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Jeanne M. Sears

Nurse Practitioners as Attending Providers in the Workers' Compensation System:
Policy Evaluation of Recent Legislation in Washington State

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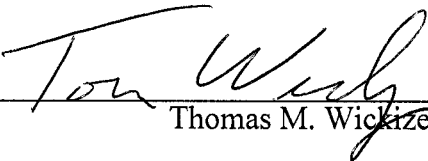
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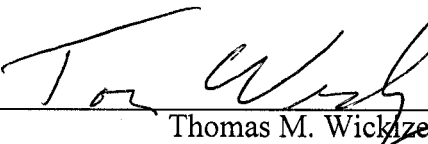
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Abstract

Nurse Practitioners as Attending Providers in the Workers' Compensation System:
Policy Evaluation of Recent Legislation in Washington State

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Advanced registered nurse practitioners (NPs) have been directly reimbursed for providing health care services to injured workers within the Washington State workers' compensation system for many years. However, prior to July 2004, NPs were restricted from independently performing those functions limited to attending physicians, such as signing accident report forms and certifying time loss. Concern about disparities in access to health care for injured workers in rural areas, delays in work-related injury reporting, and efforts by NPs to expand their scope led to the passage of pilot legislation that authorized NPs to function as attending providers in the Washington State workers' compensation system. The subject of this dissertation was the comprehensive evaluation of the effects of Substitute House Bill (SHB) 1691 (Chapter 65, Washington State Laws of 2004) on provider distribution, access to health care for injured workers, system efficiency, quality of care, worker outcomes and medical costs.

NPs were more likely than primary care physicians to be located in rural areas and counties with high unemployment. Other case mix variables, such as sociodemographics, injury type, and injury severity/complexity indicators, were similar across provider type. Authorizing NPs to function as attending providers for injured workers was not associated with any negative impact on quality of care, medical costs, or disability outcomes, and appeared to positively affect provider enrollment, availability of authorized attending providers in rural areas, and administrative efficiency. In addition, by increasing access to providers willing to care for injured workers and improving the timeliness of accident report filing, SHB 1691

may have improved system costs and outcomes. From a societal perspective, expanding the use of NPs in appropriate settings is an efficient use of resources. This research suggests that authorizing NPs as attending providers for injured workers may be a cost-effective approach to expanding the available workers' compensation provider workforce.

TABLE OF CONTENTS

	Page
List of Figures.....	ii
List of Tables.....	iii
Introduction... ..	1
Notes to Chapter 1	10
Expanding the Role of Nurse Practitioners: Effects on Rural Access to Care for Injured Workers	14
Notes to Chapter 2	32
Nurse Practitioners as Attending Providers for Injured Workers: Evaluating the Effect of Role Expansion on Disability and Costs.....	35
Notes to Chapter 3	51
Nurse Practitioners as Attending Providers for Workers with Uncomplicated Back Injuries: Using Administrative Data to Evaluate Quality and Process of Care.....	55
Notes to Chapter 4	74
Conclusion.....	78
Notes to Chapter 5	86
Bibliography.....	88

LIST OF FIGURES

Figure Number	Page
1.1. Conceptual Model: NPs as Attending Providers.....	9

LIST OF TABLES

Table Number	Page
2.1. Claimant Characteristics by Attending Provider Type.....	27
2.2. Rural/Urban Claims Filed by Selected Provider Types	28
2.3. Active L&I Providers Pre- to Post-SHB 1691	29
2.4. Change in New L&I Enrollment Applications.....	30
2.5. Percent of Accident Reports Filed within 7 Days	31
3.1. Sample Characteristics by Attending Provider Type	47
3.2. Medical Costs in First 12 Months of Claim	48
3.3. Time Loss by Injury Type	49
3.4. Models for Medical Costs and Time Loss.....	50
4.1. Sample Characteristics by Attending Provider Type	69
4.2. Claim Characteristics by Provider Type.....	70
4.3. Association of Quality/Process Indicators with Disability.....	71
4.4. Association of Quality/Process Indicators with Claim Volume.....	72
4.5. Association of Quality/Process Indicators with Provider Type	73
5.1. Stakeholder Values and Positions Relative to SHB 1691	85

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The papers in chapters 2, 3, and 4 of this dissertation were co-authored by Thomas M. Wickizer, Gary M. Franklin, Allen D. Cheadle, and Bobbie Berkowitz, and have been submitted to professional journals.

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DEDICATION

To my family and friends, and to a world with healthier work environments and health care that is easily available and delivered with respect and compassion.

Introduction

Advanced registered nurse practitioners (NPs) have been directly reimbursed for providing health care services to injured workers within the Washington State workers' compensation system for many years. However, prior to July 2004, NPs were restricted from independently performing those functions limited to attending physicians, such as signing accident report forms and certifying time loss. Concern about disparities in access to health care for injured workers in rural areas, delays in work-related injury reporting, and efforts by NPs to expand their scope led to the passage of pilot legislation that authorized NPs to function as attending providers in the Washington State workers' compensation system. The subject of this dissertation was the comprehensive evaluation of the effects of this pilot legislation on access to care, system efficiency, quality of care, worker outcomes and medical costs.

Details of Legislation and Rule-making

Substitute House Bill (SHB) 1691 (Chapter 65, Washington State Laws of 2004) took effect July 1, 2004, and was scheduled to sunset on June 30, 2007. SHB 1691 was implemented by the Washington State Department of Labor and Industries (L&I) via emergency rule-making procedures. A provider bulletin describing the rule changes (PB 04-09) was issued by L&I and sent to enrolled providers after the emergency rule was adopted. The permanent rule was effective December 15, 2004 and involved no additional changes. The new rule authorized NPs to independently perform those functions of an attending physician within their scope of practice, except for rating permanent impairment and performing independent medical examinations (IMEs). This was specifically outlined in the Washington Administrative Code (WAC) 296-23-241 to include the following functions:

- Completing and signing the Report of Accident or Physician's Initial Report, where applicable
- Certifying time loss compensation
- Completing and submitting all required or requested reports
- Referring workers for consultations

- Performing consultations
- Facilitating early return to work offered by and performed for the employer(s) of record
- Doing all that is possible to expedite the vocational process, including making an estimate of the worker's physical or mental capacities that affect the worker's employability
- Stating whether a worker has permanent impairment, such as on the department's Physician's Final Report (PFR)

SHB 1691 required that an evaluation be performed to aid in legislative decision-making regarding the future of the act. L&I was required to report to the legislature by December 1, 2006 "on the implementation of this act, including but not limited to the effects of this act on injured worker outcomes, claim costs, and disputed claims."

A second bill was passed simultaneously, Senate Bill (SB) 6356 (Chapter 163, Washington State Laws of 2004), that authorized physician assistants (PAs) to have sole signature on the Report of Accident or Physician's Initial Report for simple industrial injury claims. (Simple industrial injury claims do not involve time loss, occupational disease, inpatient care on the date of the first medical visit, or complex injuries.) SB 6356 contained identical language regarding an evaluation, and was scheduled to sunset one day later, on July 1, 2007.

