

There are significant barriers impeding attempts to compile summary statistics describing medical care for work-related conditions. Medical care data possessed by individual workers' compensation insurance

carriers is rarely available to independent researchers. Even if such information were available, it most likely would be limited to a particular carrier's clientele. Moreover, evidence suggests that a sizable proportion of work-related injuries and illnesses are not reported on workers' compensation claims forms, and thus not captured by claims databases maintained by workers' compensation insurance carriers or state agencies.⁴⁻⁵ It is particularly difficult to aggregate information across states because each state administers its own workers' compensation system with differing rules and data collection procedures.

Consequently, few studies have tried to itemize the specific types of medical services provided for occupational injuries and illnesses. Using workers' compensation claims data, attempts have been made to identify the types of treating clinicians and most common medical procedures paid for through workers' compensation.⁶⁻⁸ Additionally, a few state agencies have published summary data concerning the clinical services and medical care payments provided under their state's workers' compensation plans.^{9,10} Several researchers have found evidence suggesting that workers' compensation medical care costs more than care for similar disorders that are not job related, a difference that has been generally attributed to the use of more medical services in the workers' compensation cases, a greater use of specialists, and potential price discrimination in the charges billed to the insurer per unit of service.^{6,11-13} Workers' compensation claims data has also been used to describe diagnostic and therapeutic services provided for particular conditions, especially back injuries and other musculoskeletal disorders.¹⁴⁻¹⁷ Other published studies have focused on medical service utilization for a variety of specific work-related conditions including eye injuries,¹⁸ traumatic brain injury,¹⁹ and rotator cuff tears.²⁰

An inherent limitation of previous studies relying on workers' compensation claims data is the inability to capture information about individuals who suffer work-related illnesses or injuries but do not file claims or have their claims denied by insurers. In addition, previous studies have generally focused on particular states or medical conditions. This has produced results that are not easily comparable or generalizable. National data would be useful to provide a benchmark from which to assess the experiences of various states and regions.

The aim of this study is to gain a better understanding of the national distribution and nature of medical care provided to patients with work-related injuries and illnesses. Using data from the National Ambulatory Medical Care Survey (NAMCS), we describe nonhospitalized ambulatory medical care delivered in 1997 and 1998 to patients with work-related conditions, identifying key dimensions of care including patient demographics, diagnoses, utilization of services, provider and payer information, and characteristics of the clinical setting in which care is delivered. Additionally, features of office-based medical visits for patients with work-related disorders are compared to experiences of patients receiving care for nonoccupational conditions.

Methods

Data Source

Data for this study were obtained from the National Ambulatory Medical Care Survey, a nationally representative survey of physicians providing office-based ambulatory medical care in the United States. Findings are based on physician-supplied information about a random sample of visits made during a one-week sampling period in each calendar year. Respondents include both primary care physicians and specialists providing direct patient care in nonfederally employed office-based

settings. NAMCS has been conducted annually since 1973 by the National Center for Health Statistics (NCHS) of the U.S. Centers for Disease Control and Prevention.

Our study is based on data obtained from responses to the 1997 and 1998 NAMCS surveys. Two years of survey data were combined to provide more reliable estimates. We performed a cross-sectional descriptive analysis of aggregated data collected during those survey years. The 1997 survey contained data for 24,715 patient visits and the 1998 survey contained data for 23,339 visits, yielding a total of 48,054 visit records available for analysis.

For each visit, NAMCS collects information concerning the sociodemographic characteristics of the patient (age, race, sex, ethnicity), characteristics of the clinical practice, information about the treating physician, the clinic's geographical setting, process of care, sources of payment (including workers' compensation insurance), patient symptoms and diagnoses, medical and surgical services, and medications provided. NAMCS does not collect information about the patient's employment status or occupation. Information is provided by the treating physician or the physician's clinical staff using a written patient visit record form.²¹ Additional information regarding the characteristics of the clinical practice setting is obtained through personal interviews with participating physicians conducted by field representatives of the U.S. Bureau of the Census, on behalf of the NCHS.

Study Sample

The target population for the NAMCS includes all physician practices in the United States classified as providing "office-based patient care" by the American Hospital Association and the American Osteopathic Association. The sample for the NAMCS utilized a 3-stage probability sampling design with selection based on (1) geographically-related "primary sampling units" (PSUs), (2) physician practice char-

acteristics within each PSU, and (3) a systematic random sample of patient visits within each physician practice. The stratified random sampling procedure used to select respondents is intended to mirror the full range of office-based services provided in various regions, practice settings, and populations throughout the U.S. A full description of the NAMCS sampling strategy has been published elsewhere and is explained in detail on the NAMCS Web site.²²

This sampling process identified 4301 physicians as eligible for the study in calendar years 1997 and 1998. Each was asked to complete a patient visit record form for a systematic random sample of visits occurring during a randomly assigned 1-week reporting period. Physician response rates were 69.2% in 1997 and 67.9% in 1998. Responses were obtained from 3607 physicians covering 48,054 patient visits. Item non-response rates were generally less than 5%.

