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The Contemporary Use of Nurse Practitioners in U.S. Emergency Departments

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The Contemporary Use of Nurse Practitioners in U.S. Emergency Departments

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ABSTRACT

Problem: The increased demand for emergency care in the United States (U.S.) has been well-documented and there is growing utilization of nurse practitioners in U.S. emergency departments. However, little is known about the nurse practitioner (NP) role in the emergency department setting within the past five years.

Purpose: The purpose of this project was to describe the demographic characteristics of patients, patient conditions treated, diagnostic tests ordered, and procedures performed by nurse practitioners in a national sample of U.S. emergency departments.

Methodology: This secondary analysis used a non-experimental quantitative, descriptive exploratory design to review data from the National Hospital Ambulatory Medical Care Survey (NHAMCS), a national sample of visits to U.S. emergency departments.

Results: From July 1 through December 31, 2010, there were 462 unique patient encounters in NHAMCS with the nurse practitioner as the sole provider of care. Most (91.8%) visits occurred in metropolitan/urban regions and in not-for-profit hospitals (78.1%). More than half of the patients were female (54.5%), 76.4% of participants were aged 44 years or younger, and approximately two-thirds (68.2%) identified as Caucasian. 65.5% of patient visits were for Emergency Severity Index (ESI) Level 4 (semi-urgent) and Level 5 (non-urgent) visits. The most frequent illnesses were ENT-related, while the most common injuries were related to falls. Diagnostic (laboratory, ECG) and imaging testing was ordered in 56.1% and 37.2% of respective patient encounters. Procedures were performed in 36.6% of visits. Medications were prescribed for a large majority of emergency visits (82.9%). NSAIDS (16.9%), narcotic analgesics (7.1%), and non-narcotic analgesics (5.6%) were the most commonly prescribed drug classes.

Implications: This project reveals that most nurse practitioners working in emergency settings care for a variety of ESI Level 4 and Level 5 acuity patients in metropolitan and urban regions. As the utilization of nurse practitioners in emergency settings increases, the need for well-educated, academically prepared nurse practitioners in emergency care will become greater. Aligning graduate-level academic preparation, increasing continuing education offerings in emergency care, targeting advanced practice competencies, and supporting secondary certification in the specialty in accordance with the APRN Consensus Model, are essential. Future interdisciplinary research targeting the NP role in the ED is warranted.

THE CONTEMPORARY USE OF NURSE PRACTITIONERS IN U.S. EMERGENCY DEPARTMENTS

Introduction

The increased demand for emergency care in the United States has been well-documented (Ning, Stein, Hsia, Maselli, & Gonzales, 2010), and new evidence suggests the demand for services will increase over the next few years as a result of more people being insured through the health care reforms created by the Patient Protection and Affordable Care Act (ACA) (U.S. Department of Health and Human Services, 2015). With a 49% increase in emergency department (ED) volumes between 1997 and 2008 (Patrick & Lazarus, 2010), ED closures and hospital consolidations (Cole & Kleinpell, 2006), and an increased emphasis on quality metrics such as length of stay (LOS), left without being seen (LWBS), and door-to-provider times (Dimeo & Postic, 2012), alternative models of care that effectively integrate advanced practice nurses into traditional physician staffing plans are warranted. While nurse practitioners (NPs) provide care in emergency settings, little is known about how NPs are currently utilized.

Background

Prior research has shown that patients are willing to see NPs in the ED (Moser, Abu-Laban, & Van Beek, 2004). NPs provide effective care in the ED (Cooper, Lindsay, Kinn, & Swann, 2002; Wallis, Hooper, Kerr, Lind, & Bost, 2009; Wilson & Shifaza, 2008) and improve patient flow, reduce length of stay, and decrease wait times (Bahena & Andreoni, 2013; Ducharme, Alder, Pelletier, Murray, & Tepper, 2009; Steiner et al., 2009). In addition, two systematic reviews that evaluated NP use in the ED found that NPs: (a) reduce wait times and provide high patient satisfaction (Carter & Chochinov, 2007), and (b) provide clinically effective care equivalent to that of medical interns and residents (Carter & Chochinov; Wilson, Zwart, Everett, & Kernick, 2009).

Although prior research has described the role of the nurse practitioner in U.S. emergency departments, little is known about the nurse practitioner role in emergency settings since the implementation of the ACA. Mills and McSweeney (2005) evaluated the types of patients seen by NPs in EDs; however, those findings were based on data from 1997-2000. More recently, Campo, McNulty, Sabatini, and Fitzpatrick (2008) evaluated the common procedures performed and the educational preparation that NPs working in the ED had for those procedures in a descriptive study of 423 certified and actively practicing members of the American Academy of Nurse Practitioners. Campo et al. found that the majority of NPs were educated through on-the-job training versus through formal higher education or professional continuing education (CE). The results of these studies suggest that although NPs are being increasingly utilized in the provision of emergency care, ED NPs have little formal education regarding the role. Furthermore, there is little evidence in the nursing literature that describes the role of the NP in emergency settings within the past five years.

Literature Review

Methods

A systematic literature review was conducted. Several electronic databases were systematically searched including MEDLINE/PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), EBSCO Academic Search Complete, and EBSCO Health Source: Nursing/Academic Edition. This author searched for relevant studies using various combinations of key words that included nurse practitioner, advanced practice nurse, emergency department, role, and practice. In addition, the author reviews the reference lists of all the studies deemed relevant for additional resources meeting inclusion criteria.

The inclusion criteria for studies in this review were: (a) published in a peer-reviewed journal and available in the English language between January 1, 2009 and

December 21, 2014, (b) included data specific to U.S. emergency departments that employed NPs, and (c) included at least one subjective or objective measure related to NP utilization, the NP role or practice, types of patients seen, or procedures performed by NPs. Inclusion criteria for this review were not restricted by research methodology. Articles were excluded if they were a subjective review or commentary.

The search resulted in a total of 108 unique publications (Figure 1). The titles were read and type of study assessed by to determine if the publications met the inclusion criteria. Based on this first review, 87 (80.6%) manuscripts were excluded because the inclusion criteria were not met. The majority of these excluded studies did not relate to the NP role or practice in the ED (n=82, 94.3%). A small percentage (n=5, 5.7%) were international studies; therefore, outside the scope of this review. Abstracts were then obtained for the remaining 21 (19.4%) studies and reviewed by the author. Of these, 15 (13.9%) abstracts were excluded because they did not meet inclusion criteria. Specifically, these studies were excluded after abstract review because: (a) no analyses of U.S. ED data were included (n=12, 11.1%), (b) the study was a narrative review or commentary (n=2, 1.9%), or (c) the study did not relate to the NP role or practice in the ED (n=1, 0.9%). Next, full text retrieval was completed for the remaining six (5.6%) articles. Each unique study was reviewed to assess fit with the inclusion criteria and to determine any discrepancies. Of these, two manuscripts did not meet the inclusion criteria because they only addressed patient satisfaction or patient willingness to be evaluated by an NP and not the NP role. Thus, the final sample consisted of four research studies.