Nurse Practitioners

NPs play a significant and growing role in the U. S. health care system,¹ and NPs provide about 10% of generalist outpatient visits in Washington State. NPs are licensed as independent health care providers in Washington, though they often collaborate with physicians.^{2,3} NPs developed the profession in large part in response to limited health care access in rural and inner-city areas,^{4,5} and are the only source of care in many rural communities.⁶ There are similarities in role and function between NPs and primary care physicians (PCPs), particularly in rural settings.⁷⁻⁹ NPs tend to have a greater scope of practice in states with more rural populations.¹⁰ Inclusion of

NPs in the health care workforce has been found to mitigate both sociodemographic and geographic disparities in access to care.^{4,6}

Many studies and several systematic reviews have documented that NPs provide safe, high-quality, and cost-effective care, with clinical outcomes comparable to those of physicians.^{4,8,11-17} Research is mixed on whether utilization of tests and procedures is comparable between physicians and NPs,^{11,12} but many studies have found no overall differences.^{7,12-14} There is some evidence that NPs may provide higher quality care relative to physicians for a number of aspects of practice, including interpersonal communication, history-taking, patient education, health promotion, and care coordination.^{4,7,11,13-18} In general, patients are more satisfied with care provided by NPs as compared with physicians.^{4,8,11,16} Each of these aspects of practice has also been linked to outcomes.¹⁹⁻²⁴ In summary, NPs generally provide care that is at least equivalent in quality and in some aspects superior to that provided by physicians, which may suggest that expanded use of NPs could positively affect quality. However, the existing literature is limited and methodologically problematic.^{4,8,25}

Significance

The quality of occupational health care has been linked to outcomes such as duration of work-related disability and is increasingly receiving attention in efforts to improve outcomes and reduce costs in workers' compensation systems.^{26,27} Workers' compensation-related health care is in particular need of quality improvement; outcomes, medical costs, and patient satisfaction are generally worse than for medical care in general.^{27,28} Access to health care is also an important quality dimension, and provider availability, timely access to care, and system efficiency have also been linked to injured worker outcomes.^{27,29-31}

This research provides important new information in several respects. Many barriers to health care access and compensation for injured workers have been documented,³² but there is little research available regarding injured worker access to health care providers. Although there has been a fair amount of research on geographic health care access, none was found that specifically addressed workers'

compensation systems. In addition, few state workers' compensation systems designate NPs as attending providers,³³ and little information is available regarding care provided by NPs specifically to injured workers.³⁴ The control of escalating system costs has been an ongoing focus for policy makers²⁷ and some stakeholders have expressed concern that authorizing NPs to function as attending providers could increase medical and time loss compensation costs. No literature was found directly addressing care provided by NPs versus physicians as a correlate or predictor of work-related disability or medical costs from the perspective of the workers' compensation system.

The passage of this pilot legislation provided a natural experiment setting in which to evaluate the effect of expanding NP roles on access to health care for injured workers and on system efficiency. It also provided a unique opportunity to evaluate quality, costs, and outcomes attributable to NPs caring for injured workers. In addition, this legislation provided a model setting to compare utilization by NPs and physicians. The Washington State workers' compensation system provides for first dollar coverage, allows worker choice of provider, and is a fixed fee-for-service system. Any differences between NPs and physicians in utilization and/or medical costs should be most pronounced in this type of environment.

Study Setting and Data Sources

L&I performs the functions of an insurer for State Fund claims (covering about 70% of Washington's non-federal workers), and administers and regulates the state workers' compensation system for both State Fund and self-insured employers. Washington employers have had the right to self-insure since 1971. There are no private insurance companies in the Washington workers' compensation system. Washington is unusual (and possibly unique) in that workers pay 50% of premiums for the Medical Aid Fund and the Supplemental Pension Fund. All other costs are covered by employers. In Washington State, injured workers can select the attending provider of their choice from among authorized attending provider types. Referral or approval by the employer is not required, but the provider must enroll with L&I before billing

for services. Providers of workers' compensation-related care in Washington State are legally required to file the accident report within five days of identifying a work-related injury or illness, however compliance is inconsistent.

The bulk of the data for this research came from L&I's administrative databases, which provided detailed population-based information for State Fund claims.³⁵ (This research was restricted to State Fund claims, as the information available for self-insured claims was inadequate for evaluation purposes.) Additional area-level data was obtained via other sources, as described in subsequent chapters.

The complete claims sample included State Fund workers' compensation claims filed between July 1, 2003 and June 30, 2005 by claimants who were 18 to 70 years of age. Providers whose place of business was outside Washington State and workers with injuries occurring outside Washington State were excluded, due to the state-specific nature of the legislation. There were a total of 262,794 claims meeting these criteria. This provided a population-based set of claims for both the year prior to and the year following implementation of SHB 1691. Complete inclusion and exclusion criteria for each analysis are described in subsequent chapters.

Conceptual Model

Figure 1.1 presents the conceptual model for this evaluation. This model draws on Donabedian's conceptual framework of structure, process, and outcome.³⁶ There were three hypothesized mechanisms by which SHB 1691 (a structural factor) might have affected quality/process of care, disability outcomes, and/or medical costs:

- 1) The role expansion provided for in SHB 1691 may have encouraged greater numbers of NPs to enroll as L&I providers, thereby increasing the number of providers willing and able to treat injured workers. This could have decreased the distance an injured worker needed to travel to see a provider or the length of time required to obtain an appointment (particularly in rural or otherwise underserved areas), potentially leading to better outcomes.^{27, 29}
- 2) Prior to SHB 1691, NPs treating injured workers had been required to obtain a physician's signature on the accident report. This requirement may have caused

delays in health care and accident report filing, particularly for rural or underserved populations where physicians may have been less available. Removing this requirement may have improved administrative efficiency, potentially decreasing the time between the first medical visit and L&I's receipt of the accident report and resulting in better long-term outcomes.²⁷ In Washington, the time from the first medical visit to accident report filing is considered an administrative indicator of quality and efficiency, and the state has prioritized efforts to improve performance on such indicators in order to reduce the burden of work disability.^{27, 30, 31, 37}

- 3) SHB 1691 provided for NPs to fill the role of attending provider, and there may have been practice differences between NPs and PCPs that affected outcomes and/or medical costs. In addition, under L&I payment guidelines, NPs are paid at 90% of the physician fee schedule. Claim costs therefore might be somewhat lower for NPs based on this differential; however those services are likely to constitute a small portion of total claim costs, especially for the more costly claims.

Variables were selected for inclusion based on existing evidence for their relationship to outcomes or costs in workers' compensation settings and on their availability in L&I databases. Aside from the legislation itself, there were three levels of structure-related independent variables: contextual, provider, and worker.