Study Variables

This study focused on patient visits that were primarily for the care of a work-related injury or illness. Information collected on the patient visit record form allowed for the identification of those visits in two different ways: (1) listing of “workers’ compensation” as the primary expected source of payment for the visit, or (2) a physician’s answering “yes” to the question, “Was this visit related to injury or poisoning” followed by an affirmative response to the question, “Was this injury work-related?” For the purposes of this study, a visit was considered to be a *visit for a work-related condition* if it satisfied either of these two criteria.

Study variables included the patient’s symptoms and complaints, physician diagnoses, diagnostic and screening services, therapeutic and preventive services, surgical procedures, medications prescribed or administered during the visit, and information about the patient, physician, and physician practice. Physicians’

diagnoses were classified by NCHS using the *International Classification of Diseases, Ninth Edition, Clinical Modification* (ICD-9-CM) coding scheme and participating physicians were classified into 1 of 15 groupings, which included: general and family practice, internal medicine, various medical specialties, and a residual category of all other specialties. Anesthesiologists, radiologists, and pathologists were excluded from the NAMCS, and occupational medicine specialists were grouped under “other specialties.”

Statistical Analysis

The basic unit of analysis for this study was the patient visit. Each visit was classified as to whether or not it was a *visit for a work-related condition*. Visit weights were calculated for each patient visit by the NCHS based on the sampling strata adjusted for response rates for the combined 1997 to 1998 period, so that the sample data could be weighted to produce nationally representative estimates. Univariate statistics were calculated using weighted data to describe the percent distribution of medical care characteristics for both kinds of visits. T-tests for continuous variables and chi-squared tests for discrete variables were performed to assess the relative differences in care characteristics between visits for work-related and nonwork related conditions. The level of statistical significance was set at $P < 0.05$.

Multivariate logistic regression analyses were conducted to evaluate the association between making a visit for a work-related condition and various aspects of ambulatory medical care. Based on associations observed in the initial unadjusted comparisons, dependent variables for regression analysis were identified: the taking of blood pressure and X-rays, receiving care from the patient’s regular primary care provider, performing a surgical procedure, receiving physical therapy, prescribing

or administering a drug medication, needing to obtain authorization for treatment, the amount of time spent with the physician, and receiving exercise counseling, injury prevention counseling, or mental health counseling.

To evaluate the potential influence of various potential confounders, three different multiple logistic regression models were tested: one with age, gender, and geographical region as covariates (Model 1), another with age, gender, geographical region, race, and ethnicity as covariates (Model 2), and one which was the same as Model 2, but with “physiotherapy at visit” as an additional covariate (Model 3). To account for the potential effect of diagnosis on care, both analyses were recalculated, limited to visits for conditions that were diagnosed as either musculoskeletal disorders or acute injuries. Odds ratios and 95% confidence intervals were calculated for each of the regression analyses.

Because the estimates derived from our analyses are based on a sample rather than on the entire target universe of office visits, the results were subject to sampling error. To account for sampling effect, the 95% confidence intervals around the reported odds ratios were calculated using Taylor approximation with SUDAAN analytical software.²³

Results

Sample Characteristics

There were 1179 visits for work-related conditions in the 1997–1998 sample, which represents approximately 2.5% of ambulatory medical care visits during those years. Applying NAMCS sample weights allows us to estimate that 38.8 million ambulatory office visits for work-related conditions were made during the 2-year period, an overall average annual rate of 14.1 visits per 100 civilian workers in the United States. The distribution of visits for work-related conditions is depicted in Fig. 1. 87.2% of the visits were for care

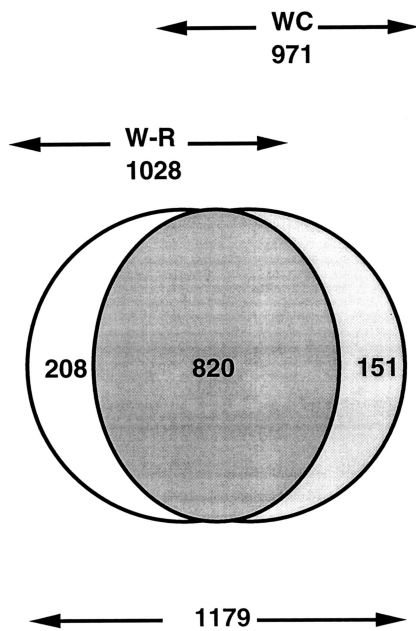


Fig. 1. Number of office visits in study population, including visits for physician-diagnosed work-related injuries (W-R) and visits with workers' compensation as the expected primary payer (WC).

of conditions that were diagnosed as work-related injuries by the doctor. Workers' compensation insurance was listed as the expected payer for 82.2% of these visits. There were a significant minority of visits that involved diagnosed work-related injuries but which were not expected to be paid by workers' compensation (17.8%), as well as some visits for conditions that were expected to be paid by workers' compensation but were not considered by the physician to be work-related injuries (12.8%).