Studies were evaluated for quality through systematic examination of the characteristics that potentially affect the findings as explicated by Whittemore and Knafl (2005) including sample size, representativeness, characteristics of subjects, measurement of predictor and outcome variables, and utilization of a theoretical framework. The studies

included in this review were abstracted and evaluated by select variables using an author-developed data-collection tool. First author, year of publication, aim or purpose, design, population, sample, response rate, measures, analytic method, key findings, and a dichotomous assessment of theory inclusion of the four included studies are presented in Table 1.

Results

All studies included in this review were of descriptive, cross-sectional design (n=4), with no randomized control trials or qualitative research represented. All studies included in this review used descriptive statistics, while two studies used chi-square analysis (Abbott, Schepp, Zierler, & Ward, 2010; Counselman et al., 2009) and one study used logistic regression (Keough, Stevenson, Martinovich, Young, & Tanabe, 2011). These findings are consistent with the descriptive, exploratory nature of the research designs utilized across all included studies. No theoretical framework was utilized in the four studies included in the review.

There was great variability in study purposes across included studies; therefore, the actual measures were varied among the four studies thus limiting the ability to summarize or synthesize findings using statistical methods. The majority of studies evaluated data through a national sampling frame (n=3) while one study evaluated only EDs in Oregon and Washington State. The number of participants varied significantly. Sample sizes ranged from 93 to 1,216, with two studies surveying nurse managers or medical directors (Abbott et al., 2010; Counselman et al., 2009), one study surveying only NPs (Keough et al., 2011), and one study surveying both the ED charge nurse and the NP on duty (Wood, Wettlaufer, Shaha, & Lillis, 2010). The response rate for administered surveys across all studies ranged from 21% to 70%.

All four studies measured demographic characteristics (Abbott et al., 2010; Counselman et al., 2009; Keough et al., 2011; Wood et al., 2010) and three studies evaluated ED characteristics or ED staffing with NPs (Abbott et al., Counselman et al., Wood et al.). Of the three studies that evaluated ED characteristics or ED staffing with NPs, each explored different concepts: (a) patient acuity evaluated by NPs (Abbott et al.), (b) types of procedures performed by NPs employed in non-traditional work settings such as EDs (Keough et al.), and (c) both patient acuity and procedures performed in pediatric ED settings (Wood et al.).

NPs appear to be increasingly represented in U.S. EDs. In national-level data that was evaluated, Couselman et al. (2009) found that 20% of medical exams were performed by NPs and physician assistants (PAs). In addition, the medical directors surveyed expect the number of NPs and PAs to increase. Fifty-one percent of respondents from a national pediatric ED survey indicated that NPs are employed and utilized in that setting (Wood et al., 2010). Wood et al. also found that NP use in pediatric EDs was distributed across all geographic regions of the U.S., while use of PAs in the ED was more likely in the Northeast and Midwest regions ($p<0.01$). Keough et al. (2011) evaluated the characteristics of 1,216 adult (ANP), family (FNP), and acute care NPs (ACNP). Of the 182 NPs who were employed in non-traditional practice settings, 31 were employed in the ED and were certified as FNP (n=13), ACNP (n=11), and ANP (n=7). In Abbott et al. (2010), a study that evaluated NP and PA staffing in Washington and Oregon, both provider types were: (a) increasing utilized in non-emergent tracks, and (b) more likely to be used in urban and larger EDs.

In the sample of articles included in this review, there was some variation in the types of patient acuity that NPs provided care for while working in the ED. A single study found that NPs or PAs were used to care for both emergent and non-emergent patients according to half of the ED manager respondents (Abbott et al., 2010). For those same

providers working in the "main ED" (i.e. higher acuity area), 60% of respondents indicated that NPs and PAs provided care to only non-emergent patients in that setting. Another study of pediatric EDs, 75% of NPs and PAs evaluated all patient acuities while 25% evaluated only low acuity patients (Wood et al., 2010).

Two studies provided a limited evaluation of procedural training or actual procedures performed in the ED by NPs. One study found that both family and adult NPs practicing in non-traditional settings had more training in central line insertion, caring for critically ill patients, trauma resuscitation, laceration repair, 12-lead ECG interpretation, and x-ray interpretation (Keough et al., 2011). The second study found that 90% of NPs surveyed regarding their ED practice commonly performed fluorescein eye exams, managed dog bite injuries, reduced nurse maids' elbow dislocations, splinted extremities, packed wounds, and managed first- and second-degree burns (Wood et al., 2010).

Analysis

The role of the NP in U.S. emergency departments is poorly elucidated in the literature as evidenced by the dearth of recent publications on this subject. Of the literature that is available, there are significant limitations to include: (a) inconsistent variables, (b) limited methodological quality, and (c) lack of national/regional level data. In addition, further inquiry is needed related to the patient population served and treatments rendered on their impact on the healthcare system. This is of particular importance as the ACA is implemented with changes in reimbursement and models of care.

Problem Statement

There is growing utilization of NPs in U.S. emergency departments. However, little is known about the NP role in the emergency department setting within the past five years.

Project Purpose

The purpose of this project is to describe the demographic characteristics of patients, patient conditions treated, diagnostic tests ordered, and procedures performed by NPs in a national sample of U.S. emergency departments. The research question for this project is: For ED patients evaluated exclusively by a NP, what are the (a) demographic characteristics, (b) primary reasons for visits, (c) common diagnostic tests ordered, and (d) common procedures performed?

Project Implementation and Measures

Theoretical Framework

This project was guided by the *Strong Model of Advanced Practice*. This model was developed through the collaboration between advanced practice nurses and academic faculty for acute care NPs at Strong Memorial Hospital in Rochester, New York (Ackerman, Norsen, Martin, Wiedrich, & Kitzman, 1996). The model, which was built on Benner's novice to expert nursing theory, has five domains of practice that surrounds the patient who is at the core of the model (Figure 2). The five domains include: (a) direct comprehensive patient care, (b) education, (c) support of systems, (d) research, and (e) publication and professional leadership. The five domains support direct and indirect care of patients, and are unified through three strands within the domains. The three strands are empowerment, scholarship, and collaboration. The model supports the progression of the advanced practice nurse from novice to expert in the provision of advanced practice nursing in all five domains (Ackerman et al.).