Contextual variables included rural/urban location (measured at the provider or worker level, depending on the analysis) and county unemployment level. Rural geographic location may directly affect costs, and may be associated with differences in provider distribution and distance to care, varying standards of practice, or diffusion of best practices.³⁸ Rural/urban location was expected to modify the relationship between SHB 1691 implementation and the measures of access and accident report filing times. Higher unemployment rates are associated with increased duration of time loss.³⁹

Provider-level variables included provider type, whether the provider was

enrolled in an existing quality improvement project,^a and volume of L&I claimants (as a proxy for familiarity with the workers' compensation system). A number of analyses relied upon comparisons between NPs and primary care physicians (PCPs). The definition of PCP included allopathic and osteopathic physicians (MDs and DOs) in general practice, family practice, or internal medicine.

Worker-level variables included sociodemographics (age, gender, marital status, dependents, pre-injury income), injury characteristics (type and severity/complexity), industry, public vs. private sector employment, employer size, and whether the employer participated in a retrospective rating group. There is evidence that each of these characteristics can affect both disability and costs.^{20, 22, 39-41}

The conceptual model presents system-level quality and provider-level quality as process dimensions that may mediate the relationship between structural factors and outcomes in the workers' compensation system. Geographic access and the timeliness of care can be considered system-level quality factors, insofar as they are affected by other system factors such as provider enrollment levels and state policy regarding authorized provider roles and signature requirements. Barriers to access may interfere with the mission of facilitating timely health care and appropriate benefits for injured workers. Delays in diagnosis and treatment can lead to increased disability.^{22, 42} (There are also a number of quality and process variables that may be important but could not be directly measured in this study.) Outcome variables were measured at the claim level, and included disability (number of cumulative time loss days) and medical costs.

Specific Aims

Chapters 2, 3, and 4 each consist of a paper prepared for publication to address a substantive aspect of the evaluation of SHB 1691. The specific aims covered by each chapter are presented below. There were two basic approaches taken in evaluating the potential pathways depicted in Figure 1.1. System-level effects of the legislation were

^a The Centers of Occupational Health and Education (COHE) project is a community-based approach to health care that provides financial incentives to enrolled providers for occupational health best practices.

assessed via measuring changes that took place from one year pre- to one year post-implementation of SHB 1691 (Aims 1, 2, and 3). In contrast, the assessment of attending provider performance (evaluating potential practice and outcome differences between NPs and PCPs) included claims filed only after implementation, since NPs by regulation could not be attending providers prior to that date (Aims 4, 5, 6, and 7).

Chapter 2: Provider Distribution and Access

Aim 1. To describe the contribution of NPs to the Washington State workers' compensation provider workforce.

Aim 2. To evaluate change in provider availability attributable to SHB 1691.

Aim 3. To evaluate the effect of SHB 1691 on timely accident report filing.

Chapter 3: Disability and Cost Outcomes

Aim 4. To determine whether there were differences in disability outcomes (cumulative time loss days) between NPs and primary care physicians in the role of attending provider, after implementation of SHB 1691.

Aim 5. To determine whether there were differences in medical costs between NPs and primary care physicians in the role of attending provider, after implementation of SHB 1691.

Chapter 4: Quality and Process of Care Indicators

Aim 6. To identify quality/process of care indicators available in administrative workers' compensation data and document their association with work disability outcomes.

Aim 7. To determine whether there were post-implementation differences between NPs and primary care physicians regarding specific quality/process of care indicators.

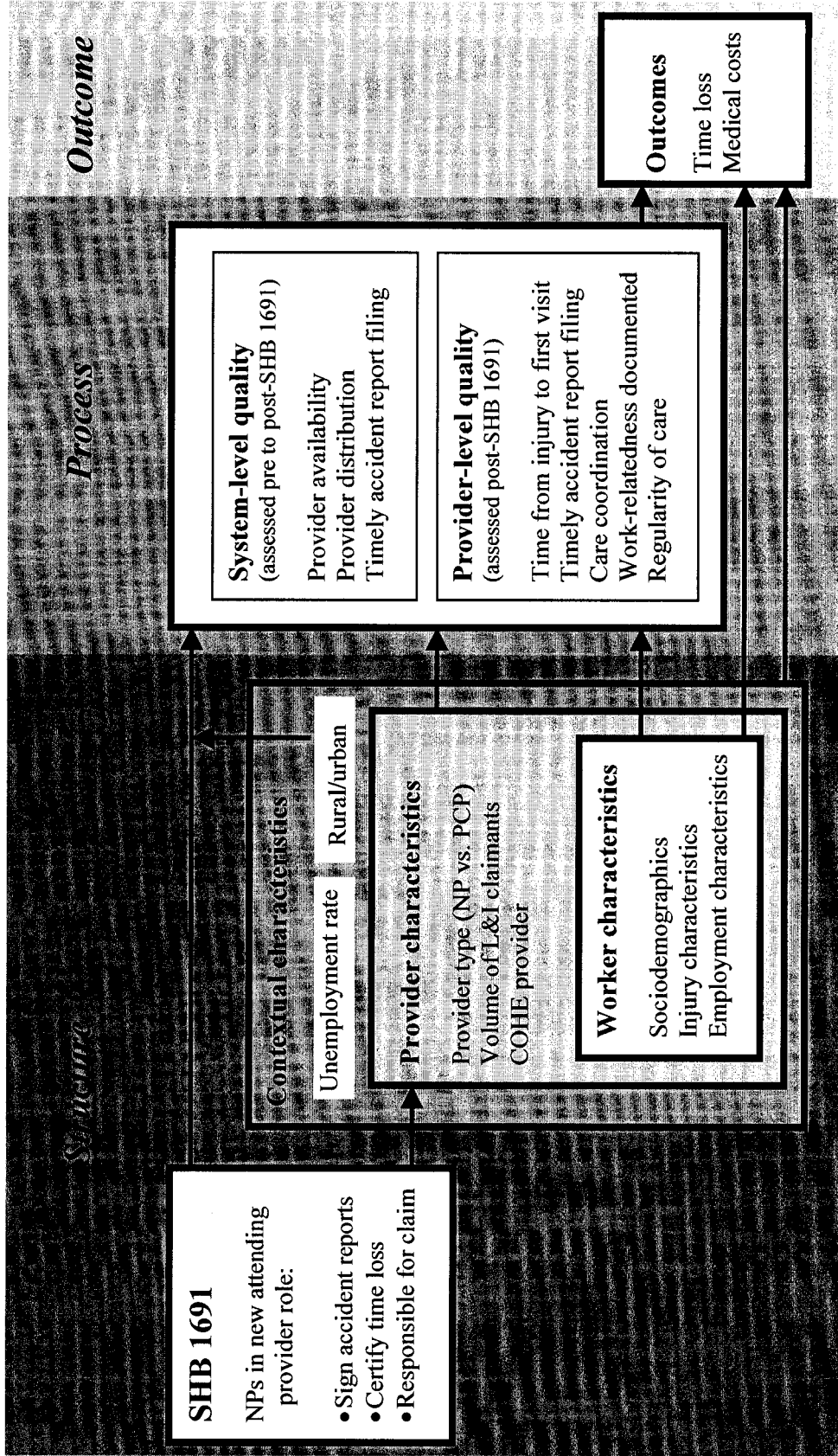


Figure 1.1. Conceptual model: NPs as attending providers in the Washington State workers' compensation system