The demographic characteristics of patients receiving care for work-related conditions are presented in Table 1. Patients receiving care for work-related conditions were predominantly white, non-Hispanic, and male. Almost all (86.1%) of the patients with work-related conditions were between 25 and 64 years old, with a notable minority (9.7%) of youthful individuals between 15 and 24 years of age. Table 2 summarizes the characteristics of the medical practices in which care was provided. The majority of ambulatory medical care for work-related condi-

tions was provided in urban areas (80.3%), in private practice settings (80.1%), and in practices owned by a physician or physician group (75.9%). There was considerable regional variation among the medical offices providing care, with the largest proportion of visits for work-related conditions (32.3%) being in the western United States.

The demographic characteristics of patients receiving care for work-related conditions were significantly different than patients receiving care for nonwork related conditions, which makes it difficult to draw direct unadjusted comparisons between the care provided to the two groups. For example, most patients receiving care for work-related conditions were male (62.3%) while females comprise the majority of other ambulatory care patients (60.7%). Also, there was a much greater proportion of younger (<15 years) and older (>65 years) patients receiving care for nonwork related conditions ($P < 0.05$). In addition, patients receiving care for work-related conditions were more likely to be black ($P < 0.05$). The proportion of Hispanic patients making visits for work-related conditions was about twice as great than among those making visits for nonwork related conditions ($P < 0.05$). Visits for work-related conditions were more heavily concentrated in the West, and less so in the South, compared to other visits ($P < 0.05$). In addition, there were significantly different diagnostic patterns among the two groups. Subsequent regression analyses accounted for these differences by controlling for age, gender, race, ethnicity, geographical region, and type of diagnosis.

Descriptive Analysis of Care Provided

Major characteristics of care provided during the visit are reported in Table 3. Most visits for care of work-related conditions were for care of musculoskeletal disorders or acute

injury (67.3%). Diagnostic and screening services were provided in slightly over half of these visits (53.6%) as were various types of therapeutic and preventive services (52.3%). Medications were prescribed or administered at about half of all visits (48.5%). Services rendered frequently to those with work-related conditions included X-rays (20.5% of visits), exercise counseling (13.7%), injury prevention counseling (11.4%), and physiotherapy (22.0%). Patients with work-related conditions were seen by a medical doctor at almost every (95.6%) visit. They were seen most frequently by orthopedic specialists (32.3% of visits), general and family practice physicians (22.9%), and internists (11.4%). The physician providing care for the work-related condition was also the patient's regular primary care provider in only about one-quarter of visits (25.6%). While 82.2% of visits for work-related conditions were paid for by workers' compensation, a notable proportion were expected to be paid for by other sources including private insurance (12.1%), Medicare (2.3%), and out-of-pocket payment by the patient (1.3%). Authorization for care by a third-party payer was needed in over one-third of these visits (36.3%). On average, a visit for care of a work-related condition lasted about 18 minutes.

Office-based medical visits for care of work-related conditions differed from other ambulatory care visits in numerous ways. They were directed significantly more often at care for musculoskeletal disorders or acute injuries, and were twice as likely to involve conditions that resulted from an assault. Visits for work-related conditions more often included X-rays, injury prevention, exercise counseling, and physiotherapy. Compared to ambulatory visits for other conditions, visits for work-related conditions were less likely to involve out-patient surgery, prescription drug medication, and the taking of blood pressure (all at $P < 0.05$).

TABLE 1
Patient Demographic Characteristics, NAMCS, 1997-1998

	Visits for "Work related conditions" <i>n</i> = 1,179	Visits for "Non-work related conditions" <i>n</i> = 46,875
Age (in years)**		
<15	0.6	17.9
15-24	9.7	8.2
25-44	53.2	25.0
45-64	32.9	24.3
65-74	2.6	12.8
>75	1.0	11.8
Age (mean, in years)**	40.8 years	42.7 years
Sex**		
Female	37.7	60.7
Male	62.3	39.3
Race**		
White	83.7	85.7
Black	11.9	10.3
Asian/Pacific Islander	2.4	3.5
American Indian/Eskimo/Aleut	1.9	0.5
Ethnicity**		
Hispanic origin	18.7	9.6
Not Hispanic	81.3	90.4