Findings in the literature review suggest that NPs have little formal education in emergency care. Having additional understanding of the NP role in contemporary emergency care settings would be beneficial by strengthening the educational domain in the *Strong Model of Advanced Practice* direct comprehensive patient care would be positively

influenced. The model provides an ideal framework for this project, because new skill acquisition and increased knowledge for the prospective NP or the NP currently functioning in the ED is seen as an outcome measure for improved educational processes that can be implemented at different intervals across Benner's continuum. Additional insight in this area will improve both graduate education and continuing education offerings to better respond to the needs of rapidly changing patient care delivery methods.

Methodology

Design

A non-experimental quantitative, descriptive exploratory design was used to assess types of patients seen and common procedures performed in U.S. emergency departments. This secondary analysis used data from the National Hospital Ambulatory Medical Care Survey (NHAMCS). According to the Centers for Disease Control and Prevention (CDC) (2014), NHAMCS is based on a national sample of visits to EDs of general and short-stay hospitals. The survey is designed to evaluate the use of ambulatory care services in hospital emergency and outpatient departments (CDC).

Protection of Human Subjects

Approval for this project was obtained through the Institutional Review Board (IRB) at Otterbein University. Because this project was a secondary data analysis and only de-identified data were utilized from publically available data files, this project qualified for expedited review. All data downloaded from the NHAMCS survey was kept confidential on a password-protected computer. This researcher completed CITI Human Subjects Research training; specifically, the *Social and Behavioral Responsible Conduct of Research Course* and the *Social/Behavioral Research Course* (Basic Course).

Data Source Description

The National Hospital Ambulatory Medical Care Survey (NHAMCS) Emergency Department Patient Record was the secondary data source for this project. The data are based on a national probability sample (i.e. all 50 states and the District of Columbia) of visits to emergency departments in non-institutional general and short-stay hospitals, exclusive of Federal, military, or Veterans Administration facilities (CDC, 2014). Hospitals matriculate into NHAMCS through field representatives of the U.S. Census Bureau, and hospital staff or Census Bureau staff complete the patient record forms for each sampled visit from the medical record. Older NHAMCS data are available for public download, while the most recent years may be accessed through an application process and payment of data access fees.

The NHAMCS survey uses a four-stage probability sampling design; consisting of (a) geographically defined areas, (b) the hospitals within these areas, (c) the inclusion of all EDs within selected hospitals, and (d) finally the patient visits. Patient records were randomly sampled from patient visits during a randomly assigned 4-week reporting period. Data elements included in the survey were demographics, payor source, patients' complaints, diagnoses, diagnostic/screening services, vital signs, procedures, pharmacological therapy, disposition, types of providers seen, causes of injury, and hospital characteristics such as geographic region.

Sample and Setting

Data were obtained from the NHAMCS for a sample of patients presenting for emergency care to U.S. emergency departments during the year 2010, the most current year of data publically available from the CDC. According to the NHAMCS Micro-Data File Documentation (CDC, 2010), a total of 488 hospitals were selected for the 2010 NHAMCS, of which 388 had eligible EDs staffed 24 hours per day. All eligible facilities were surveyed with a response rate of 92.0% (n=357). A sample of 449 Emergency Service Areas (ESAs),

defined as areas within the ED where emergency services are provided, was selected from the EDs. Of these, 427 met the inclusion criteria by providing forms for at least half of their expected visits based on the total number or visits during the reporting period. The resulting unweighted ESA sample response rate was 95.1%, and the overall unweighted two stage sampling response rate was 87.5%.

For this secondary analysis, data were selected from the six-month period of July 1-December 31, 2010. Because the NHAMCS data did not delineate the extent to which each healthcare provider is involved in medical decision making, data were included where the patient records indicated the NP was the sole provider. De-identified data were obtained for all age groups seeking emergency care.

Data Abstraction

Standard demographic variables were obtained, including age, gender, race, ethnicity, race, residence, and payor source. Geographic characteristics of the sample was collected to understand both region and population density. Several clinical indicators were collected, including arrival method, initial versus follow-up ED visit, reason for visit, and hospital admissions from the ED. Initial triage data classification based off the five-level Emergency Severity Index (ESI) was also obtained (Figure 3). The ESI is a five-level ED triage algorithm that stratifies patients into five classes from 1 (most urgent) to 5 (least urgent) on the basis of acuity and resource needs (Agency for Healthcare Research and Quality, 2013).

The types of diagnostic services provided, including blood testing, cardio-pulmonary testing, and imaging were collected. The survey collected 12 types of procedures: (a) administration of intravenous fluids, (b) casting, (c) splint/wrap application, (d) incision and drainage, (e) foreign body removal, (f) nebulizer therapy, (g) bladder catheterization, (h) pelvic exam, (i) central line insertion, (j) cardiopulmonary

resuscitation, (k) endotracheal intubation, and (l) "other procedures". All procedures listed were evaluated in this project. The most common medication classifications and specific medications that were prescribed during the visit or at ED discharge were obtained. Finally, primary diagnoses and ED quality metrics (door to provider time, length of stay) were collected.

Data Analysis

Public data files from the NHAMCS survey for the year 2010 were downloaded from the CDC website via file transfer protocol. Data from the NHAMCS survey were analyzed using the IBM Statistical Package for the Social Sciences (SPSS), version 22.0. Data were filtered to remove entries where physicians or PAs provided care. In most instances where NPs were listed as one of the providers, physicians were also listed. Because the dataset did not indicate which provider was responsible for medical decision making, diagnosis, or the procedures performed, only records where the NP was the sole provider were able to be selected for analysis. Descriptive statistics were obtained for all measures under consideration for this project, including frequencies, mean, median, range, and standard deviation where applicable. For this project, the only patient visits that were reviewed were those where the NP was the sole provider. Due to the complex nature of the sampling design, calculation of sampling errors would be ideal; however, due to the convenience sampling methodology used in this review, the sample may not represent the population and therefore not be generalizable.

Outcome Analysis

Results

Characteristics of the Sample

There were a total of 17,151 patient visit records in the NHAMCS ED public data files from July 1, 2010 through December 31, 2010. Of the 1,037 records where a NP

participated in providing care, only 462 records indicate that the NP was the sole emergency care provider. This figure represents only 2.7% of ED visits in the sampled time period. Most (n=424, 91.8%) of the ED patient visits involving a NP occurred in Metropolitan Statistical Areas, or urban centers, as well as in non-Federal not-for-profit hospitals (n=361, 78.1%). Only 11.9% (n=55) of visits occurred in micropolitan regions (i.e. population ≥10,000 but <50,000). Patients were unevenly represented across the four geographic regions of the U.S.: Midwest (33.5%), Northeast (26.8%), South (37.2%) and West (2.4%). See Table 2 for additional location demographics.

