of groups that are appropriately matched was analysis of the cost data completed.

CHAPTER III

METHODOLOGY

Research Aims

Does the total cost of care for treatment of conditions commonly identified as non-urgent vary between urgent care centers and EDs for adults aged 18 - 50?

Does the cost of care paid by patients for treatment of conditions commonly identified as non-urgent vary between urgent care centers and EDs for adults aged 18 - 50?

The null hypothesis for each question is that there is no difference in cost of care between the two alternative settings.

Research Design or Method

The study was designed to determine the differences in cost of care between urgent care centers and hospital EDs for the treatment of adults aged 18 - 50 presenting with diagnoses commonly identified as non-urgent. The research design was a retrospective analysis of archival data using the 2014 MarketScan® Commercial Claims and Encounters Database. Patients younger than age 18 or older than age 50 at the time of service, and patients with comorbid clinical conditions predictive of higher costs were excluded from the dataset. Inclusion in the study was based upon a limited group of primary diagnosis codes and further limited to two site of cares, urgent care center or hospital ED.

This study is a comparison of outcomes, as measured by the total cost of care and patient out-of-pocket costs of care, between two groups each sharing common characteristics other than the location of service. The research design goal was to eliminate, as much as possible, potential selection bias, or the possibility that any observed difference in total costs of care is attributable to differences in the types of individuals or clinical conditions who selected the location of care, rather than in differences between the two alternative care sites themselves. To achieve this goal, the dataset for study excluded patients younger than age 18 or older than age 50 at the time of service. Additionally, the data set excluded all patients with a CCI > 0.

Following the exclusions based on age and comorbid conditions, the technique used to select the two cohorts was propensity-scored matching. Matching was used for balancing the baseline characteristics in the two cohorts prior to any outcome analysis. Matching was made based on the information available in the database, including patient demographics (age, gender, zip code, and health plan) and patient clinical condition. For matching purposes, zip codes were used to identify the patient location in one of five geographic regions: northeast, north central, south, west or unknown. Likewise, the type of insurance plan was used to group patients into one of five insurance plan types to account for the impact, if any, of plan design on patient behavior. Finally, patient clinical condition was analyzed using the Elixhauser algorithm to measure and match the comorbidity of each patient (Elixhauser, Steiner, Harris, & Coffey, 1998). These Elixhauser comorbidities, as defined by their respective ICD-9-CM codes, are shown in Table 1 of the Appendix.

Operational Definitions

Defining Conditions Commonly Identified as Non-Urgent

Researchers have defined non-urgent care in the ED as meaning a delay in treatment of a few hours would not increase the likelihood of an adverse clinical outcome to the patient (Uscher-Pines, L., Pines, J., Kellerman, A., Gillen, E. & Mehrota, A., 2013). Identification of non-urgent visits has typically been based on three alternative approaches: on the patient's self-reported sense of urgency, on a prospective analysis of clinical data available (chief complaint, vital signs, level of distress, medical history) at the time of the patient's presentation to the ED, or on a retrospective analysis of clinical data post visit (admission, diagnosis, tests ordered, referrals). While a patient's self-reported sense of urgency is meaningful in understanding why patients decide to visit the ED as opposed to alternative sites of care, this criterion does not address the important issue of clinical appropriateness. Prospective or retrospective analyses of clinical data provide a more defensible approach to the determination of medical necessity.

Weinick et al. (2010) used hospital ED and urgent care center clinical data to identify those specific clinical diagnoses that are commonly identified as non-urgent, and which can frequently be effectively treated in an urgent care or other non-acute setting. Primary diagnosis codes and drug prescription data were used to identify the overlap between conditions commonly treated in both urgent care centers and hospital EDs. Using data from this study we have defined conditions that are commonly considered non-urgent and can effectively be treated in an urgent care setting to include those

primary diagnoses that represent greater than 2% of hospital ED volumes and that were determined to not require ED care in at least 75% of ED visits.

To select our population of potential cohort members from the database, we first selected only those patients whose primary or first-listed diagnosis code (International Classification of Diseases, Ninth Revision (ICD-9)) represents a condition commonly identified as non-urgent. Table 2 (below) summarizes the specific diagnoses that meet our definition of non-urgent.

TABLE 2 – CONDITIONS COMMONLY IDENTIFIED AS NON-URGENT

Condition	% of UCC Visits	% of ED Visits	% not Requiring ED Care
Upper Respiratory Infections	33.3%	9.8%	
Rhinosinusitis, Laryngitis	18.7%	5.0%	81.1%
Pharyngitis	8.1%	2.3%	93.9%
Ear Infections	6.5%	2.5%	95.7%
Urinary Tract Infections	3.1%	2.4%	75.6%

Source: Weinick et al., (2010)

As summarized in Table 2, these conditions collectively represent 36.4% of urgent care visits and 12.2% of hospital ED visits.

Table 3 (below) shows the ICD-9 diagnosis codes associated with each of these common conditions.

TABLE 3 – ICD-9 CODES FOR COMMON NON-URGENT CONDITIONS

Condition	ICD-9 Code(s)
Rhinosinusitis	461.x; 473.x
Laryngitis	464.x, 476.x
Pharyngitis	462.x, 472.x
Ear Infections	380.x, 381.x, 382.x
Urinary Tract Infections	599.x

Source: International Classification of Diseases, Ninth Revision

From this population of patients who were seen with any of the listed primary diagnosis codes we excluded any patient whose claims data indicated they were admitted to the hospital for an inpatient stay during the same episode of care. By definition, ED visits that result in an inpatient stay are considered to be appropriate presentations to the ED. No other patient exclusions will be made. This definition of non-urgent visit is consistent with the definitions used by Weinick et al. (2010).

Defining Location

Location of service was also a primary variable for determining the claims to be extracted from the database. Our study is interested in only the comparison between urgent care centers and hospital EDs. Accordingly, the study will exclude all claims with any location code other than a STDPLAC value of 20, indicating urgent care center, or 23, indicating hospital emergency department (Truven Health Analytics, 2015).

Defining Cost of Care

The study defines cost of care as the total payments received by the urgent care center or hospital ED from all sources of payment for the defined episode of care. This definition includes payments made by primary and secondary insurance plans, as well as payments on deductibles and co-payments made by patients and their families (Truven Health Analytics, 2015). The total cost of care also includes payments made to both the facility and related physicians for the same episode of care (Truven Health Analytics, 2015) and related prescription costs filled on the day of the initial visit. For purposes of our analysis, we included only prescription costs directly related to the specific diagnoses (see Table 2 in the Appendix). These costs are defined in the database by the TOTPAY variable (Truven Health Analytics, 2015).