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Expanding the Role of Nurse Practitioners: Effects on Rural Access to Care for Injured Workers

Rural areas are served by fewer health care providers per capita, and the distance involved in traveling to an appropriate provider may present a significant health care access barrier for injured workers.¹⁻³ At the same time, rural areas account for a large fraction of workplace injuries and workers' compensation costs. In 2004, 116,159 work-related accident reports were filed with Washington's state-administered workers' compensation insurance fund (State Fund), and 30% of those injuries occurred in rural Washington counties. By July of 2006, claims for those rural injuries had resulted in more than \$98.3 million in medical costs and \$52.3 million in compensation due to time lost from work.^b Delays in diagnosis and treatment due to access barriers may lead to increased work-related disability.^{4, 5}

Concern about disparities in access to health care for injured workers in rural areas and efforts by advanced registered nurse practitioners (NPs) to expand their scope in the Washington State workers' compensation system led to the passage of Substitute House Bill (SHB) 1691 (Chapter 65, Washington State Laws of 2004). The act was implemented July 1, 2004 as a three-year pilot program that authorized NPs to independently perform those functions of an attending physician within their scope of practice, with the exception of rating permanent impairment. NPs provide about 10 percent of Washington's generalist outpatient visits.⁶ NPs are licensed as independent health care providers in Washington, though they often collaborate with physicians.^{7, 8} NPs developed the profession in large part in response to limited health care access in rural and inner-city areas,⁹ and are the only source of care in many rural communities.¹⁰ There are similarities in role and function between NPs and primary care physicians (PCPs), particularly in rural settings.¹¹⁻¹³ NPs tend to have a greater scope of practice in states with more rural populations.¹⁴ Inclusion of NPs in the health

^b These figures are underestimates. They don't include pending bills, estimates of future costs, or public administrative and friction costs, nor do they include societal costs. These figures also exclude non-reported injuries and rejected claims, and claims filed against self-insured employers (which account for about a third of Washington's non-federal workers).

care workforce has been found to mitigate both sociodemographic and geographic disparities in access to care.^{9, 10}

Many barriers to health care access and compensation for injured workers have been documented,¹⁵ but there is little research available regarding injured worker access to health care providers. Although SHB 1691 was not expected to affect the underlying numbers or distribution of NPs in Washington State, NP role expansion may have improved access by increasing NP participation in the workers' compensation system. Prior to SHB 1691, NPs who treated injured workers were required to obtain physician signatures on key workers' compensation forms, such as the initial accident report. This may have caused delays in health care and accident report filing, particularly for rural or underserved populations where physicians may have been less available. Provider availability, timely access to care, and system efficiency have been linked to injured worker outcomes.¹⁶⁻¹⁸

The aims of this study were to (1) describe the contribution by NPs to Washington's workers' compensation provider workforce, (2) evaluate change in provider availability attributable to SHB 1691, and (3) evaluate the effect of SHB 1691 on timely accident report filing.

Methods

Study Setting

In Washington, approximately 70% of non-federal employees are covered by the State Fund (the state-administered workers' compensation insurance fund). Self-insured employers account for the balance. Providers must enroll with the Department of Labor and Industries (L&I) before billing for workers' compensation-related services. Providers of workers' compensation-related care in Washington are legally required to file the accident report within five days of identifying a work-related injury or illness, however compliance is inconsistent.

Of the 39 counties in Washington, 31 were designated rural by the Washington State Office of Financial Management (OFM), which defines rural counties as those having a population density of fewer than 100 persons per square mile.¹⁹ The 31 rural

counties account for 86% of the state's total land area,²⁰ 30.2% of all worker injuries (documented by accepted claims), and 25.7% of the employed population.²¹

Study Population and Data Sources

The study population included workers 18 to 70 years of age who were injured in Washington and filed an accepted State Fund workers' compensation claim between July 1, 2003 and June 30, 2005 (one year before and one year after SHB 1691 implementation). The study population also included Washington-based health care providers who were enrolled with L&I at any point during the same time period. Primary care physicians (PCPs) were defined as allopathic and osteopathic physicians in general practice, family practice, or internal medicine. The few physician assistants (PAs) with surgical specialties were excluded. L&I provided claim, provider enrollment, and medical billing data. County-level data on licensed NPs were obtained from the Washington State Department of Health, and county-level employed population statistics were obtained from the Bureau of Labor Statistics (BLS). The University of Washington Human Subjects Division reviewed and approved this study.

Study Design and Data Analysis

This natural experiment was evaluated using descriptive techniques and a pre-post design. Injury categories were constructed using American National Standards Institute (ANSI) Z16.2 coding for nature of injury and part of body.²² Rural areas were defined by linking zip codes to Rural Urban Commuting Area (RUCA) codes (version 2.0; Categorization C).²³ Where zip codes were not available (for injury location and for external county-level data), we followed the OFM definition.²⁰ Distressed counties were those counties with a three year average unemployment rate at least 120% of the statewide unemployment rate. There was little missing data and fewer than 1% of claims otherwise meeting eligibility criteria did not have billing data available. All statistical analyses were conducted using Stata 8.2 for Windows (StataCorp, College Station, TX).

NP Contribution to L&I Provider Workforce. Three general approaches can

be taken to workforce estimation: (1) computation of provider-to-population ratios, (2) need-based approaches (medical morbidity), and (3) demand-based approaches (utilization).²⁴ In addition, geographic accessibility is increasingly recognized as an important descriptor.² Because each approach provides somewhat different information and has differing strengths and weaknesses,²⁴ the number of active providers in rural and urban counties was calculated using 3 different denominators for this study: (1) land area in square miles (geographic accessibility), (2) number of accepted injury claims (combination of need and demand), and (3) employed population (provider-to-population).

Active providers were defined as those with any allowed L&I accident report or medical bill within each year of interest (exclusive of pharmacy bills). Although the employed population denominators were not directly comparable to the numbers of workers covered by the State Fund (BLS data include employed persons 16 and over and include federal and self-insured employers), they served as a reasonable approximation. Work injuries were counted based on the reported county of injury for all accepted claims within each study year.

Change in L&I Provider Enrollment Associated with SHB 1691. In addition to assessing provider availability and participation based on medical billing and attending provider status, the incidence of provider applications for L&I enrollment was also analyzed. New L&I enrollment applications for NPs and PCPs were tabulated by geographic region. An ARIMA-based time series analysis²⁵ was used to assess whether there was a significant increase in monthly enrollment applications associated specifically with SHB 1691 implementation over a total of 24 months (12 months before and 12 months after implementation). Both a step function (using an indicator for SHB 1691 implementation) and a hinge function (the indicator for SHB 1691 implementation along with a term for the interaction of SHB 1691 implementation and time) were tested.

Change in Timely Accident Report Filing for NPs. This analysis incorporated a difference-in-difference approach, comparing change from pre- to post-

SHB 1691 implementation for NP claims with change for PCP claims, and removing the difference from the estimated effect to account for secular trends.²⁶⁻²⁸ SHB 1691 had no direct effect on PCP practice, but changes over time in accident report filing due to other factors would likely affect PCPs similarly to NPs. The comparison groups were constructed based on the subset of claims that had first medical visit bills only from NPs or only from PCPs.