percent distribution of visits, weighted data

** *P* < .001, * *P* < .05

TABLE 2
Practice Characteristics, NAMCS, 1997-1998

	Visits for "work-related conditions" <i>n</i> = 1,179	Visits for "nonwork related conditions" <i>n</i> = 46,875
Office type		
Private practice**	80.1	86.7
Clinic/urgicenter**	12.4	5.4
Private clinic*	1.5	2.7
Neighborhood mental health center	1.8	1.5
Local government clinic	0.5	0.8
HMO	3.7	2.9
Solo practice*	35.2	39.5
Ownership of medical practice		
Physician/group	75.9	77.7
Hospital	7.5	7.7
Healthcare corporation	9.7	8.0
HMO	3.0	3.2
Other	3.9	3.3
Geographic region of practice		
Northeast*	18.0	21.4
Midwest	22.1	22.2
South**	27.6	34.2
West**	32.3	22.2
Medical practice located in an urban area (MSA)	80.3	81.2

percent distribution of visits, weighted data

** *P* < .001, * *P* < .05

likely to be treated by an orthopedic specialist. Compared to care for non-work related conditions, office visits for work-related conditions were less likely to be provided in an HMO setting or involve capitated payment. They were more frequently "new patient" visits, and were more likely to result from a referral by another physician. Authorization for care was required over three times more often in visits for work-related ailments compared to other visits. No significant differences between the two categories of visits were reported in the percentage of visits in which the patient saw a physician, or in the average amount of time spent with a physician during the visit.

Multivariate Analysis

Results of the multiple logistic regression analyses are summarized in Table 4, in which odds ratios and 95% confidence intervals are presented for the crude unadjusted data and for each of the three regression models (1 to 3) described previously. These odds ratios reflect the probability that a patient being seen for a work-related condition receives a particular type of care during the visit (the dependent variable) relative to a patient being seen for a nonwork related condition. To help account for differences in diagnostic patterns between those two types of visits, odds ratios were also calculated restricted only to patients who received ambulatory care either for musculoskeletal conditions or acute injuries.

Regression analysis under Model 1 indicated that having a visit for a work-related visit significantly *increases* the odds that X-rays (OR = 4.00), physical therapy (OR = 9.81), and injury prevention counseling (OR = 6.08) are provided during the visit, and that authorization for care is needed (OR = 4.30), after controlling for patient age, patient gender, MSA status (urban/rural), and the geographical region where care was provided. Likewise, making a visit for a work-related condition significantly *decreases* the odds that blood

Patients receiving ambulatory care for work-related conditions were much less frequently seen by their

regular primary care provider than were those being cared for nonwork related conditions, and were more

TABLE 3

Medical Care Characteristics, NAMCS, 1997-1998

	Visits for "work-related conditions" n = 1,179	Visits for "nonwork related conditions" n = 46,875
Major reason for the visit		
Acute problem**	44.3	36.7
Chronic problem, routine**	19.6	27.6
Chronic problem, flareup	10.2	9.2
Pre- or post- surgery/injury follow-up**	23.0	7.7
Non-illness(e.g., routine prenatal, general exam, well baby)**	2.9	18.8
Patient's chief complaints and symptoms		
Musculoskeletal symptoms**	48.7	8.9
Acute injury**	18.6	2.4
Other	32.7	88.7
Physician's diagnosis of patient's condition (ICD-9 groupings)		
Infectious and parasitic diseases**	0.3	3.1
Neoplasm**	0.1	3.1
Endocrine, nutritional, metabolic, and immunity disorders**	0.3	4.9
Mental disorders*	2.9	4.8
Diseases of the nervous system and sense organs*	7.7	9.7
Diseases of the circulatory system**	0.9	7.6
Diseases of the respiratory system**	1.1	12.8
Diseases of the digestive system**	1.2	3.7
Diseases of the genitourinary system**	0.1	6.1
Diseases of the skin and subcutaneous tissue, hair, & nails**	1.0	4.9
Diseases of musculoskeletal system and connective tissue**	27.3	6.6
Symptoms, signs, and ill-defined conditions**	2.1	5.5
Injury and poisoning**	44.6	5.3
Supplementary classification**	8.6	17.2
All other diagnoses*	0.3	1.4
Unknown	1.6	3.3
The visit was related to a specific injury or poisoning**	89.1	8.6
The visit was related to a self-inflicted injury or poisoning	0.2	0.4
The patient's condition was the result of an assault**	3.1	1.5
Diagnostic and screening services were provided**	53.6	71.5
Blood pressure was taken during the visit**	29.3	46.1
X ray was taken during the visit**	20.5	5.9
Therapeutic and preventive services were provided**	52.3	62.3
Exercise counseling and education was provided**	13.7	10.2
Injury prevention counseling and education was provided**	11.4	2.5
Mental health counseling and education was provided*	1.6	2.5
Surgical procedures were performed*	3.1	4.5
Visit involved:		
Physiotherapy**	22.0	2.4
Psychotherapy	3.0	2.2
Psycho-pharmacotherapy	2.4	2.0
At least one drug was prescribed during the visit**	48.5	64.6
Medical providers seen during the visit:		
Physician	95.6	96.5
Physician assistant	2.1	2.2
Nurse practitioner*	0.3	1.0
Nurse midwife	0.1	0.1
RN**	8.5	13.9
LPN	10.3	11.7
Medical/nursing assistant**	15.2	22.5
Other	5.2	5.0
Physician specialty		
General and family practice	22.9	25.0
Internal medicine**	11.4	16.3
Pediatrics**	0.2	11.9
Obstetrics and gynecology**	0.0	9.8
Ophthalmology**	1.2	6.0
Orthopedic surgery**	32.3	3.8