The study also analyzed the total patient out-of-pocket costs, a subset of the total costs. Patient out-of-pocket costs are defined to include the deductibles, copayments, and coinsurance payments required by the patient's insurance plan. These are defined in the database by the TOTDED, TOTCOINS and TOTCOPAY variables (Truven Health Analytics, 2015).

Data Set Description

"The MarketScan® Research Databases capture person-specific clinical utilization, expenditures, and enrollment across inpatient, outpatient, prescription drug, and carve out services. The data come from a selection of large employers, health plans, and government and public organizations. The MarketScan Research Databases link paid

claims and encounter data to detailed patient information across sites and types of providers and over time. The annual medical databases include private-sector health data from approximately 350 payers" (Truven Health Analytics, 2015, p. 1).

The specific database was the 2014 MarketScan® Commercial Claims and Encounters Database. This research database includes data related to "individuals in plans or product lines with fee-for-service plans and fully capitated or partially capitated plans" (Truven Health Analytics, 2015, p. 2). These individuals include active employees and dependents, early (non-Medicare) retirees and dependents, and COBRA continues (Truven Health Analytics, 2015).

Data Analysis

The outcomes of the analysis are comparisons by location code of the total cost of care and patient out-of-pocket cost of care for a cohort of patients presenting with non-urgent conditions at urgent care centers as compared to the total cost of care and patient out-of-pocket cost of care for a matched cohort of patients presenting with non-urgent conditions at hospital emergency departments.

Descriptive statistics were produced using means and standard deviations for continuous data and counts and percentages of categorical data. Patient characteristics and other covariates were compared between the location groups using chi-square tests for categorical data and t-test or non-parametric Wilcoxon rank-sum test for continuous variables to evaluate the degree of success of the propensity score matching process. Additionally, graphical representations of match success were produced. Outcomes

analysis of cost differences between the two groups was tested using generalized linear models with a Gamma distribution and a log link, since this model accounts for the skewed distribution of healthcare cost data (Montaz-Rath, Christiansen, Ettner, Loveland, & Rosen, 2006). All analyses were conducted using SAS v9.4 (Cary, NC), and a P-value less than 0.05 was considered significant.

Limitations

The analysis is limited by the accuracy and completeness of the underlying database, including collection of all paid claims data and consistent, accurate utilization of ICD-9 codes. Truven Health Analytics conducts significant editing and validity testing to maximize the accuracy and completeness of the data (Truven Health Analytics, 2015). The study conclusions are generalizable only to the commercially-insured US population, not the Medicare or Medicaid populations. Likewise, the conclusions are generalizable only to the locations of hospital ED or urgent care center, not to alternative settings such as physician offices or retail clinics. Finally, the conclusions are not generalizable beyond the specific diagnoses examined or beyond the ages of 18-50.

CHAPTER IV

RESULTS

Descriptions of the Sample Population and Matched Cohorts

Overall, 710,596 patients were included in the unmatched sample (see Tables 4 and 5 below), 502,928 (70.8%) who presented for treatment in an urgent care center, and 207,668 (29.2%) who presented for treatment in a hospital ED. Following a 1:1 propensity-scored matching of the patients who presented at the hospital ED, a total of 415,336 patients were included in the analysis.

Prior to propensity-score matching, several demographic differences were evident between the urgent care and ED populations. First, ED patients were slightly younger, with a mean age of 31.5 years vs. the urgent care center mean age of 33.3. In addition, while the entire population was proportionately more male than female, the proportion of males to females was higher in the ED population than in the urgent care center population (71.6% male vs. 68.5% male). Geographically, a greater proportion of the ED patients were located in the north central region (22.8% vs. 14.0%), and a lesser proportion were located in the northeast (19.7% vs. 22.2%) and west (13.0% vs. 19.6%). ED patients were more likely to be a member of a Preferred Provider Organization (58.5% vs. 51.1%), and less likely to have an unknown or missing insurance plan type (8.0% vs 16.5%). ED patients also exhibited higher proportions of clinical comorbidities than urgent care center patients, as 18.4% of ED patients presented with 1 comorbidity vs. 16.2% of urgent care patients, 7.6% with 2 comorbidities vs. 5.2%, and 5.4% with 3

or more comorbidities vs. 2.6%. Finally, the ED patients exhibited a higher proportion of most comorbidities including depression (9.0% vs. 7.5%), uncomplicated hypertension (8.7% vs. 5.6%), COPD (5.9% vs. 3.9%), obesity (5.1% vs. 3.0%), and uncomplicated diabetes (4.0% vs. 2.1%). P-values for descriptive statistics results are not given because the sample size is so large that almost all difference are statistically significant even when not clinically important.

After propensity-score matching, the differences between the ED and urgent care populations were no longer evident, demonstrating the effectiveness of the matching for research purposes. For example, the mean ages of the ED and urgent care were similar (31.5 vs. 31.4), as was sex (71.6% vs. 71.1% male), geography (41.9% vs. 41.9% South), and insurance plan type (58.5% vs. 58.4% PPO). Furthermore, the proportion of patients with comorbidities between the matched ED and urgent care cohorts were also similar (68.6% vs. 69.5% had 0, 18.4% vs. 18.7% had 1, 7.6% vs 7.2% had 2, and 5.4% vs, 4.6% had 3 or more), as were the proportions of types of comorbidities.

TABLE 4 – DEMOGRAPHICS OF PATIENTS AGED 18-50 PRESENTING IN AN URGENT CARE CENTER OR HOSPITAL ED FOR CONDITIONS COMMONLY CONSIDERED TO BE NON-URGENT, BEFORE AND AFTER MATCHING