The patient ages in the sample ranged from less than 1 year of age to 95 years old (Table 3). Younger patients were largely represented in that 76.4% of participants were aged 44 years or younger. Almost one-third (31.8%) of participants were under 15 years of age, while only 6.3% were aged 65 and older. More than half of the patients were female (54.5%) and approximately two-thirds (68.2%) identified as Caucasian (Table 4). Of the minority groups, 27.9% identified as African-American and 14.3% identified as Hispanic or Latino. Most (94.4%) of patients in the sample reported living in a private residence.

Patients reported their primary expected source of payment as private insurance (32.7%), followed by Medicaid (31.4%), self-pay (14.1%), Medicare (9.7%), and workers compensation (2.2%) (Table 5). The percentage of patients with median household incomes in the bottom two quartiles (≤ $40,626) was 61.1%.

Patients presented to the ED with a variety of acuities; however, 65.5% of patient visits were for ESI Level 4 (semi-urgent) and Level 5 (non-urgent) visits. 22.9% of encounters were triaged as Level 3 (urgent), while only 4.7% of visits were categorized as Level 1 (immediate) or Level 2 (emergent)(Table 6). Most patients arrived by private or public transportation (91.1%) while 6.5% presented via ambulance transport. 42.6% of ED patient visits with care provided by NPs were injury-related. The average wait time to see a

NP was 49.6 (SD 68.3) minutes and the median time was 31 minutes (skewness 4.16, kurtosis 33.19) (Table 7). The mean length of stay was 143.1 (SD 116.9) minutes and the median was 114 minutes.

Primary Reasons for ED Visits

ED patients in this sample cared for by NPs presented for a variety of illnesses and injuries. As shown in Table 8, common illnesses of the ear, nose, and throat were well represented, with acute pharyngitis (3.9%) and otitis media (3.2%) being the two most common. Other illness or infectious processes were also identified as frequent, such as cellulitis or abscess, acute upper respiratory tract infection, fever not otherwise specified (NOS), acute bronchitis, urinary tract infection, cough, and streptococcal sore throat. Common injuries or pain syndromes in the top primary diagnoses included headache/head injury, sprains and strains, lumbago/backache, neck strains and sprains, finger injuries, superficial corneal injuries, and toxic effects of venom. Dental disorders of the teeth and gums were the sixth-most common diagnoses (1.9%).

Patients reported many mechanisms of the primary injury that brought them to the ED. As shown in Table 9, although several mechanisms of injury were identified, the largest category of injury was falls. Seven of the top 20 causes of injury were fall-related (12.6%). Other common injuries were the result of overexertion (3.2%), motor vehicle collisions (3%), striking stationary objects or furniture (3%), cutting or piercing accidents (2.2%), fight or brawl (1.5%), dog bite (1.3%), poisoning and toxic reactions (1.1%), and alcohol use/abuse (0.9%).

Diagnostic Tests Ordered by NPs

Diagnostic testing ordered by NPs in this sample are broadly categorized as laboratory testing, cardiopulmonary testing (e.g. electrocardiogram, arterial blood gas), and radiographic imaging testing. As shown in Table 10, diagnostic testing, including laboratory

and cardiopulmonary testing, was ordered in 56.1% of the patient encounters included in this sample. The frequencies of all procedures collected by NHAMCS were reported in the table. The most common laboratory tests performed were CBC (17.1%), BUN/creatinine (12.6%), urinalysis (12.1%), electrolyte panel (11%), and glucose (10.8%). Table 11 illustrates that imaging testing was performed in 37.2% of cases, with x-ray the most commonly ordered test (29.4%), followed by CT scan (7.6%) and ultrasound (2.8%). No magnetic resonance imaging (MRI) was ordered in this sample.

Common Procedures Performed by NPs

Procedures were performed by NPs in 36.6% of ED patient visits (Table 12). The most common procedures performed were splint/wrap (11.3%), intravenous fluids (9.7%), and suturing/stapling (4.1%). Other commonly performed procedures were incision and drainage (2.2%), nebulizer therapy (1.9%), and pelvic exam (1.9%). NPs did not engage in most invasive procedures, such as central line insertion, endotracheal intubation, or cardiopulmonary resuscitation, indicating that care was primarily provided to ESI Level 4 or Level 5 within the emergency care setting.

Common Medications Ordered by NPs

Medications were either prescribed or provided by NPs for most emergency visits (82.9%) (Table 13). As shown in both Tables 13 and 14, the most common medications prescribed where NSAIDS, narcotic analgesics, antimicrobial agents, antiemetics, bronchodilators, corticosteroid preparations, local anesthetics, muscle relaxers, benzodiazepines, and H2 antagonists. NSAIDS (16.9%), narcotic analgesics (7.1%), and non-narcotic analgesics (5.6%) were the most commonly prescribed drug classes. 14.4% of prescribed medications were antimicrobial agents (Table 13) and nine of the top 25 medications prescribed were antibiotics (Table 14). The most frequent controlled substance medications (i.e. DEA schedules II-V) used in the sample were acetaminophen-

hydrocodone (5.8%), hydromorphone (1.3%), lorazepam (1.1%), morphine (1.1%), and acetaminophen-oxycodone (1.1%).

Discussion

To this author's knowledge, this project is one of the first to evaluate the NP role in U.S. emergency departments with a national dataset within the past five years. Clinical practice is increasingly dynamic in response to rapid changes within the healthcare delivery system. NPs must be prepared for role evolution through education, certification, and post-employment continuing education.

The findings of this project are largely consistent with prior research (Abbott et al., 2010; Mills & McSweeney, 2005). NPs in this sample provided the majority of care within not-for-profit hospitals operating in metropolitan and urban settings. NPs typically provided care for lessor acuity visits such as acute common illnesses and injuries within the scope of practice of the modern advanced practice nurse. The types of diagnostic tests ordered, procedures performed, and medications prescribed are consistent with ESI Level 4 and Level 5 acuity patients. There was little evidence that NPs were involved in caring for acute life threatening emergencies when practicing as a solo provider, although few records did indicate participation in ESI Level 1(n=1) and Level 2 cases (n=21).