The primary predictor variable was the term created by interacting the binary indicator for SHB 1691 implementation (before = 0, after = 1) with the binary indicator for provider type (PCP = 0, NP = 1). The coefficient for this variable represents the change over time for NP claims, controlling for any secular trends captured by PCP claims. The outcome variable was whether or not the accident report was filed within 7 days of the first medical visit, reflecting the 5-day filing requirement and an allowance for weekends. Covariates included rural location, age, sex, injury type, and provider participation in an occupational health best practices program.⁹ Linear regression was used in order to provide a directly interpretable coefficient; robust variance estimates were used to account for heteroskedasticity.^{29, 30} A separate regression model assessed change in timely accident report filing for NPs in rural vs. urban areas by adding a third-order interaction term using the indicators for provider type, SHB 1691 implementation, and rural region (including all lower-order interaction terms in addition to the covariates included in the model above).

Claims were included if the date of injury, first medical visit, and accident report filing date all occurred within either the pre- or the post-SHB 1691 implementation study year. Although this method resulted in underestimates of actual filing times, it allowed for unbiased comparison between the two study years, avoided calendar time-dependent truncation due to claims being unobserved until the accident report was filed, and avoided misclassification due to accident report filing intervals

⁹ The Centers of Occupational Health and Education (COHE) project is a community-based approach to health care that provides financial incentives to enrolled providers for occupational health best practices. Elements of this project have been found to substantially reduce accident report filing times.

that crossed the implementation date.

Claims filed in the three months immediately after SHB 1691 implementation were excluded in a secondary analysis intended to explore the possible effect of delayed diffusion of information about the bill, comparing October 2003 to June 2004 with October 2004 to June 2005. The three month exclusion was selected because NPs accounted for a higher percentage of claims filed in the second quarter compared with the first quarter after implementation, suggesting some diffusion delay, but there was no rise in subsequent quarters.

Results

Provider Characteristics

There were a total of 286 NPs and 2,610 PCPs who were recorded as the first attending provider for any eligible claim filed during the year after implementation of SHB 1691. Of the PCPs, 24.6% were internists, 62.3% were family practitioners, and 13.1% were general practitioners. (L&I does not record specialty for NPs.)

A higher proportion of NPs were located in rural areas (22.0% compared with 17.3% for PCPs, $P = .05$) and distressed counties (20.6% compared with 15.9% for PCPs, $P = .04$). Median annual claim volume was nearly three times as high for PCPs (PCPs = 14, NPs = 5), and was higher for rural providers (PCPs = 19, NPs = 7), compared with urban providers (PCPs = 14, NPs = 5).

Claimant Characteristics

There were 42,533 eligible claims filed in the year after implementation of SHB 1691. Although the large number of claims resulted in statistically significant comparisons, most differences were small in magnitude. Mean age was 37.0 for claimants seeing NPs, compared with 38.2 for those seeing PCPs ($P < .001$). Median pre-injury monthly income was \$2,112 for claimants seeing NPs, compared with \$2,418 for those seeing PCPs (computed using only claims involving time loss; $P < .001$). The most notable difference was that a markedly higher proportion of claimants having NPs (versus PCPs) as their attending provider were injured in a rural county (see Table 2.1). NPs were somewhat more likely to see claimants who were female

and had dependents. The distribution of injury type was remarkably similar between NPs and PCPs.

NP Contribution to L&I Provider Workforce

There were 115,225 claims filed and accepted in the year prior to implementation of SHB 1691, compared with 116,566 claims for the year following implementation, a 1.2% increase (there was a 3% increase in the employed population over the same time period). The number of claims filed by PCPs (along with other providers, primarily occupational medicine physicians, chiropractors and clinics) decreased in rough proportion to the increase in the number of claims filed by NPs and PAs. (The increase in claims filed by PAs was related to concurrent legislation.^d)

In the first year after implementation of SHB 1691, NPs were the first attending provider for 7.0% of the accepted claims filed by primary care providers (NPs, PCPs, and PAs). NPs filed 10.8% of those claims in rural areas compared with 6.3% in urban areas ($P < .001$). For those workers with injuries that occurred in rural counties, 13.3% had an NP as their first attending provider, compared with only 4.5% of those injured in urban counties ($P < .001$). All counties where NPs filed more than 10% of the accepted claims filed by primary care providers were rural counties. A higher percentage of the claims filed by NPs (21.1%) were filed by rural providers, compared with PAs, PCPs, or occupational medicine physicians (see Table 2.2).

The number of active NPs in the L&I system rose 11.4% statewide after implementation of SHB 1691 (the number of active PCPs rose only 1.6%). Table 2.3 presents numbers of active NPs and PCPs by geographic region pre- and post-SHB 1691 implementation and shows that, regardless of choice of denominator (land area, injury claims, or employed population), there was an observed increase in NPs participating with L&I over the study period and that the increase was larger in rural

^d The passage of a companion bill for physician assistants, Senate Bill (SB) 6356 (Chapter 163, Laws of 2004), authorized physician assistants (PAs) to have sole signature on accident reports for simple industrial injury claims. (Simple industrial injury claims do not involve time loss, occupational disease, inpatient care on the date of the first medical visit, or complex injuries.) SB 6356 contained identical language regarding an evaluation, and was scheduled to sunset on July 1, 2007.

compared with urban counties (in contrast to PCPs). The percent increase in active NPs after SHB 1691 implementation ranged from 7.4% to 14.0% (depending on the geographic region and denominator used) while for PCPs, the change ranged from a 2.6% decrease to a 1.7% increase.

Change in L&I Provider Enrollment Associated with SHB 1691

The number of new L&I enrollment applications from NPs rose 40.0% statewide after SHB 1691 implementation (the number of PCP enrollment applications rose 18.7%). However, time series analysis did not provide evidence for a significant increase in monthly enrollment associated with SHB 1691 implementation, using either a step or a hinge function. For NPs, there was a larger observed enrollment increase in rural compared with urban areas, while for PCPs the opposite was observed (see Table 2.4).

Change in Timely Accident Report Filing for NPs

After SHB 1691 implementation, there was a significant increase in the percent of claims filed within 7 days of the first medical visit for those workers seen only by NPs, but no change for those seen only by PCPs (see Table 2.5). The number of NP-only claims rose by 286% (from 742 to 2,125) pre- to post-implementation, compared with a 2% drop in PCP-only claims. Urban providers filed 69.7% of claims within 7 days, compared with 60.5% for rural providers.