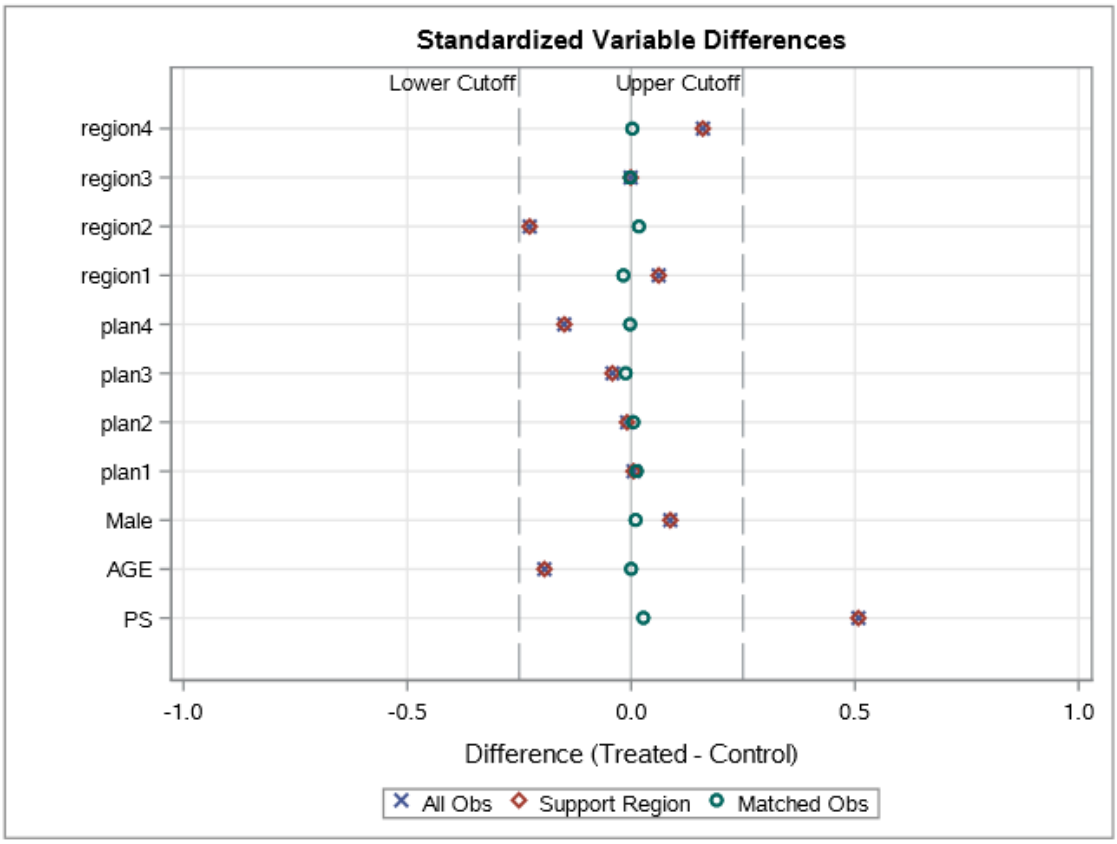
	Unmatched Groups (n = 710,596)		Matched Groups (n = 415,336)	
Variable	Urgent Care Center Patients (n = 502,928)	Hospital ED Patients (n = 207,668)	Urgent Care Center Patients (n = 207,668)	Hospital ED Patients (n = 207,668)
Age, mean	33.3	31.5	31.4	31.5
Sex, %				
Female	32.5%	28.4%	28.9%	28.4%
Male	67.5%	71.6%	71.1%	71.6%
Geographic Region, %				
Northeast	22.2%	19.7%	19.0%	19.7%
North Central	14.0%	22.8%	23.4%	22.8%
South	41.9%	41.9%	41.8%	41.9%
West	19.6%	13.0%	14.2%	13.0%
Unknown	2.3%	2.6%	1.5%	2.6%
Insurance Plan Type, %				
Comprehensive, EPO, HMO, Capitated	13.4%	13.2%	13.7%	13.2%
Comsumer Driven, HDHP	13.5%	13.8%	13.9%	13.8%
Point-of-service	5.5%	6.5%	6.1%	6.5%
Preferred Provider Organization	51.1%	58.5%	58.4%	58.5%
Unknown	16.5%	8.0%	7.9%	8.0%
Comorbidities per Patient, %				
0	76.0%	68.6%	69.5%	68.6%
1	16.2%	18.4%	18.7%	18.4%
2	5.2%	7.6%	7.2%	7.6%
3	1.8%	3.2%	2.9%	3.2%
4	0.6%	1.3%	1.1%	1.3%
5 or more	0.3%	0.9%	0.6%	0.9%

TABLE 5 – COMORBIDITIES BY TYPE OF PATIENTS AGED 18-50 PRESENTING IN AN URGENT CARE CENTER OR HOSPITAL ED FOR CONDITIONS COMMONLY CONSIDERED TO BE NON-URGENT, BEFORE AND AFTER MATCHING

	Unmatched Groups (n = 710,596)		Matched Groups (n = 415,336)	
Variable	Urgent Care Center Patients (n = 502,928)	Hospital ED Patients (n = 207,668)	Urgent Care Center Patients (n = 207,668)	Hospital ED Patients (n = 207,668)
Comorbidities by Type, %				
AIDS/HIV	0.1%	0.2%	0.2%	0.2%
Alcohol abuse	0.4%	0.6%	0.6%	0.6%
Blood loss anemia	0.1%	0.2%	0.2%	0.2%
Cardiac arrhythmias	1.2%	2.0%	1.8%	2.0%
Chronic pulmonary disease	3.9%	5.9%	5.6%	5.9%
Coagulopathy	0.2%	0.3%	0.3%	0.3%
Congestive heart failure	0.1%	0.3%	0.2%	0.3%
Deficiency anemia	0.9%	1.3%	1.2%	1.3%
Depression	7.5%	9.0%	8.5%	9.0%
Diabetes, complicated	0.3%	0.7%	0.6%	0.7%
Diabetes, uncomplicated	2.1%	4.0%	3.7%	4.0%
Drug abuse	0.6%	1.5%	1.2%	1.5%
Fluid and electrolyte disorders	0.7%	1.8%	1.4%	1.8%
Hypertension, complicated	0.2%	0.3%	0.3%	0.3%
Hypertension, uncomplicated	5.6%	8.7%	8.6%	8.7%
Hypothyroidism	3.9%	3.9%	3.9%	3.9%
Liver disease	0.6%	1.1%	1.0%	1.1%
Lymphoma	0.1%	0.1%	0.1%	0.1%
Metastatic cancer	0.0%	0.1%	0.1%	0.1%
Obesity	3.0%	5.1%	4.8%	5.1%
Other neurological disorders	0.7%	1.2%	1.1%	1.2%
Paralysis	0.1%	0.3%	0.2%	0.3%
Peptic ulcer disease, excl. bleeding	0.1%	0.2%	0.2%	0.2%
Peripheral vascular disorders	0.2%	0.3%	0.2%	0.3%
Psychoses	0.2%	0.5%	0.4%	0.5%
Pulmonary circulation disorders	0.1%	0.2%	0.2%	0.2%
Renal failure	0.2%	0.4%	0.3%	0.4%
Rheumatoid arthritis	0.6%	0.7%	1.4%	0.7%
Solid tumor w/o metastasis	0.6%	0.7%	0.6%	0.7%
Valvular disease	0.5%	0.6%	0.5%	0.6%
Weight loss	0.3%	0.6%	0.5%	0.6%

Propensity-score matching was performed in SAS utilizing the Greedy Matching method. In propensity-score matching, service location (ED or urgent care) was treated as the primary dependent variable, and variables age, sex, plan type, region, and 31 comorbidities were treated as predictor variables. A 1:1 matching ratio was used, whereby a single ED patient was matched to a single urgent care patient who had the most similar propensity score. Evidence of balance on covariates was checked and illustrated with a Love Plot of standardized mean or proportion differences for all covariates before and after matching (Figure 1). All covariates (age, sex, insurance plan type, and geographic region) matched within a statistically significant range.