Unanticipated findings included a limited population of older adults and limited presentation of rural or non-metro ED encounters. Although older adults are certainly consumers of emergency care, only 6.3% of the sample included adults aged 65 years and older. A possible rationale is that older adults, due to increased incidence of comorbidities, have higher patient acuity and were evaluated by physician team members instead of solely by the NP. Regarding the inclusion of rural ED visits, prior evidence suggests that rural NPs are involved in more acute emergent patient conditions, and that the scope of practice in these settings may be considered "broader" than their urban counterparts (Mills &

McSweeney, 2005). Further analysis of the differences of the NP role between rural and urban sites was not feasible because rural visits were poorly represented in the sample.

Limitations

There are several limitations of this project. The last year of publically available data through the CDC was 2010, which is older data and may not reflect current practice patterns within the past 12-24 months. Sample limitations include the following: (a) sample size vis-à-vis variables measured, (b) limited encounters from every season (e.g. winter, spring not represented), (c) lower sample size for the older adult population, and (d) limited representation from non-metro areas and the western regions of the United States.

Although the NHAMCS was a national survey, the survey itself has certain methodological limitations and data abstraction issues; therefore, relationship-inferences must be carefully analyzed (Cooper, 2012). Sampling errors were not calculated because population-level estimates were not required. Diagnoses and procedures are coded for billing purposes by professional coding staff, which limits interpretation of what actual care was provided. This project utilized descriptive statistics only and did not test hypotheses with inferential statistics. However, it is not known the extent of data errors through the abstraction and data entry process and thus results, while consistent with prior findings in the literature, must be interpreted with caution.

Because the dataset includes all provider types involved in patient care in the ED, the sample analyzed was limited to cases in which the nurse practitioner was the sole provider of patient in order to elucidate the unique impact of this role. Otherwise, it would not have been possible to know the extent of physician or PA involvement in the encounter. This limitation impacted the overall sample size, but was necessary to more accurately

assess the NP role within the constraints of the dataset. Operating within these constraints, this project was not able to assess the NP role in ESI Level 1, 2, or 3 visits.

The procedures collected by the survey are limited to twelve specific items plus an "other" category (Table 12). There are additional procedures performed by NPs in emergency settings (e.g. ocular injury treatment, nasal packing, lumbar puncture, joint reduction) that, if included, would have helped to more clearly describe current practice trends.

Implications and Recommendations for Nurse Practitioner Practice

This study provides insight into the current NP role in U.S. emergency departments. Although emergency nursing and emergency medicine is a recognized specialty, there is currently no primary certification for NPs in this role. The American Nurses Credentialing Center (ANCC) offers a secondary certification exam for the Emergency Nurse Practitioner (ENP); however, candidates must be certified with one of the population foci in accordance with the APRN Consensus Model. Although this project did not examine NP certification, there is a blend of family NPs, adult NPs, pediatric NPs, and acute-care NPs (along with newer adult-gerontology and pediatric acute care certifications) in current practice.

Secondary certification as an ENP is an essential next step for role development of those NPs who are working in EDs. While the family NP role allows providers to care for all age groups, the scope of practice is limited for the acutely and critically ill. Conversely, the adult-gerontologic acute care NP can provide care for the acutely ill, but has limited training in minor illness care and they cannot provide care for pediatric patients. While the ENP does not increase a NPs scope of practice beyond initial certification, it does provide a standardized national credential and nomenclature.

The results of this project, among other evidence, support the need for specific programs of study for the NP who desires to practice in emergency care environments.

Academic preparation, both didactic and clinical experiences, should be tailored for the ED setting and should address care for all age groups, minor illnesses, major/critical illnesses, and traumatic injuries. Evidence-based continuing education offerings should support this specialty role, both with foundational materials and courses that reflect advanced practice level decision making.

Conclusion

With the increased utilization of emergency departments as access points to the healthcare system, the need for well-educated, academically prepared NPs in emergency care will become greater. Aligning graduate-level academic preparation, expanding high-quality continuing education, and supporting ENP certification are essential for preparing expert clinicians for not only today's needs, but future needs as well. As responsibilities and the scope of practice of the emergency NP expand due to intra-, inter-, and extra-professional forces, so should the formal role and the academic preparation for that role. Future interdisciplinary research targeting the NP role in the ED is warranted. Specifically, identification of role trends, gaps in role preparation, scope of practice variances, and barriers to practice, are all essential. Monitoring the market demands for role expectations is equally important. While regional variations in practice may exist, ongoing assessment at annual intervals may provide additional insight with more current data than existing national datasets can afford.