TABLE 3 (CONTINUED)

Medical Care Characteristics, NAMCS, 1997-1998

	Visits for "work-related conditions" <i>n</i> = 1,179	Visits for "nonwork related conditions" <i>n</i> = 46,875
Dermatology**	0.2	3.9
Psychiatry	2.7	2.9
General Surgery	2.9	2.6
Otolaryngology**	0.6	2.6
Cardiovascular diseases**	0.2	2.3
Urology**	0.2	2.0
Neurology**	2.5	1.0
All other specialties	22.7	9.9
Provider is the patient's regular primary care physician**	25.6	51.2
Primary expected source of payment for the visit		
Private insurance**	12.1	55.6
Medicare**	2.3	20.6
Medicaid**	0.7	8.6
Self-Pay**	1.3	7.5
Workers' compensation**	82.2	0.0
No charge*	0.1	1.0
Other	0.7	5.3
Unknown	0.5	1.4
Care was provided in an HMO setting**	12.9	29.7
Capitated payment basis for the visit**	4.5	12.9
Provider has not previously seen this patient (ie, new patient)**	21.6	12.6
Patient was referred by another physician or health plan**	28.2	15.5
Authorization from the insurer was required for care**	36.3	9.8
Time spent with physician (mean number of minutes)	18.1	17.7

percent distribution of visits, weighted data

** $p < .001$, * $p < .05$

pressure is taken (OR = 0.43), mental health counseling is provided (OR = 0.49), surgical procedures are conducted (OR = 0.64), and prescription drugs are ordered or administered during the visit (OR = 0.55), and that the provider is the patient's regular primary care physician (OR = 0.36), after controlling for those covariates. Exercise counseling, which had a crude odds ratio of 1.40, was not statistically significant under any of the regression models.

The same associations persisted with approximately the same odds ratios, when race and ethnicity (Model 2) and physiotherapy (Model 3) were included as additional covariates in the regression model. As additional covariates were included into the model, the variance expanded slightly around the odds ratios, but all the associations remained statistically significant at the $P < 0.05$ level, except for surgical proce-

dures, which was statistically significant under Model 3, but not under Models 1 or 2.

Essentially the same patterns were observed when the regression analyses were recalculated using data only from visits for musculoskeletal conditions or traumatic injuries. Restricting Model 1 to those diagnoses only, we found that making a visit for a work-related condition increases the likelihood that injury prevention counseling (OR = 1.68) and physical therapy (OR = 2.02) are provided during the visit and that authorization for care is required (OR = 3.87). Similarly, it decreases the likelihood that blood pressure is taken (OR = 0.58), mental health counseling provided (OR = 0.19), and prescription drugs are ordered or administered during the visit (OR = 0.70). However, the associations between making a visit for a work-related condition and having surgical

procedures and X-rays during the visit were no longer statistically significant at $P < 0.05$, when restricted to musculoskeletal conditions and acute injuries.

Discussion

This study is the first in the United States utilizing nationally representative data to derive general information about medical care for a variety of work-related injuries and illnesses. It utilizes a novel methodological approach in which physicians' self-reported survey responses are used to identify a subgroup of visits that deal with the care of work-related ailments. Using national survey data allows for a more inclusive analysis of medical care visits for work-related disorders than would typically be possible through the use of workers' compensation claims records. For example, the NAMCS data set includes cases of physician-

TABLE 4

Regression Analysis, NAMCS 1997-1998: Selected Characteristics of Care as Dependent Variables, "Making a Visit for a Work-Related Condition" as the Major Independent Variable ($n = 48,054$)

Odds ratios and 95% confidence intervals weighted data, adjusted for sampling error