The findings of multivariate analysis were consistent with the data presented in Table 2.5. Controlling for age, sex, injury type, rural location, provider participation in an occupational health best practices program, and secular trends, SHB 1691 implementation was associated with a 15.7 percentage point improvement in timely (7-day) accident report filing (95% CI: 11.6, 19.7). The use of logistic regression resulted in similar findings.^e Limiting the pre-post comparison to nine-month time

^e We reported linear regression results as the primary finding because we preferred to present directly interpretable coefficients (change in percentage points). Logistic regression produced an odds ratio of 2.01 (95% CI: 1.69, 2.40). This provides evidence for the same direction of effect but is an overestimate of the relative risk because accident report filing within 7 days was not a rare event. The usual concerns with using linear regression for a binary dependent variable were not important for this analysis. Predicted values for the linear regression model ranged from 0.29 to 0.97. Heteroskedasticity of a

periods (to allow for three months of delayed diffusion) did not have a material impact on the findings. There was no evidence that implementation of SHB 1691 was more important in improving timely accident report filing for NPs in rural compared with urban areas.

Discussion

We found that NPs filed 7% of the accepted workers' compensation claims filed by primary care providers in the year after SHB 1691 was implemented.⁶ Regardless of choice of participation metric (attending provider status, provider billing activity, or new enrollment applications), or choice of denominator (land area, injury claims, or employed population), there was an observed increase in NPs participating with L&I after implementation of SHB 1691, particularly in rural areas (in contrast to findings for PCPs). SHB 1691 was associated with a 16 percentage point improvement in timely accident report filing for claimants seeing only NPs at the first medical visit, with a similar effect in rural and urban areas. An increase in the number of available providers and more timely filing of the accident report can reduce delays in access to initial and ongoing care, potentially leading to better outcomes.^{16, 18} In Washington, timely accident report filing is considered an administrative indicator of quality and efficiency, and the state has prioritized efforts to improve performance on such indicators in order to reduce the burden of work disability.^{18, 31} With the notable exception that NPs were more likely than PCPs to serve workers in rural and distressed areas, we did not find substantial case mix differences between NPs and PCPs.

It was surprising that there was not a significant differential impact of the legislation on accident report filing in rural areas. We had expected that physician signatures would be more time-consuming to obtain for rural NPs. However, NPs are nearly as likely to practice independently of physicians in urban as in rural areas of

binary variable is only an important problem when the mean of the outcome is not close to 0.5, which didn't apply in this case.^{29, 30} We also used robust variance estimates to account for heteroskedasticity. Concerns about non-normality are not important in large samples, due to the central limit theorem.²⁹

Washington.^{7, 8} It could be that needing to obtain a physician signature accounted for as many delays in urban areas (in urban areas, physicians may be inaccessible due to busy schedules or worksite choices rather than geographic distance).

As expected, we found a much higher density of L&I providers in urban compared with rural counties. In the year after implementation of SHB 1691, there were 11 times as many NPs per 1,000 square miles in urban vs. rural counties (13 times as many for PCPs). However, finding more providers per 1,000 injury claims and per 10,000 employed workers in rural compared with urban counties was unexpected. The opposite is usually reported. For example, in the year 2000 in Washington, there were 210 generalist physicians per 100,000 people in metropolitan counties compared with 146 in rural counties.³² There are several possible explanations for our findings. County-based measures of rurality introduce misclassification, however, this would not explain why our findings for PCPs differ in direction from the county-based findings reported above. Provider head counts do not necessarily produce realistic estimates of the supply of health care available to injured workers, due to differences in training, specialty, experience, scope of practice, productivity, and/or full-time status.⁶ Head counts may be a differentially poorer measure in rural areas,³³ and perhaps even more so in the workers' compensation setting, where L&I claimants typically account for a very small portion of a provider's practice. Finally, it may be that there was more sharing of L&I provider identification numbers in urban areas (perhaps due to turnover and supervision issues at teaching hospitals and academic centers).

There was an observed increase in NP enrollment, however the time series analysis did not provide evidence of an increase attributable solely to implementation of SHB 1691. Slow dissemination of information about the rule changes may have limited the direct effects of SHB 1691. Although an L&I provider bulletin explaining the new rules was sent to all enrolled clinical providers, L&I did not do any systematic outreach or publicity to non-enrolled providers. Other than SHB 1691, there are several possible explanations for the observed increase. Increased NP enrollment

could result if injured workers were increasingly seeking out NPs, employers were increasingly hiring NPs to provide care to their workers, or medical facilities seeing injured workers were increasingly hiring NPs. However, accounting for the employed population and for the number of injury claims in the analysis of active provider availability had only a minor impact. The effect of the legislation on NP enrollment applications would likely also depend on the availability of licensed NPs that weren't already enrolled. For example, a county with 90% of its NPs enrolled as L&I providers at baseline would have less room for increase than a county with 20% of its NPs enrolled, even if there existed both need and provider motivation. Unfortunately, baseline data on the number of NPs licensed by county was unavailable. However, in August of 2005, there were 2,705 NPs in all specialties licensed in the State of Washington, 504 in rural counties and 2,201 in urban counties. The number of NPs enrolled with L&I was approximately 47% of the number of Washington-licensed NPs. This was somewhat lower for urban (43%) and higher for rural counties (64%), suggesting that NPs in rural counties were more likely to be enrolled with L&I than those in urban counties (as of a year after SHB 1691 was implemented). (It should be noted that an active license doesn't necessarily indicate the NP was actively practicing, and the county of licensure was based on preferred mailing address, which is not necessarily the same as practice location.)

It was not possible to determine from the available administrative data whether injured workers saw a different mix of provider types after implementation of SHB 1691, or whether there were differences only in which provider signed (and billed for) the accident report due to the rule changes. The data did not allow for determining which NPs were in solo practice, or in practice only with other NPs. Of those claims having medical bills submitted only by NPs at the first medical visit, 10.2% had an NP listed as the first attending provider prior to SHB 1691 implementation, while 78.0% had an NP listed as first attending provider after implementation. One likely explanation is that the legislation enabled those NPs who were already seeing injured workers independently to be identified as the attending provider of record. However, it

is interesting that that the number of claims with bills only from NPs at the first medical visit nearly tripled after SHB 1691 implementation. This may be due to NPs being more likely to see injured workers independently post-implementation, since NPs were already able to bill for their services.

Limitations

All analyses relied on existing administrative data subject to well-known limitations.^{34,35} Perhaps most importantly, the L&I data excludes those with the poorest access of all, who never enter the workers' compensation system due to multiple systemic barriers.^{16,36} However, there are also important advantages to using administrative data, particularly the ability to link enrolled provider data with claim information at both individual and population-based levels.³⁷

A second set of limitations are related to the provider data. The use of multiple identification numbers by a single provider was corrected for the 4% of providers for which this was identified, but there may have been additional cases. Although technically not permitted, some providers may have used another provider's existing number, rather than applying for their own. This was not possible to detect or correct. Provider addresses may have reflected mailing address rather than practice location. Active providers were defined on the basis of billing data, which may have undercounted available providers (e.g., if there were few worker injuries occurring within a service area). In addition, the impact of excluding self-insured companies was uncertain, but may have resulted in underestimates of provider volume.³⁷

Finally, primary care physicians may not be an appropriate comparison group for the analysis of NP geographic distribution, because the underlying factors affecting the distribution and availability of physicians are quite different from those affecting the distribution and availability of NPs.^{38,39} However, no other group was felt to be as broadly comparable. Chiropractors are limited by L&I regulations to treating spine or extremity-related conditions. Occupational medicine physicians file very few rural claims (Table 2.2). PAs are not authorized to function as attending providers in Washington State.