Figure 1. Flow chart of search and retrieval process and results

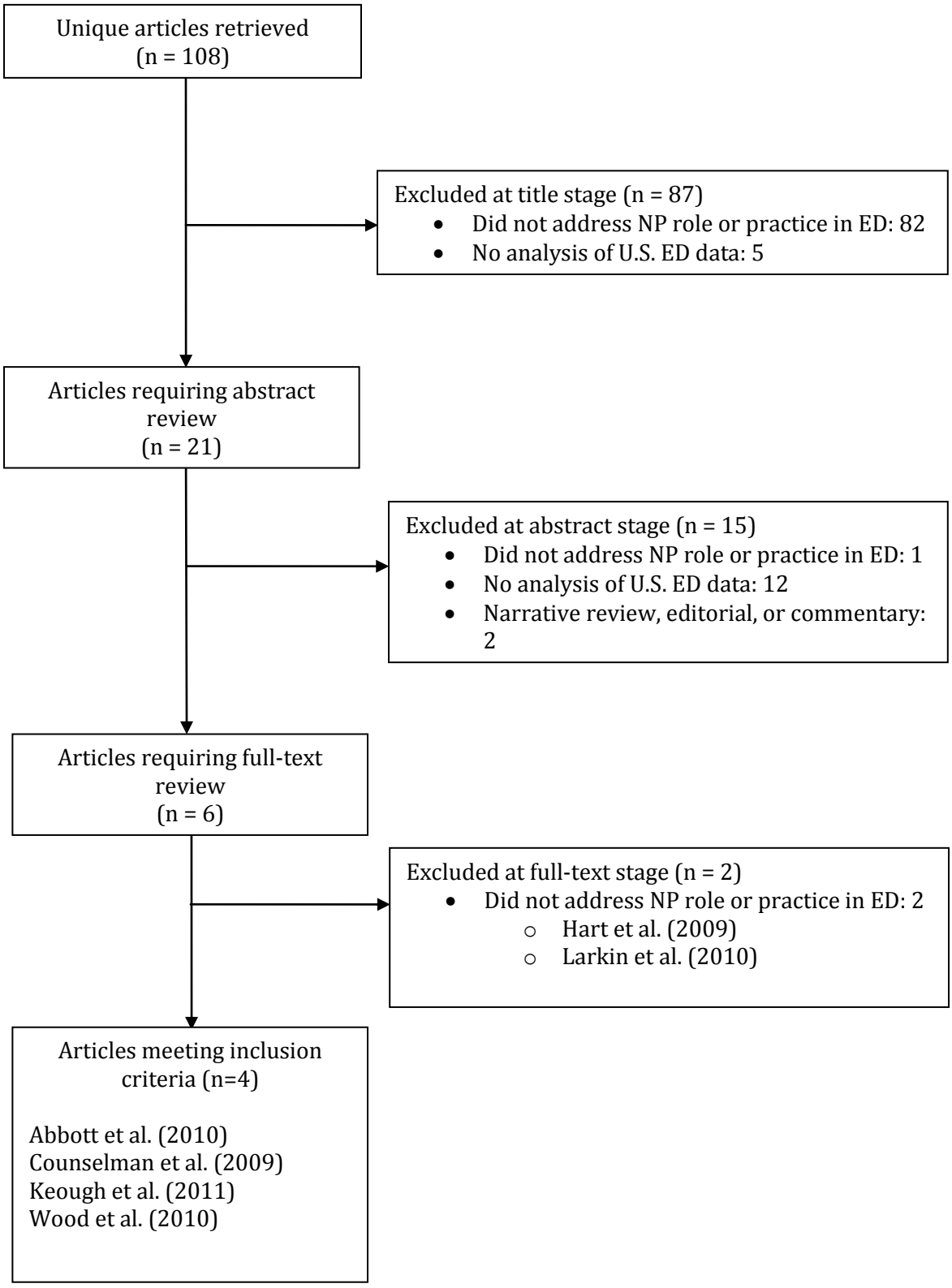
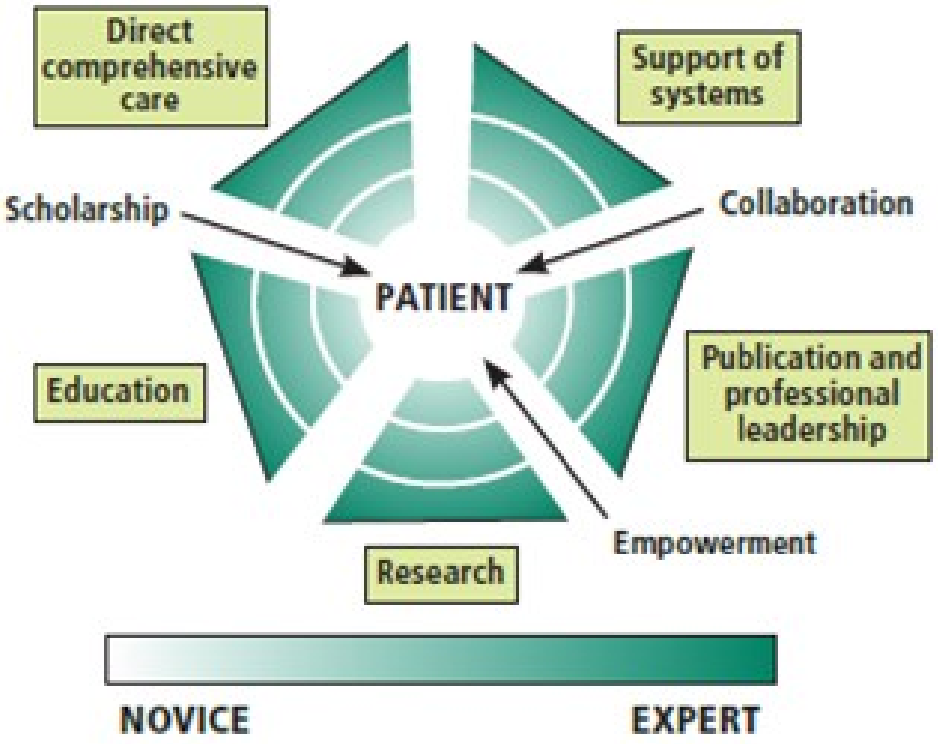


Figure 2. The Strong Model of Advanced Practice



Ackerman, M.H., Norsen L., Wiedrich, J., & Kitzman, H.J. (1996). Development of a model of advanced practice. American Journal of Critical Care, 5, 68-73.

Permissions:

1. Model used with permission from the *American Journal of Critical Care*.
2. Graphic used with permission from *Health Sciences Centre Winnipeg* and retrieved from URL http://www.hsc.mb.ca/staff-nurses.html

Figure 3: Emergency Severity Index (ESI)

Level	Stability	Seen	Description	% of Cases	% Admitted
ESI 1	Severely unstable	Immediately	Often require an intervention (e.g. intubation) to be stabilized	2	73
ESI 2	Potentially unstable	< 10 min	Often require laboratory and radiology testing, medication, and admission	22	54
ESI 3	Stable	< 30 min	Often require laboratory and radiology testing, medication, and are most often discharged	39	24
ESI 4	Stable	Non-urgently	Require minimal testing or a procedure, and are expected to be discharged	27	2
ESI 5	Stable	Non-urgently	Require no testing or a procedure, and are expected to be discharged	10	0

Adapted from:

Reiter, M., & Scaletta. T. (2008, August 29). On your mark, get set, triage! Emergency Physicians Monthly. Retrieved from http://www.epmonthly.com/departments/subspecialties/management/on-your-mark-get-set-triage/

Table 1. Literature Review Grid

Study (Year)	Aim(s) or Purpose	Design (Method)	Population	Sample (N)	Response Rate	Measures	Analytic Methods	Key Findings	Theory Utilized
Abbott et al. (2010)	Examine the utilization and current staffing patterns of NP[1] and PA[2] in ED[3] practice in Washington and Oregon. Aims: (1) determine percentage of EDs employing NPs/PAs; (2) compare/describe organizational characteristics of hospitals in Washington and Oregon that utilize this workforce with those that do not; and (3) describe staffing patterns/roles	Cross-sectional (Survey)	ED managers from Washington and Oregon	93	59%	-Demographics -Organizational characteristics -Operational characteristics -Understanding NP/PA scope of practice	D[4] $\chi 2$[5]	-NP/PAs more likely to be used in urban and larger EDs -NP/PAs increasingly utilized in non-emergent tracks in the ED -50% of respondents indicated that NP/PAs used to provide care for both emergent and non-emergent patients -60% of respondents indicated that NP/PAs used to provide care for only non-emergent patients in the main ED -89% of respondents indicated that NP/PA use improved timeliness of care	N[6]
Counselman et al. (2009)	Describe the current status of the emergency medicine and nursing workforces in the US[7]	Cross-sectional (Survey)	Emergency department medical directors /nurse managers in hospitals in 2006 AHA[8] database	713 medical directors 548 nurse managers	27.2% 21%	-Demographics -Board certification and training -ED nurse staffing characteristics -Physician-nursing collaboration -Hospital and ED characteristics -ED staffing models -Physician staffing estimates	D $\chi 2$	-20% of medical exams are performed by mid-level providers -65% of medical directors expect mid-level provider positions to increase within 5 years	N