Dependent Variable	All conditions			Musculoskeletal conditions and acute injuries only				
	Crude	Model 1	Model 2	Model 3	Crude	Model 1	Model 2	Model 3
Blood pressure was taken during the visit	0.49 (0.34–0.71)	0.43 (0.29–0.62)	0.42 (0.29–0.61)	0.47 (0.32–0.68)	0.58 (0.38–0.89)	0.58 (0.38–0.88)	0.57 (0.38–0.85)	0.59 (0.39–0.89)
Provider is the patient's regular primary care physician	0.33 (0.22–0.48)	0.36 (0.25–0.54)	0.35 (0.24–0.52)	0.39 (0.27–0.57)	0.41 (0.28–0.62)	0.43 (0.29–0.63)	0.42 (0.29–0.62)	0.45 (0.31–0.65)
Exercise counseling and education was provided	1.40 (1.09–1.80)	1.25 (0.96–1.63)	1.23 (0.93–1.62)	0.98 (0.74–1.21)	0.90 (0.70–1.17)	0.91 (0.69–1.18)	0.92 (0.69–1.23)	0.87 (0.65–1.16)
Injury prevention counseling and education was provided	5.05 (3.47–7.35)	6.08 (4.51–8.19)	6.11 (4.52–8.25)	4.51 (3.13–6.50)	1.76 (1.30–2.36)	1.68 (1.25–2.27)	1.67 (1.23–2.26)	1.62 (1.18–2.23)
Mental health counseling and education was provided	0.63 (0.34–1.20)	0.49 (0.26–0.91)	0.50 (0.28–0.91)	0.54 (0.20–0.97)	0.19 (0.06–0.59)	0.19 (0.06–0.58)	0.21 (0.07–0.63)	0.20 (0.07–0.62)
Surgical procedures were performed	0.68 (0.48–0.98)	0.64 (0.44–0.93)	0.67 (0.46–0.97)	0.73 (0.50–1.06)	0.92 (0.59–1.43)	1.07 (0.70–1.63)	1.09 (0.71–1.68)	1.14 (0.74–1.75)
Physical therapy was administered during visit	11.30 (8.55–14.93)	9.81 (7.44–12.92)	9.88 (7.60–12.84)	Not applicable	2.24 (1.54–3.25)	2.02 (1.49–2.73)	2.01 (1.53–2.64)	Not applicable
At least one drug was prescribed during the visit	0.52 (0.43–0.62)	0.55 (0.45–0.66)	0.55 (0.45–0.66)	0.60 (0.49–0.73)	0.66 (0.54–0.82)	0.70 (0.56–0.86)	0.71 (0.57–0.88)	0.74 (0.59–0.92)
Authorization from the third-party payer was required for care	5.32 (4.18–6.77)	4.30 (3.39–5.45)	4.28 (3.42–5.36)	4.26 (3.21–5.66)	4.51 (3.39–6.00)	3.87 (2.85–5.24)	3.70 (2.75–4.97)	3.65 (2.71–4.92)
X-rays were taken during the visit	4.15 (3.07–5.60)	4.00 (3.03–5.28)	4.02 (3.05–5.29)	2.79 (2.09–3.73)	1.15 (0.85–1.55)	1.21 (0.89–1.64)	1.19 (0.88–1.62)	1.12 (0.81–1.55)

Crude: Unadjusted

Model 1: Controlling for age, gender, region, and MSA location (urban/rural)

Model 2: Controlling for age, gender, region, and MSA location (urban/rural), race, ethnicity

Model 3: Controlling for age, gender, region, and MSA location (urban/rural), race, ethnicity, physiotherapy at visit

diagnosed work-related injuries that are not expected to be covered under workers' compensation.

A distinctive advantage of the NAMCS is its ability to collect direct clinical-level information supplied by the treating physician concerning medical diagnoses, service utilization, and patient and practice characteristics. This approach minimizes many of the recall problems and other potential reporting biases that can compromise studies relying exclusively on patient self-reporting, employer records, or insurance company forms. This consideration is especially relevant in the workers' compensation arena, where the reporting of information on such records potentially affects workers' compensation benefit decisions and employment consequences.

There are other methodological advantages to the use of national health care surveys; the use of large sample sizes, the availability of sample weights to derive nationally representative estimates, the ease of acquiring the data, and the ability to draw comparisons with nonoccupational cases drawn from the same data source. The primary disadvantage in this approach is the absence of several variables that are pertinent for studies of occupational medical care; notably, patient employment status, occupation and job exposures, employer characteristics, and the costs of medical services and workers' compensation benefit payments. Additionally, the NAMCS is limited to medical encounter information and thus does not allow for long-term follow-up of the outcomes of care including patient functional status, injury recurrence, duration of work disability, and other vocational consequences.