Conclusions

Despite these limitations, the natural experiment presented by SHB 1691 offered a useful mechanism to assess the extent to which NPs contribute to workers' compensation-related care, and the extent to which regulation-based signature requirements can impact system efficiency. Although generalizability is limited by the variation between states in both NP scope of practice and workers' compensation regulations, there is little existing research regarding the role of NPs from a workers' compensation system perspective⁴⁰ and this study provides important new information. The results suggest that authorizing NPs to function as attending providers for injured workers may improve provider availability (especially in rural areas), timely access to care, and system efficiency, which in turn may improve worker outcomes and system costs.

Table 2.1. Claimant characteristics by attending provider type (percent of claims)

Claimant characteristics	NP (N = 3,211)	PCP (N = 39,322)	P
Injured in a rural county	53.3	24.7	<.001
Male	64.8	67.4	.003
Married*	50.4	51.0	.75
1 or more dependents*	40.4	36.6	.04
Injury type:			<.001
Back/neck sprains	15.8	17.5	
UE/LE† sprains	18.0	17.1	
UE/LE lacerations & contusions	23.7	23.0	
UE/LE fractures	2.9	2.6	
UE/LE bursitis	3.6	3.7	
UE/LE heat burns	1.3	1.0	
Carpal tunnel	1.9	2.3	
Hearing loss	0.8	1.3	
Eye scratches	4.4	3.2	
Conjunctivitis	0.8	0.7	
Other injury	14.3	15.2	
Other occupational disease	2.4	2.8	
Unspecified/multiple	13.6	13.2	

* Includes only compensable claims (n=9,834)

† UE/LE: upper extremity & lower extremity

Table 2.2. Rural/urban claims filed by selected provider types after SHB 1691

Provider type filing claim	Number of claims	Percent filed by rural providers	Percent filed by urban providers
Nurse practitioners	3,211	21.1	78.9
Physician assistants	3,607	17.7	82.3
Primary care physicians	39,322	12.8	87.2
Occupational medicine physicians	7,083	0.1	99.9
Total	53,223	11.9	88.1

Table 2.3. Active L&I providers pre- to post-SHB 1691, by rural/urban county

Provider type	Rural counties			Urban counties		
	Pre-SHB 1691	Post-SHB 1691	Percent change	Pre-SHB 1691	Post-SHB 1691	Percent change
<i>NP counts</i>						
Total number	172	196	+ 14.0	328	361	+ 10.1
Per 1,000 square miles	3.02	3.44	+ 14.0	34.11	37.54	+ 10.1
Per 1,000 injury claims	4.94	5.57	+ 12.8	4.08	4.44	+ 8.8
Per 10,000 workers	2.26	2.47	+ 9.3	1.48	1.59	+ 7.4
<i>PCP counts</i>						
Total number	1,107	1,123	+ 1.5	2,421	2,462	+ 1.7
Per 1,000 square miles	19.45	19.73	+ 1.5	251.74	256.00	+ 1.7
Per 1,000 injury claims	31.78	31.90	+ 0.3	30.12	30.26	+ 0.5
Per 10,000 workers	14.56	14.15	- 2.6	10.92	10.82	- 0.9

Table 2.4. Change in new L&I enrollment applications, by rural/urban region

Provider type	Rural		Urban		Percent change
	Pre-SHB 1691	Post-SHB 1691	Pre-SHB 1691	Post-SHB 1691	
NP enrollments	23	35	177	245	+ 38.4
PCP enrollments	78	82	474	573	+ 20.9

Table 2.5. Percent of accident reports filed within 7 days of the first medical visit, by provider type

Provider type	N	Pre-SHB 1691	Post-SHB 1691	<i>P</i>
Only NP bills	2,867	52.2	65.1	<.001
Only PCP bills	57,103	67.9	67.8	.84

Notes to Chapter 2

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Nurse Practitioners as Attending Providers for Injured Workers: Evaluating the Effect of Role Expansion on Disability and Costs

Nurse practitioners (NPs) play a significant and growing role in the United States health care system.¹ In Washington State, NPs provide about 10% of generalist outpatient visits and are licensed as independent health care providers, though they often collaborate with physicians.^{2,3} Many studies and several systematic reviews have documented that NPs provide safe, high-quality, and cost-effective care, with clinical outcomes comparable to those of physicians.⁴⁻⁹ However, research on utilization is mixed; although many studies have found no differences between physicians and NPs, some studies have found that NPs order more tests and procedures.^{4-7, 10-13}

The passage of a 3-year pilot program that expanded the role of NPs in the Washington State workers' compensation system has provided a unique opportunity to evaluate costs and outcomes attributable to NPs caring for injured workers. Substitute House Bill (SHB) 1691 (Chapter 65, Washington State Laws of 2004) was implemented July 1, 2004 and authorized NPs to independently perform those functions of an attending physician within their scope of practice, with the exception of rating permanent impairment. Prior to the implementation of this act, NPs who treated injured workers were required to obtain physician signatures on key workers' compensation forms and were not authorized to certify time loss benefits. In the first year following SHB 1691 implementation, NPs submitted about 7% of the workers' compensation claims filed by primary care providers. In addition to providing a setting for evaluating costs and outcomes for NPs caring specifically for injured workers, this pilot legislation provides a model setting to compare utilization by NPs and physicians. The Washington State workers' compensation system provides for first dollar coverage, allows worker choice of provider, and is a fixed fee-for-service system. Any differences between NPs and physicians in utilization or medical costs should be most pronounced in this type of environment.

The control of escalating workers' compensation system costs has been an

ongoing focus for policy makers¹⁴ and some stakeholders have expressed concern that authorizing NPs to function as attending providers could increase medical and time loss compensation costs. No literature was found directly addressing care provided by NPs versus physicians as a correlate or predictor of work-related disability or medical costs from the perspective of the workers' compensation system. This study assessed the impact of SHB 1691 by examining medical costs and disability outcomes for injured workers in the care of NPs benchmarked against those in the care of primary care physicians (PCPs).

Methods

Study Setting

In Washington, approximately 70% of non-federal employees are covered by the State Fund (the state-administered workers' compensation insurance fund). Self-insured employers account for the balance. Injured workers can select the health care provider of their choice from among authorized attending provider types, but the provider must enroll with the Washington State Department of Labor and Industries (L&I) before billing for workers' compensation-related services. Providers of workers' compensation-related care in Washington are legally required to file an accident report within 5 days of identifying a work-related injury or illness, and the provider that files the accident report is recorded as the first attending provider. Workers have the right to change attending providers after notice to L&I. Transfers of attending provider may result from such underlying factors as patient dissatisfaction, a mismatch between the care required and scope or training of the provider, or a change in the worker's residence.