FIGURE 1 – LOVE PLOT DEMONSTRATING THE BALANCE OF COVARIATES BETWEEN THE MATCHED GROUPS



Unadjusted Cost Outcomes Analysis

Total costs of care were defined to include all payments (insurance and patient portions) for the entire episode of care, which includes the urgent care or ED visit cost, as well as the associated prescription costs. As shown in Table 6 (below), unadjusted episode costs for patients presenting at the urgent care center were substantially less than those matched episodes of care for patients presenting at the hospital ED (mean of $246 vs. $1,381, p<.0001). The difference was driven principally by the visit costs (mean of $200 vs. $1,307, p<.0001), as prescription costs were a relatively small portion of total episode costs (mean of $46 vs. $73, p<.0001). These results were consistent when

considering only the patient portion of the episode costs (urgent care mean of $95 vs. ED mean of $399, p<.0001).

TABLE 6 – UNADJUSTED EPISODE COSTS OF CARE

	Urgent Care Center (n = 207,668)			Hospital ED (n = 207,668)		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Episode Costs (Visit + Prescription)						
Patient portion	$ 95	$ 56	$ 121	$ 399	$ 180	$ 703
Total (Patient + Insurance)	$ 246	$ 173	$ 342	$ 1,381	$ 777	$ 2,324
Prescription Costs						
Patient portion	$ 18	$ 5	$ 45	$ 29	$ -	$ 100
Total (Patient + Insurance)	$ 46	$ 10	$ 268	$ 73	$ -	$ 855
Visit Costs						
Patient portion	$ 77	$ 48	$ 100	$ 370	$ 156	$ 661
Total (Patient + Insurance)	$ 200	$ 156	$ 175	$ 1,307	$ 748	$ 2,045

Adjusted Cost Outcomes Analysis

While the propensity score matching served to match age, sex, plan type, region, and comorbidities, there were underlying differences in the distribution of the patients' primary diagnosis as shown in Table 7 (below).

TABLE 7 – PRIMARY DIAGNOSIS BY COHORT

Primary Diagnosis	Emergency Department (n = 207,668)		Urgent Care Center (n = 207,668)	
Rhinosinusitis	37,515	18.1%	83,131	40.0%
Laryngitis	1,680	0.8%	1,597	0.8%
Pharyngitis	55,323	26.6%	63,182	30.4%
Ear Infection	29,349	14.1%	28,608	13.8%
Urinary Tract Infection	83,801	40.4%	31,150	15.0%

This variance in frequency of primary diagnosis required control in our analysis of adjusted cost. In addition, after testing for clinically plausible interaction effects, a significant difference was found for cost differences between ED and UCC depending on sex for both total cost ($p<.0001$) and out-of-pocket patient cost ($p<.0001$models (Table 8). Analysis also identified two Elixhauser comorbidities (diabetes with complications and psychosis) as having a significant impact on episode cost. Therefore, these two conditions were adjusted for in the final analyses—along with presenting condition, sex, age, geographical region, and insurance plan type.

Total costs of care were defined to include all payments (insurance and patient portions) for the entire episode of care, which includes the urgent care or ED visit cost, as well as the associated prescription costs. As shown in Table 8 (below), adjusted episode costs for patients presenting at the urgent care center were substantially less than those matched episodes of care for patients presenting at the hospital ED (adjusted mean of $257 vs. $1,240, $p<.0001$), while controlling for presenting condition, age, sex, insurance

plan type, geographic region, complicated diabetes, and psychosis diagnosis (all covariates were statistically significant at p<.0001). The difference was driven principally by the visit costs, as prescription costs were a relatively small portion of total episode costs. These results were consistent when considering only the patient portion of the episode costs (urgent care mean of $99 vs. ED mean of $351, p<.0001).

TABLE 8 – ADJUSTED COSTS BY LOCATION AND SEX

	Total Adjusted Episode Costs			Total Adjusted Patient Costs		
	ED	UCC	Difference	ED	UCC	Difference
Total, no sex interaction	$ 1,240	$ 257	$ 983	$ 351	$ 99	$ 252
Males	$ 1,194	$ 266	$ 928	$ 351	$ 95	$ 256
Females	$ 1,261	$ 253	$ 1,008	$ 351	$ 96	$ 255

The marginal total episode cost differences between locations, at a 95% confidence interval, for total episode costs (Figure 2) and patient out of pocket costs (Figure 3) are shown below. Marginal cost differences are defined as the difference between the adjusted mean cost estimate of the ED less the adjusted mean cost estimate of the urgent care center. For adjusted total episode costs, the marginal cost difference is $985. For females, the marginal total episode cost difference is $1,008, while for males the difference is $928. When analyzing the patient out-of-pocket portion of the total episode costs, the marginal cost difference is $255. The difference in adjusted mean out-of-pocket costs between females ($256) and males ($252) is just $4.