Our finding that approximately 2.5% of office-based medical visits in the United States are for care of work-related conditions is consistent with other estimates drawn from workers' compensation data and health system records.^{24,25} The distribution of the types of work-related

disorders seen in the NAMCS sample generally conforms with other tabulations of occupational injuries and illnesses reported by workers' compensation claimants, which indicate that musculoskeletal ailments (especially low back sprains and strains), fractures and other acute crushing injuries, traumatic contusions, burns, cuts, and cumulative trauma disorders of the upper extremities are the most common forms of job-related conditions receiving medical attention.²⁶ NAMCS data also permitted estimates to be made of the extent of care provided for other less common job-related conditions for which information is rarely available; for example, we found that 2.9% of ambulatory medical visits were for care of work-related mental disorders and 3.1% were for conditions that resulted from an assault at work.

Black patients accounted for 11.9% of visits for work-related conditions, 16% greater than the proportion of blacks making other types of ambulatory visits (10.3%), and slightly higher than the percentage of blacks in the U.S. civilian workforce (11.3%). Interestingly, Hispanics accounted for a surprisingly high proportion of medical visits for work-related conditions (18.7%), over twice their share of other ambulatory visits (9.6%) and substantially greater than the percentage of Hispanics (10.9%) in the U.S. civilian labor force.²⁷ Observed differences among these racial and ethnic groups could reflect the influence of various factors including relatively more exposure to job hazards among minority workers, inferior access for minorities to on-site medical care at the place of employment, greater care-seeking behavior and medical service utilization among those groups, lower rates of general health insurance coverage among blacks and Hispanics (which might promote case shifting to available workers' compensation coverage), geographical trends in proximity of these patients to ambulatory care facilities,

and other factors. Further investigation of these differences is being undertaken by our research team and will be reported elsewhere.

While the vast majority (82.2%) of the medical visits for care of work-related conditions had workers' compensation insurance as the expected primary payer, there was a significant proportion of visits for work-related conditions (17.8%) paid by other sources including private insurance, Medicare, and self-payment by the patient. This is consistent with, and helps to corroborate, other studies that have shown that a substantial proportion of occupational injuries and illnesses are either not reported to employers or workers' compensation carriers, or are not paid by compensation insurers because of denials, delays, or administrative encumbrances. A population-based survey in Connecticut, for example, found that approximately 11% of persons with work-related musculoskeletal disorders pay out-of-pocket expenses for medical treatment of those conditions.²⁸ Similarly, 13.6% of injured workers surveyed in New Hampshire reported using other types of insurance besides workers' compensation to pay for all or part of their treatment costs, and 21% of surveyed workers with occupational back pain and 10% with those with work-related upper extremity disorders incurred out-of-pocket expenses for medical care related to those disorders.²⁹

Given the restrictions on provider choice in many state workers' compensation systems, it is not surprising that most medical visits for work-related conditions were not provided by the patient's regular primary care physician, and that a relatively high proportion of visits (21.6%) were initial visits to a clinician not previously seen by the patient. Moreover, owing to the acute and traumatic nature of many work-related injuries and the preponderance of musculoskeletal disorders, a relatively high proportion of visits for work-related

conditions were made to orthopedic specialists rather than to generalists.

Few of the visits for work-related conditions were provided in an HMO (12.9%) or had capitated payment (4.5%). This finding reflects the continued modest level and slow penetration of managed care into the workers' compensation setting.³⁰ The vast majority of workers' compensation medical care is still provided in a fee-for-service, private practice environment. Nevertheless, insurance companies exert an especially strong influence over the care provided for job-related conditions, as evidenced by the relatively high proportion of care (36.3% of visits) that requires insurance authorization. Is it noteworthy that even when the multivariate analyses were restricted to specific physical diagnoses (musculoskeletal disorders and acute injuries), authorization for care was required much more often for work-related than for nonwork related conditions. The use of utilization review practices in workers' compensation has increased dramatically during the past 10 years as states have sought to adopt measures to reign in escalating workers' compensation costs. As of 2001, 31 states mandated the use of some form of utilization review for workers' compensation cases.³¹ The potential danger in aggressive utilization review is that it may hinder or delay access to appropriate care by injured workers.³²

Perhaps the widespread adoption of utilization review procedures in workers' compensation helps to explain our observation that pharmaceutical medications are less commonly prescribed or administered at visits for care of a work-related disorders than at visits for other types of conditions. This finding is consistent with national statistics indicating that prescription drug costs constitute a relatively low proportion of workers' compensation medical care outlays (which have been estimated at 3.5–5.5%) compared to the costs of prescription drugs as a percentage of

total health care spending in the United States (estimated to be 8.1–11.4%).^{33–35} At the same time, however, several authorities have claimed that there is widespread overuse of pharmaceutical medications in workers' compensation, particularly for cases of work-related back pain and other musculoskeletal conditions.^{9,15} Several different factors may be at work here. For example, it is plausible to think that ambulatory care visits for work-related conditions, especially those being paid for by workers' compensation insurance, are narrower in scope, focusing in a targeted way on the specific work-related injury or illness. By contrast, visits for treatment of nonwork related musculoskeletal ailments and acute injuries are likely to be made in a broader primary care context, often with the patient's regular primary care physician. Such visits, while dealing with the patient's primary complaint, may also present the clinician with the opportunity for follow-up assessment of other chronic conditions and comorbidities, along with the refill of regularly used medications.