Study (Year)	Aim(s) or Purpose	Design (Method)	Population	Sample (N)	Response Rate	Measures	Analytic Methods	Key Findings	Theory Utilized
Keough et al. (2011)	Examine NP practice sites as compared with certification and examine additional education received after employment	Cross-sectional (Survey)	Adult, family, and acute care NPs certified by the ANCC[9]	1216	69.8%	-Demographics (age, gender, race, ethnicity) -Certification -Type of practice setting -Reasons chosen to practice at primary practice setting	D LogR[10]	-Majority of participants practiced in the same setting as certification. -For NPs practicing in non-traditional settings, 65% of FNPs[11](n=13) and 26% of ANPs[12] (n=7) worked in ED settings -Nurses practicing in non-traditional settings more likely to have ACNP[13] certification versus FNP or ANP -FNPs and ANPs practicing in non-traditional settings had more training in central line insertion, caring for critically ill patients, trauma resuscitation, laceration repair, 12-lead ECG interpretation and x-ray interpretation. -ACNPs had more education on needle thoracentesis, writing orders, pharmacology, and interpreting lab tests.	N
Wood et al. (2010)	Determine the prevalence of NPs in PEDs[14] and FT[15] areas Identify common procedures performed by NPs in PEDs	Cross-sectional (Survey)	U.S. hospitals participating in the National Association of Children's Hospitals and Related Institutions	198	53%	Survey 1 (ED charge nurse): -Hospital type -Setting type -Population served -Annual patient volume -Presence of FT area -Use of NPs or PAs -Areas worked by NP/PAs Survey 2 (NP on duty): -Educational background -Specialty of NP program -Board certification -Shifts and hours worked -Types of patients seen -Procedures performed	D	-51% of respondents used NPs -Use of NPs distributed across all geographic regions, while use of PAs statistically more likely in the Northeast and Midwest ($p<0.01$) -Freestanding children's hospitals more likely to use NPs than children's hospitals within general hospitals ($p<0.01$) -75% of respondents evaluated all patient acuities; 25% evaluated low acuity only -Variation exists in NPs' participation in common ED procedures	N

Legend:

1. Nurse Practitioner 2. Physician Assistant 3. Emergency Department 4. Descriptive statistics 5. Chi-square 6. No 7. United States 8. American Hospital Association 9. American Nurses Credentialing Center 10. Logistic Regression 11. Family Nurse Practitioner 12. Adult Nurse Practitioner 13. Acute Care Nurse Practitioner 14. Pediatric Emergency Department 15. Fast Track

Table 2. Geographic and Hospital Characteristics (*N*=462)

Variable	*n*	Percentage*
Geographic region		
Northeast	124	26.8
Midwest	155	33.5
South	172	37.2
West	11	2.4
Urban-rural classification		
Large central metro	148	32.0
Large fringe metro	130	28.1
Medium metro	95	20.6
Small metro	26	5.6
Micropolitan	55	11.9
Unknown or blank	8	1.7
Metropolitan Statistical Area (MSA) Classification		
MSA	424	91.8
Non-MSA	38	8.2
Hospital Ownership		
Voluntary non-profit	361	78.1
Government, non-Federal	55	11.9
Proprietary	46	10.0

*Note: Due to rounding, percentages may not total to 100.

Table 3. Age of Patients (*N*=462)

Variable	*N*	M±SD Range Median
Age	462	28.1 ± 21.8 0-95 25
Variable	***n***	**Percentage***
Age Distribution		
Under 15 years	147	31.8
15-24 years	81	17.5
25-44 years	125	27.1
45-64 years	80	17.3
65-74 years	11	2.4
75 years and over	18	3.9

*Note: Due to rounding, percentages may not total to 100.

Table 4. Demographic Characteristics (*N*=462)

Variable	*n*	Percentage*
Gender		
Male	210	45.5
Female	252	54.5
Imputed Race		
Caucasian	315	68.2
African American	129	27.9
Others	18	3.9
Imputed Ethnicity		
Hispanic or Latino	66	14.3
Non-Hispanic or Latino	396	85.7
Patient Residence		
Private Residence	436	94.4
Nursing Home	4	0.9
Homeless	3	0.6
Other	6	1.3
Not indicated	13	2.8

*Note: Due to rounding, percentages may not total to 100.

Table 5. Socioeconomic Characteristics

Variable	*n*	Percentage*
% Pop. Below Poverty Level		
Quartile 1 (< 5.00%)	81	17.5
Quartile 2 (5.00-9.99%)	93	20.1
Quartile 3 (10.00-19.99%)	164	35.5
Quartile 4 (≥ 20.00%)	106	22.9
Median Household Income		
Quartile 1 (<32,793)	137	29.7
Quartile 2 (32,794-40,626)	145	31.4
Quartile 3 (40,627-52,387)	80	17.3
Quartile 4 (≥ 52,388)	82	17.7
Primary Payor Source		
Private insurance	151	32.7
Medicaid	145	31.4
Self-pay	65	14.1
Medicare	45	9.7
Workers Compensation	10	2.2
Other	8	1.7
No charge	7	1.5
Unknown or blank	31	6.7

*Note: Due to rounding, percentages may not total to 100.

Table 6. Clinical Indicators

Variable	*n*	Percentage*
Emergency severity index		
Immediate	1	0.2
Emergent	21	4.5
Urgent	106	22.9
Semi-urgent	215	46.5
Non-urgent	88	19.0
ESI not conducted	31	6.7
Arrival by ambulance		
Yes	30	6.5
No	421	91.1
Unknown or item blank	11	2.4
Episode of Care		
Initial visit	414	89.6
Follow-up visit	27	5.8
Unknown or item blank	21	4.5
Related to injury, poisoning		
Yes	197	42.6
No	265	57.4
Admit to hospital		
Yes	10	2.2
No	452	97.8

*Note: Due to rounding, percentages may not total to 100.