FIGURE 2 – MARGINAL TOTAL EPISODE COST DIFFERENCES

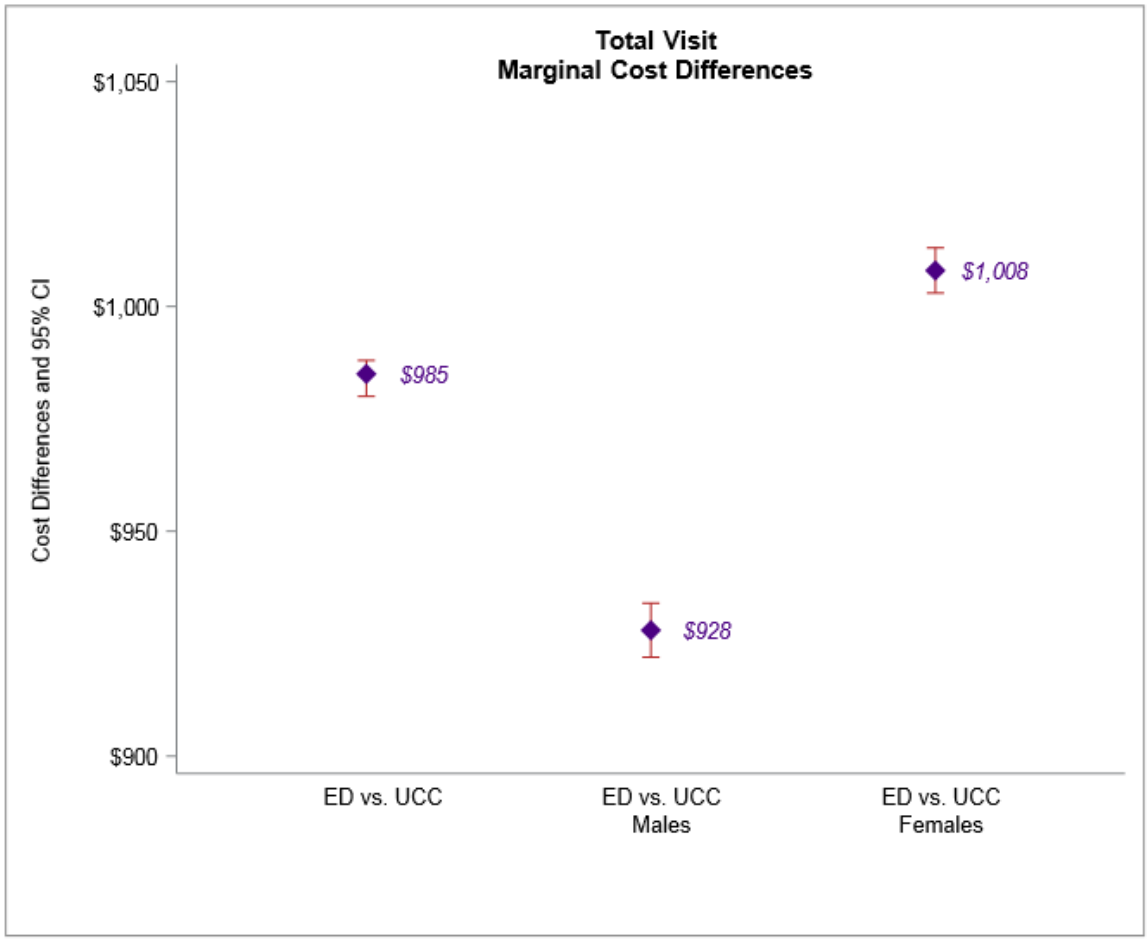
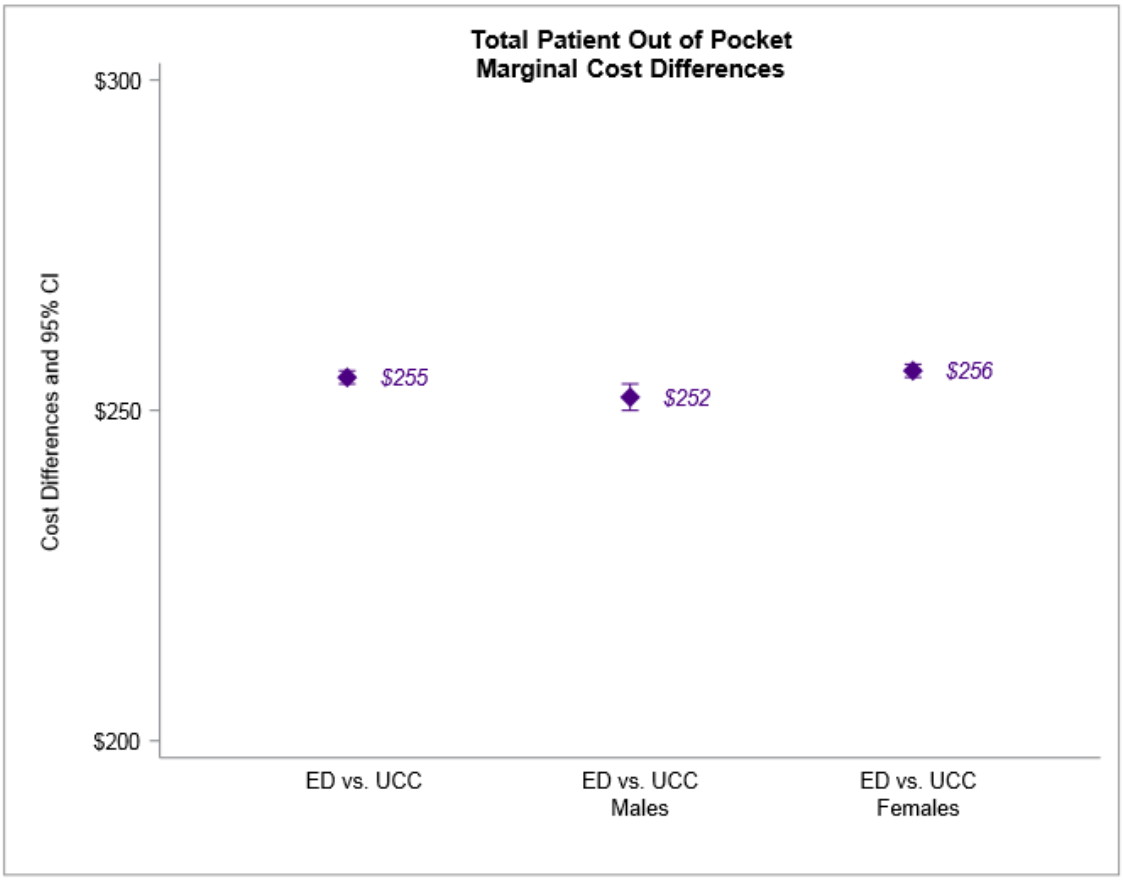


FIGURE 3 – MARGINAL PATIENT OUT-OF-POCKET COST DIFFERENCES



CHAPTER V

DISCUSSION

In this study, we compared the total costs of care and patient out-of-pocket costs of care for adult patients presenting at either a hospital ED or urgent care center for the treatment of conditions commonly considered to be non-urgent. We found that mean total adjusted episode costs of $1,240 for patients who presented at an ED were 4.8 times greater than the mean total episode costs of $257 for patients presenting at an urgent care center, these cost estimates varied dependent on sex however the direction and magnitude of the differences remained. Furthermore, the patient portion of the mean adjusted total episode costs $351 was 3.5 times greater for patients presenting at an ED as compared to the urgent care center mean patient costs of $99. Extrapolating the difference in mean episode costs to the entire sample of 207,668 patients who presented at an ED projects a potential savings of approximately $204.1 million in the sample population alone, including savings of $52.3 million to patients and their families. Further extrapolating this difference across the US healthcare system provides an estimate of the potential savings opportunity nationwide. In 2013, total ED visits were estimated to be 130.4 million (Rui, Kang, & Albert, 2017). Of these visits, 42% are estimated to be adults aged 18 – 50, and 36% are estimated to be individuals with private insurance (Rui, Kang, & Albert, 2017). Assuming that 12.2% of these visits were for conditions commonly defined as non-urgent, we can conservatively estimate that there were 2.4 million such annual visits in 2013 (Weinick, R., Burns, R., & Mehrotra, A., 2010) . Extrapolating the

difference in mean episode costs to this population yields a total projected annual savings opportunity of $2.4 billion, including a patient portion of $613 million. These findings support the hypothesis that the US healthcare system, and individual patients and families, could significantly reduce costs of care by selecting the most appropriate setting for treatment of non-urgent conditions.