Many of these findings raise intriguing questions about the determinants of medical care for work-related conditions. For example, why is blood pressure measured far less often at ambulatory visits for work-related conditions than at visits for nonwork related conditions, even when considering only visits for care of musculoskeletal disorders and acute injuries? One possibility is that this finding reflects the sizable portion of visits for work-related conditions that are directed toward return-to-work decisions, disability determinations, or other medical-legal exigencies that are tangential to the direct medical diagnosis and treatment of an injury or illness. Another possibility is that some medical care visits for work-related conditions are so narrowly focused on the care of a single particular condition (eg, an acute injury), that clinicians fail to consider or test for

the presence of comorbidities (eg, hypertension) or general indicators of overall physical health that would be commonly performed in general ambulatory practice.

A notable finding was the extremely strong relationship between a work-related diagnosis and physiotherapy being provided at the visit (OR = 9.81, Model 1 for all work-related conditions). It is reasonable to assume that this finding reflects, in part, differences in diagnostic mix between work-related and nonwork-related conditions. But it is intriguing that this association remained significantly elevated (OR = 2.02 for Model 1) when restricted to musculoskeletal disorders and acute injuries. It is possible that the greater tendency for care of work-related conditions to include physiotherapy reflects the emphasis on rehabilitation and return-to-work in occupational health care, and the relatively broad coverage for physical therapy services provided by workers' compensation insurance.

Limitations

This study depended on information self-reported by physicians and clinical staff at ambulatory care practices, and thus is subject to possible reporting errors or omissions. Special training provided to participating physicians by NCHS personnel on how to complete the forms presumably helped mitigate such potential errors. In addition, the analysis was limited to variables contained on the NAMCS survey form, and thus did not include potentially important information about the patient's employment status, occupation, and vocational outcomes, thus restricting our ability to study the influence of those factors. While providing a summary of ambulatory care provided in clinics and physician offices, the NAMCS excludes several other forms of care including hospital-based ambulatory care, emergency department services, and care provided in federal facilities.

The strategy employed for identifying visits for work-related disorders could result in some misclassification of cases. Although using "workers' compensation payment" as an indicator for a work-related disorder has been found to be reasonably accurate in other studies,³⁶ it has the disadvantage of potentially misclassifying cases that are either nonoccupational and inappropriately paid for by workers' compensation or those that are job-related but unreported or otherwise not accepted for payment by a workers' compensation insurer. Similarly, while a physician's judgment that a patient's injury is work-related is a widely accepted indicator of occupational causation, the emphasis on "injury" in the wording of the NAMCS question might be interpreted by some physicians as excluding work-related back pain or other chronic conditions or illnesses. Additionally, the grouping of occupational medicine specialists into a generic "other specialists" category did not allow for an analysis of particular patient distribution or care patterns among physicians with special training in the diagnosis and treatment of work-related disorders.

Conclusion and Policy Implications

The findings from our analysis of the NAMCS suggest several opportunities for enhancing medical care of occupational conditions. For instance, while injury prevention counseling and education is provided approximately five times more often at visits for work-related conditions than at visits for nonwork related conditions, that service is apparently *not* provided at the vast majority (88.6%) of visits for work-related injuries and illnesses. In addition, mental health counseling is provided at only 1.6% of the visits for work-related conditions, about half as often as for nonwork-related conditions and only one-fifth as often at visits for work-related (compared to

nonwork related) musculoskeletal disorders and acute injuries. And, as mentioned previously, blood pressure is measured at only 29.3% of visits for work-related conditions, less than half as frequently as for other types of visits. These findings help to identify areas for upgrading provider awareness and enhancing clinical service delivery.

In summary, using the National Ambulatory Medical Care Survey as a analytical tool has allowed us to provide the nation's first statistical overview of ambulatory medical services for patients with work-related conditions. It has revealed distinctive patterns of care and highlighted areas for increased attention by providers, health system administrators, and workers' compensation policy makers. Potential areas for system improvement include increasing access to workers' compensation insurance coverage for payment of medical services for work-related injuries and illnesses, improving care coordination between general and occupational care providers, tightening management control over the utilization of some services, expanding provider attention to the importance of blood pressure measurement and other procedures aimed at assessing general health during visits dealing primarily with job-related disorders, and enhancing patient counseling and educational efforts in several areas.

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