Table 7. Emergency Department Times

Variable	*N*	Median	Mean ± SD
Door to provider time	462	31.0	49.6 ± 68.3
Length of stay	462	114.0	143.1 ± 116.9

Table 8. Top 20 Primary Diagnoses (broad category)

Variable	*n*	Percentage*
Diagnosis		
Acute pharyngitis	18	3.9
Unspecified otitis media	15	3.2
Other cellulitis/abscess	12	2.6
Headache	10	2.2
Sprains and strains	10	2.2
Disorder of teeth/gums	9	1.9
Acute URI	8	1.7
Lumbago	8	1.7
Head injury, unspecified	8	1.7
Fever, unspecified	7	1.5
Backache, unspecified	6	1.3
Sprains/strains of neck	6	1.3
Acute bronchitis	5	1.1
Constipation, unspecified	5	1.1
Urinary tract infection	5	1.1
Cough	5	1.1
Open wound of finger(s)	5	1.1
Superficial injury cornea	5	1.1
Toxic effect of venom	5	1.1
Streptococcal sore throat	4	0.9

*Note: Due to rounding, percentages may not total to 100.

Table 9. Top 20 Causes of Primary Injury (detailed category)

Variable	*n*	Percentage*
Diagnosis		
Unspecified fall	18	3.9
Other overexertion	15	3.2
Fall from other slipping, tripping, or stumbling	12	2.6
Accident caused by other spec cutting/piercing	10	2.2
Other environmental and accidental causes	10	2.2
Striking against by other stationary object w/o fall	9	1.9
Other striking against w/ or w/o subsequent fall	8	1.7
Unspecified person in other motor vehicle traffic acc	8	1.7
Foreign body accidently entering other orifice	8	1.7
Unarmed fight or brawl	7	1.5
Unspecified person in traffic accident	6	1.3
Dog bite	6	1.3
Striking against furniture without subsequent fall	5	1.1
Fall on or from other stairs or steps	5	1.1
Fall into other hole or opening	5	1.1
Fall from playground equipment	5	1.1
Other fall from one level to another	5	1.1
Poisoning and toxic reactions from	5	1.1
Caught accidentally in or between objects	5	1.1
Alcohol use/abuse	4	0.9

*Note: Due to rounding, percentages may not total to 100.

Table 10. Diagnostic Tests Ordered

Variable	*n*	Percentage*
Diagnostic tests ordered		
Yes	259	56.1
No	199	43.1
Item blank	4	0.9
Test ordered		
CBC	79	17.1
BUN/creatinine	58	12.6
Cardiac enzymes	21	4.5
Electrolytes	51	11.0
Glucose	50	10.8
Liver function tests	25	5.4
Arterial blood gases	3	0.6
PT/INR	10	2.2
Blood culture	5	1.1
Blood alcohol	4	0.9
Other blood test	36	7.8
Cardiac monitor	6	1.3
ECG	17	3.7
HIV test	1	0.2
Rapid flu / Influenza	12	2.6
Pregnancy test	32	6.9
Toxicology screen	5	1.1
Urinalysis	56	12.1
Wound culture	5	1.1
Other test/service	74	16.0

*Note: Due to rounding, percentages may not total to 100.

Table 11. Imaging Tests Ordered

Variable	*n*	Percentage*
Imaging tests ordered		
Yes	136	37.2
No	326	62.8
Imaging test		
X-ray	136	29.4
CT Scan	35	7.6
MRI Scan	0	0.0
Ultrasound	13	2.8
Other imaging	4	0.9
Unknown or blank	31	6.7

*Note: Due to rounding, percentages may not total to 100.

Table 12. Procedures Performed

Variable	*n*	Percentage*
Procedures performed		
Yes	169	36.6
No	281	60.8
Item blank	12	2.6
Procedures		
IV fluids	45	9.7
Cast	3	0.6
Splint or wrap	52	11.3
Suturing/Staples	19	4.1
Incision and drainage	10	2.2
Foreign body removal	3	0.6
Nebulizer therapy	9	1.9
Bladder catheter	3	0.6
Pelvic exam	9	1.9
Central line	0	0
CPR	0	0
Endotracheal intubation	0	0
Other procedures	36	7.8

*Note: Due to rounding, percentages may not total to 100.

Table 13. Top 20 Medication Categories

Variable	*n*	Percentage *
Medications prescribed or provided?		
Yes	383	82.9
No	75	16.2
Item blank	4	0.9
Drug Category		
CNS; analgesics; NSAID	78	16.9
CNS; analgesics; narcotic analgesic combinations	33	7.1
CNS; analgesics; miscellaneous	26	5.6
Anti-infectives; penicillins; aminopenicillins	21	4.5
CNS; Antiemetic/antivertigo agents; 5HT3 receptor agonists	15	3.2
Anti-infectives; miscellaneous antibiotics	13	2.8
Hormones; adrenal cortical steroids; glucocorticoids	13	2.8
CNS; analgesics; narcotic	12	2.6
Respiratory agents; bronchodilators; adrenergic bronchodilat	11	2.4
Miscellaneous agents; local injectable anesthetics	10	2.2
Anti-infectives; macrolide derivatives; macrolides	10	2.2
CNS; Muscle relaxants; skeletal muscle relaxants	9	1.9
Anti-infectives; quinolones	8	1.7
CNS; Anxiolytics, sedatives, and hypnotics; benzodiazepines	8	1.7
CNS; Anxiolytics, sedatives, and hypnotics; miscellaneous	8	1.7
Anti-infectives; cephalosporins; third gen. cephalosporins	8	1.7
Anti-infectives; penicillins; natural penicillins	7	1.5
Immunological agents; immunostimulant; vaccine combination	7	1.5
Nutritional products; minerals and electrolytes	6	1.3
Gastrointestinal agents; H2 antagonists	5	1.1

*Note: Due to rounding, percentages may not total to 100.

Table 14. Top 25 Medications Prescribed or Provided

Variable	*n*	Percentage*
Medication		
Ibuprofen	45	9.7
Ketorolac	27	5.8
Hydrocodone-APAP	25	5.4
Acetaminophen	24	5.2
Amoxicillin	21	4.5
Ondansetron	15	3.2
Albuterol	11	2.4
Azithromycin	9	1.9
Ceftriaxone	8	1.7
Diphenhydramine	8	1.7
Lidocaine	7	1.5
Penicillin	7	1.5
Naproxen	6	1.3
TMP-SMX	6	1.3
Hydromorphone	6	1.3
Methylprednisolone	6	1.3
Cyclobenzaprine	6	1.3
Clindamycin	5	1.1
Lorazepam	5	1.1
Morphine	5	1.1
Prednisone	5	1.1
Oxycodone-APAP	5	1.1
Ciprofloxacin	4	0.9
Doxycycline	4	0.9
Cephalexin	4	0.9

*Note: Due to rounding, percentages may not total to 100.

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