Of course, episode costs alone are not the sole criteria by which we should evaluate alternative locations of service. Ultimately, the more appropriate comparison is value, which would take into account a measure of clinical outcome as well as the cost of care. Two previous studies have attempted to evaluate the relative quality of care between urgent care centers and hospital EDs for non-urgent conditions. A 2009 study based on a single Minnesota health plan compared urgent care and ED clinical performance for 3 specific diagnoses (otitis media, pharyngitis, and urinary tract infection) (Mehrotra, et al., 2009). Clinical performance was measured based on 14 quality measures and 7 preventative care measures specific to the 3 diagnoses (Mehrotra, et al., 2009). The authors found that urgent care centers outperformed EDs across 9 of 14 quality measures, in aggregate, and across all preventative care measures (Mehrotra, et al., 2009). A second study in 2014 used a similar study design across a broader group of Aetna claims from 2009-2012 (Shrank, et al., 2014). Using 20,153 matched episodes of care, this study concluded that urgent care center performance exceeded hospital ED performance in 11 of 14 quality measures for the same diagnoses (otitis media, pharyngitis, and urinary tract infections) (Shrank, et al., 2014). Based on these studies, it is reasonable to hypothesize that for the treatment of specified non-urgent conditions, clinical performance at an

urgent care center may be at least as effective, if not more effective, than care received at hospital EDs. This suggests urgent care centers may not only be less costly, but may also provide a greater value than an ED for treatment of non-urgent conditions.

Given that cost and quality at an urgent care center are preferable to the ED for non-urgent conditions, it is important to understand the reasons that patients choose to visit the ED. A 2013 systematic review of relevant literature identified 26 relevant studies examining the reasons individuals visit an ED for non-urgent reasons (Uscher-Pines et al., 2013). This systematic review identified 15 factors that had been evaluated as possible causes for ED usage for non-urgent conditions (Uscher-Pines et al., 2013). Of these 15 factors, two (health status and gender) were analyzed in our study. Four of the 26 studies examined health status as a factor, two concluding that individuals with poorer health were more likely to utilize the ED, and two finding no association between ED use and health status (Uscher-Pines et al., 2013). Our study found that patients presenting at the ED for non-urgent conditions did demonstrate a greater number of comorbidities than patients presenting at an urgent care center. This finding supports the belief that patients presenting at the ED may be sicker or more complex patients than those presenting in an urgent care setting. Ten of the 26 studies examined gender as a factor with mixed results, four finding women more likely than men to make non-urgent ED visits, two finding men more likely than women, and four finding no association between gender and non-urgent ED visits (Uscher-Pines et al., 2013). Our study found that patients who present at an ED or urgent care center for non-urgent conditions are disproportionately male.

Based on the systematic literature review, knowledge of alternatives is another factor that influences patient selection of the ED (Uscher-Pines et al., 2013). One study found that 76% of ED users selected the ED because they believed they would receive better care (Uscher-Pines et al., 2013). Available research suggests that this perception is incorrect. Likewise, one survey found that non-urgent ED users believed that alternative places of service were more expensive than the ED (Uscher-Pines et al., 2013). Clearly, our study found this perception is not correct for individuals with commercial insurance. These findings suggest that patient education is at least one component to target for reducing the selection of the ED for non-urgent care.

In recent years, there has been an increasing trend toward high-deductible health plans and consumer-driven healthcare. One premise of this movement is that patients and families will make better informed choices when they are spending their own dollars rather than simply spending the insurer's funds. In these models, health insurance plan designs typically include high copayment requirements at the ED to incentivize utilization of alternative, lower-cost settings. One risk of these financial incentives is that patients will avoid the use of the ED when another setting is most appropriate. One recent study found that patient responsibility did not reduce the incidence rate of initial ED visits, but did reduce subsequent visits to the ED (Wharam, et al., 2007). So while the plan design was not effective at preventing initial ED visits, it was effective at reducing subsequent visits (Wharam, et al., 2007).

Conclusion and Recommendations

The challenge of inappropriate utilization of hospital EDs for non-urgent conditions has been documented and studied. Our study has, for the first time that we know of, analyzed the cost differential between hospital EDs and urgent care centers for the treatment of non-urgent conditions across a large, national database of commercial claims. We found presentation at the ED results in total episode costs 5.6 times greater than presentation at an urgent care center, including patient out-of-pocket costs that are 4.2 times greater at the ED as compared to urgent care. Available studies demonstrate the urgent care setting is as effective as or more effective than the ED in treating common non-urgent conditions. The US healthcare system could save, conservatively, more than $2.3 billion annually if patients selected urgent care setting.

Changing behavior is difficult, however the potential benefits of this behavioral change are significant to individuals, to payors, and to the US healthcare system overall. Accordingly, we recommend the following:

- Payors are encouraged and incentivized to educate plan members as to the cost effectiveness and clinical effectiveness of urgent care centers rather than EDs for the treatment of non-urgent conditions. In addition to education, plan design (copayments and coinsurance) can be an effective means of encouraging behavioral change.
- Employers with self-funded health plans should also encourage the utilization of appropriate sites of care through education and plan design. Educating employees

to make cost-effective, value-based decisions will improve employee satisfaction with their health plan and with the sponsoring employer.

- Urgent care centers and their trade associations should educate their patients and communities on the benefits of their services relative to EDs for the treatment of non-urgent conditions, and should coordinate with primary care physicians to provide complementary after hours and weekend care.
- Hospital EDs will operationally benefit from a reduction in non-urgent patient volumes. While Federal law requires EDs to treat all patients who present, there should be stronger efforts to triage patients to a more appropriate setting, and to educate patients on a more appropriate location should the clinical issue recur.
- Primary care physicians should educate their patients on the most appropriate setting for after-hours and weekend care for non-urgent conditions, and should coordinate such care with other community providers such as urgent care centers.
- Together, the components of the health system should better coordinate health services among the participants. Physicians, urgent care centers, EDs, and insurers together need to encourage appropriate utilization of the parts through improved care coordination. Emerging models of population health may better incentivize more coordinated behavior.
- Finally, we need to identify those local and regional efforts that have been successful at influencing patient behavior to identify those practices that have been effective at reducing ED utilization for non-urgent conditions.

Limitations

The analysis is limited by the accuracy and completeness of the underlying database, including collection of all paid claims data and consistent, accurate utilization of ICD-9 codes. Truven Health Analytics conducts significant editing and validity testing to maximize the accuracy and completeness of the data (Truven Health Analytics, 2015). The results of this study are limited to the population of commercially-insured adults aged 18 – 50 in the United States, and to the specific clinical diagnoses that were studied (upper respiratory infections and urinary tract infections). The results are also limited to hospital EDs and urgent care centers and cannot be assumed to apply to other settings such as physician offices or retail clinics.

Areas for Further Study

Future studies should examine differences in ED utilization rates for non-urgent conditions to identify geographic areas or health plans that are statistically different from their peers. By identifying outliers, we may be able to identify factors such as access to care, patient education efforts, or plan designs that are most effective at appropriately influencing patient behavior. By identifying successful models for replication, we can begin to make inroads in realizing available financial savings, while simultaneously improving clinical quality.

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Appendices

Appendix A: ICD-9-CM Coding Algorithms for Elixhauser Comorbidities

Table 1: ICD-9-CM and ICD-10 Coding Algorithms for Elixhauser Comorbidities

Comorbidities	Elixhauser's original ICD-9-CM	Elixhauser AHRQ-Web ICD-9-CM	ICD-10	Enhanced ICD-9-CM
Congestive heart failure	398.91, 402.11, 402.91, 404.11, 404.13, 404.91, 404.93, 428.x	398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.x	I09.9, I11.0, I13.0, I13.2, I25.5, I42.0, 142.5-I42.9, I43.x, I50.x, P29.0	398.91, 402.01, 402.11. 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 425.4-425.9, 428.x
Cardiac arrhythmias	426.10, 426.11, 426.13, 426.2-426.53, 426.6-426.8, 427.0, 427.2, 427.31, 427.60, 427.9, 785.0, V45.0, V53.3		I44.1-I44.3, I45.6, I45.9, I47.x-I49.x, ROO.O, ROO.1, ROO.8, T82.1, Z45.0, Z95.0	426.0, 426.13, 426.7, 426.9, 426.10, 426.12, 427.0-427.4, 427.6-427.9, 785.0, 996.01, 996.04, V45.0, V53.3
Valvular disease	093.2, 394.0-397.1, 424.0-424.91, 746.3-746.6, V42.2, V43.3	093.2, 394.x-397.1, 397.9, 424.x, 746.3-746.6, V42.2, V43.3	A52.0, I05.x-I08.x, I09.1, I09.8, I34.x-I39.x, Q23.O-Q23.3, Z95.2, Z95.4	093.2, 394.x-397.x, 424.x, 746.3-746.6, V42.2, V43.3
Pulmonary circulation Disorders	416.x, 417.9	416.x, 417.9	I26.x, I27.x, I28.0, I28.8, I28.9	415.0, 415.1, 416.x, 417.0, 417.8, 417.9
Peripheral vascular disorders	440.x, 441.2, 441.4, 441.7, 441.9, 443.1- 443.9, 447.1, 557.1, 557.9, V43.4	440.x, 441.x, 442.x, 443.1-443.9, 447.1, 557.1, 557.9, V43.4	I70.x, I71.x, I73.1, I73.8, I73.9, I77.1, I79.0, I79.2, K55.1, K55.8, K55.9, Z95.8, Z95.9	093.0, 437.3, 440.x, 441.x, 443.1-443.9, 447.1, 557.1 557.9, V43.4
Hypertension, uncomplicated	401.1, 401.9	401.1, 401.9, 642.0	I10.x	401.x
Hypertension, complicated	402.10, 402.90, 404.10, 404.90, 405.1, 405.9	401.0, 402.x-405.x, 642.1, 642.2, 642.7, 642.9	I11.x-I13.x, I15.x	402.x-405.x
Paralysis	342.0. 342.1, 342.9-344.x	342.x-344.x, 438.2-438.5	G04.1, G11.4, G80.1, G80.2, G81.x, G82.x, G83.0-G83.4, G83.9	334.1, 342.x, 343.x, 344.0-344.6, 344.9
Other neurological disorders	331.9, 332.0, 333.4, 333.5, 334.x, 335.x, 340.x, 341.1-341.9, 345.0, 345.1, 345.4, 345.5, 345.8, 345.9, 348.1, 348.3, 780.3, 784.3	330.x-331.x. 332.0, 333.4, 333.5, 334.x, 335.x, 340, 341.1-341.9, 345.x, 347.x, 780.3, 784.3	G10.x-G 13.x, G20.x-G22.x, G25.4, G25.5, G31.2, G31.8, G31.9, G32.x, G35.x-G37.x, G40.x, G41.x, G93.1, G93.4, R47.0, R56.x	331.9, 332.0, 332.1, 333.4, 333.5, 333.92, 334.x-335.x, 336.2, 340.x, 341.x, 345.x, 348.1, 348.3, 780.3, 784.3
Chronic pulmonary disease	490-492.8, 493.00-493.91, 494.x-505.x, 506.4	490x-492.x, 493.x, 494x-505.x, 506.4	I27.8, 127.9, J40.x-J47.x, J60.x-J67.x, J68.4, J70.1, J70.3	416.8, 416.9, 490.x-505.x, 506.4, 508.1, 508.8
Diabetes, uncomplicated	250.0-250.3	250.0-250.3, 648.0	E10.0, E10.1, E10.9, E11.0, E11.1, E11.9, E12.0, E12.1, E12.9, E13.0, E13.1, E13.9, E14.0, E14.1, E14.9	250.0-250.3
Diabetes, complicated	250.4-250.7, 250.9	250.4-250.9, 775.1	E10.2-E10.8, E11.2-E11.8, E12.2-E12.8, E13.2-E13.8, E14.2-E14.8	250.4-250.9
Hypothyroidism	243-244.2, 244.8, 244.9	243-244.2, 244.8, 244.9	E00.x-E03.x, E89.0	240.9, 243.x, 244.x, 246.1, 246.8
Renal failure	403.11, 403.91, 404.12, 404.92, 585.x, 586.x, V42.0, V45.1, V56.0, V56.8	403.01, 403.11, 403.91, 404.02, 404.03, 404.12, 404.13, 404.92, 404.93, 585.x, 586.x, V42.0, V45.1, V56.x	I12.0, I13.1, N18.x, NI9.x, N25.0, Z49.0-Z49.2, Z94.0, Z'99.2	403.01, 403.11, 403.91, 404.02, 404.03, 404.12, 404.13, 404.92, 404.93, 585.x, 586.x, 588.0, V42.0, V45.1, V56.x
Liver disease	070.32, 070.33, 070.54, 456.0, 456.1, 456.2, 571.0, 571.2-571.9, 572.3, 572.8, V42.7	070.22, 070.23, 070.32, 070.33, 070.44, 070.54, 456.0, 456.1, 456.20, 571.0, 571.2-571.9, 572.3, 572.8, V42.7	B18.x, I85.x, I86.4, I98.2, K70.x, K71.1, K71.3-K71.5, K71.7, K72.x-K74.x, K76.0, K76.2-K76.9. Z94.4	070.22, 070.23, 070.32, 070.33, 070.44, 070.54, 070.6, 070.9, 456.0-456.2, 570.x, 571.x, 572.2-572.8, 573.3, 573.4, 573.8,573.9, V42.7

Table 1: ICD-9-CM and ICD-10 Coding Algorithms for Elixhauser Comorbidities (Continued)

Comorbidities	Elixhauser's original ICD-9-CM	Elixhauser AHRQ-Web ICD-9-CM	ICD-10	Enhanced ICD-9-CM
Peptic ulcer disease excluding bleeding	531.70, 531.90, 532.70, 532.90, 533.70, 533.90, 534.70, 534.90, V12.71	531.41, 531.51, 531.61, 531.7, 531.91, 532.41, 532.51, 532.61, 532.7, 532.91, 533.41, 533.51, 533.61, 533.7, 533.91, 534.41, 534.51, 534.61, 534.7, 534.91	K25.7, K25.9, K26.7, K26.9, K27.7, K27.9, K28.7, K28.9	531.7, 531.9, 532.7, 532.9, 533.7, 533.9, 534.7, 534.9
AIDS/HIV	042.x-044.x	042.x-044.x	B20.x-B22.x, B24.x	042.x-044.x
Lymphoma	200.x-202.3x, 202.5-203.0, 203.8, 238.6, 273.3, V10.71, V10.72, V10.79	200.x-202.3, 202.5-203.0, 203.8, 238.6, 273.3	C81.x-C85.x, C88.x, C96.x, C90.0, C90.2	200.x-202.x, 203.0, 238.6
Metastatic cancer	196.x-199.x	196.x-199.x	C77.x-C80.x	196.x-199.x
Solid tumor without metastasis	140.x-172.x, 174.x, 175.x, 179.x-195.x, V10.x	140.x-172.x, 174.x, 175.x, 179.x-195.x	C00.x-C26.x, C30.x-C34.x, C37.x-C41.x, C43.x, C45.x-C58.x, C60.x-C76.x, C97.x	140.x-172.x, 174.x-195.x
Rheumatoid arthritis/ collagen vascular diseases	701.0, 710.x, 714.x, 720.x, 725.x	701.0, 710.x, 714.x, 720.x, 725.x	L94.0, L94.1, L94.3, M05.x, M06.x, M08.x, M12.0, M12.3, M30.x, M31.0-M31.3, M32.x-M35.x, M45.x, M46.1, M46.8, M46.9	446.x, 701.0, 710.0-710.4, 710.8, 710.9, 711.2, 714.x, 719.3, 720.x, 725.x, 728.5, 728.89, 729.30
Coagulopathy	286.x, 287.1, 287.3-287.5	286.x, 287.1, 287.3-287.5	D65-D68.x, D69.1, D69.3-D69.6	286.x, 287.1, 287.3-287.5
Obesity	278.0	278.0	E66.x	278.0
Weight loss	260.x-263.x	260.x-263.x, 783.2	E40.x-E46.x, R63.4, R64	260.x-263.x, 783.2, 799.4
Fluid and electrolyte disorders	276.x	276.x	E22.2, E86.x, E87.x	253.6, 276.x
Blood loss anemia	280.0	280.0, 648.2	D50.0	280.0
Deficiency anemia	280.1-281.9, 285.9	280.1-281.9, 285.2, 285.9	D50.8, D50.9, D51.x-D53.x	280.1-280.9, 281.x
Alcohol abuse	291.1, 291.2, 291.5-291.9, 303.9, 305.0, V113	291.0-291.3, 291.5, 291.8, 291.9, 303.x, 305.0	F10, E52, G62.1, I42.6, K29.2, K70.0, K70.3, K70.9, T51.x, Z50.2, Z71.4, Z72.1	265.2, 291.1-291.3, 291.5-291.9, 303.0, 303.9, 305.0, 357.5, 425.5, 535.3, 571.0-571.3, 980.x, V11.3
Drug abuse	292.0, 292.82-292.89, 292.9, 304.0, 305.2, 305.9	292.0, 292.82-292.89, 292.9, 304.x, 305.2-305.9, 648.3	F11.x-F16.x, F18.x, F19.x, Z71.5. Z72.2	292.x, 304.x, 305.2-305.9, V65.42
Psychoses	295.x-298.x, 299.1	295.x-298.x, 299.1	F20.x, F22.x-F25.x, F28.x, F29.x, F30.2, F31.2, F31.5	293.8, 295.x, 296.04, 296.14, 296.44, 296.54, 297.x, 298.x
Depression	300.4, 301.12, 309.0, 309.1, 311	300.4, 301.12, 309.0, 309.1, 311	F20.4, F31.3-F31.5, F32.x, F33.x, F34.1, F41.2, F43.2	296.2, 296.3, 296.5, 300.4, 309.x, 311

Source:

Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining Comorbidities in ICD-9-CM and ICD-10 administrative data. *Med Care.* 2005 Nov; 43(11): 1130-9.

Appendix B – Prescription Drug Classes Included in the Definition of Episode Costs

Truven Database Value	Description
58	Analgesics/Antipyrates, Salicylates
59	Analgesics/Antipyrates, Nonsteroid/Antiinflamatories
60	Analgesics/Antipyrates, Opiate Agonists
61	Analgesics/Antipyrates, Opitate Part Agonists
62	Analgesics/Antipyrates, NEC
128	Antitussives/Cold Comb. NEC
129	Expectorants/Cold Comb. NEC
131	Cough/Cough/Cold Comb.
133	Antiinfectives, Antibiotics EENT
134	Antiinfectives, Antivirals EENT
135	Antiinfectives, Sulfonamides EENT
136	Antiinfectives, Misc. EENT
137	Antiinfectives/Antiinflamatories EENT
138	Antiinlamatory Agents, EENT
141	Anesthetics, Local EENT
144	Mouthwashes/Gargles Misc. EENT
160	Antiemetics, NEC
161	Histamine (H2) Antangonists, NEC
162	Gastrointestnal Drugs, Misc., NEC
190	Antiinf S/MM, Antibiotics & Comb.
192	Antiinf S/MM, Antifungals & Comb.
194	Antiinf S/MM, Antiinf Local Misc.
195	Antiinf S/MM, Agents & Comb.
196	Antiinf S/MM, Antiprut. Local
248	Leukotirene Modifiers