Study Population and Data Sources

The study population included injured workers 18 to 70 years of age who had a first medical visit at a primary care facility (e.g., office, clinic, urgent care) along with filing of an accepted State Fund workers' compensation claim by an NP or PCP between July 1, 2004 and June 30, 2005 (the first year after implementation of SHB 1691). PCPs were defined as allopathic and osteopathic physicians (MDs and DOs)

specializing in general practice, family practice, or internal medicine. Claims were included only if the injury occurred in Washington and the first attending provider was located in Washington. Fatalities and claims with total permanent disability were excluded, as were claims with inpatient, ambulance, or emergency department services at the first medical visit. Providers reporting more than 500 claims in the year after implementation were also excluded, as such high claims activity likely reflected a more specialized practice of occupational health rather than primary care.

L&I provided claimant, provider, and medical billing data for State Fund claims. Data through June 30, 2006 were extracted on October 2, 2006, providing 12 to 24 months of follow-up data and 3 additional months of bill processing time for each claim. Fewer than 1% of claims otherwise meeting eligibility criteria were dropped due to lack of available billing data. County-level unemployment data were obtained from the Bureau of Labor Statistics (BLS). The University of Washington Human Subjects Division reviewed and approved this study.

Study Design and Variables

This study compared NPs and PCPs in the role of attending provider based on the medical costs and disability outcomes of injured workers in their care. The “after-only” study design relied on the assumption (vetted by stakeholders) that the experience of injured workers in the care of PCPs provided an acceptable benchmark for assessing the implications of expanding the definition of attending provider.¹⁵ Comparison groups were based on the first attending provider type for each claim.

For the analysis of medical costs, the dependent variable was defined as total medical costs for the first 12 months for each claim, including all allowed professional, facility, and pharmacy charges. Under L&I payment guidelines, NP services are paid at 90% of the fee schedule. To make this study generalizable beyond Washington and to be able to use costs as a proxy for utilization across provider types, medical costs were imputed as though NP services were paid at 100% of the fee schedule. This overestimates actual costs for NP claims within Washington, so both results are reported. For the analysis of disability outcomes, the dependent variable

was time loss duration (cumulative compensated days lost from work).

Covariates were included based on existing evidence for their association with disability and medical costs. Injury categories were constructed using American National Standards Institute (ANSI) Z16.2 coding for nature of injury and part of body.¹⁶ Information on whether there was prior treatment for the same or a similar injury and on whether there were coexisting conditions potentially impacting recovery was obtained from the provider via the accident report. Baseline radiculopathy (sciatica) was identified from ICD-9 codes in medical billing data for the first week of treatment. As a proxy for familiarity with the L&I system, providers who were responsible for more than an average of 2 claims per month in the year following implementation (16.7% of NPs, 31.6% of PCPs) were considered higher volume providers. The Centers of Occupational Health and Education (COHE) project provides financial incentives to enrolled providers for implementing occupational health best practices with the goal of reducing work disability.¹⁷ A binary indicator based on whether the first attending provider had enrolled by the end of the follow-up period was used to control for participation in this project. County unemployment rates were assigned based on the month the accident report was filed. Rural areas were defined by linking zip codes to Rural Urban Commuting Area (RUCA) codes.¹⁸ Where zip codes were not available, we followed the Washington State Office of Financial Management's definition of rural counties as those having a population density of fewer than 100 persons per square mile.

Data Analysis

Although medical costs were highly skewed, the large number of claims made linear regression a reasonable approach.^{19, 20} To check robustness of the findings, two additional linear regression models were also run, one using log-transformed costs and one using winsorized costs (truncation at the 98th percentile for each group).^{20, 21} To account for changes in the fee schedule and the uneven time allowed for bill submission, the medical cost regression models included a variable for the number of months between SHB 1691 implementation and filing of the accident report.

Time loss days were censored based on follow-up time. Cox proportional hazards regression with true stratification by injury type was used to assess time loss duration, and logistic regression was used to predict the likelihood of any time loss. However, time lost from work is compensated in Washington only if more than 3 days of work are lost, so zero time loss days represents both those with no lost work days and those with 1 to 3 lost work days. Conceptually, the number of days lost from work is a continuous albeit nonlinear process, since even those with no time loss did take at least enough time to see a provider for their injury at some point during the claim. Due to the mixed nature of the dependent variable, several other statistical methods were used to check robustness of the findings, combining claims with and without time loss. In one model, a constant (0.001) was added to the dependent variable in order to include all claims in a Cox model (the typical Cox model excludes all those with no time loss, since the number of time loss days serves as the observed time scale). In another model, linear regression was used to analyze only those claims that were closed within 12 months (excluding about 10% of claims), to sidestep the issue of censoring. Lastly, a zero-inflated negative binomial model was used to address the issue of excess zeros, again only in those claims closed within 12 months.

All analyses were run a second time using the 82% of claims that had no transfers of attending provider throughout the claim ($N = 24,683$), since the first attending provider was not necessarily responsible for downstream events after transfer occurred.

Several approaches to detect and control potential selection bias were implemented. Cases with indications of high baseline severity were excluded as previously described. Regression analyses controlled for individual demographics, injury type, prior treatment for the same or similar injury, presence of coexisting conditions that might impact recovery, and provider and employment characteristics. To assess potential confounding by severity, subanalyses were conducted using only back sprain/strain cases, both with and without an indicator for the presence of baseline radiculopathy. (Radiculopathy is a severity indicator specifically relevant to

back injuries, and is associated with both medical costs and time loss duration.)

Standard errors were adjusted to account for correlation of outcomes within a specific provider's practice. Robust variance estimates were used to account for heteroskedasticity. All statistical analyses were conducted using Stata 8.2 for Windows (StataCorp, College Station, TX).

Results

Provider Characteristics

There were a total of 251 NPs and 2,437 PCPs who were recorded as the first attending provider for any eligible claim filed during the year after implementation of SHB 1691. Of the PCPs, 24% were internists, 63% were family practitioners, and 13% were general practitioners. (L&I does not record specialty for NPs.) A higher proportion of NPs were located in rural areas (22.3% compared with 17.4% for PCPs, $P = .05$) and in counties with chronically high unemployment levels (21.5% compared with 15.7% for PCPs, $P = .02$). Median annual workers' compensation claim volume for PCPs was more than double that for NPs (NPs = 6, PCPs = 15; $P < .001$). Participation in the COHE occupational best practices project did not significantly differ across provider type (NPs = 8.8%, PCPs = 6.9%, $P = .26$).

Claimant Characteristics

There were 29,949 eligible claims filed during the year after implementation of SHB 1691. Although the large number of claims resulted in statistically significant comparisons, most differences were small in magnitude. The most notable difference was that NPs saw a markedly higher percentage of claimants who were injured in a rural county, 54% versus 28% (see Table 3.1). NPs had slightly higher proportions of claimants who were female and had dependents. The distributions of injury type and severity/complexity indicators (baseline radiculopathy, prior treatment, and coexisting conditions) were remarkably similar between NP and PCP claims. Mean claim duration (measured from accident report filing to claim closure) was 10 days shorter for NP claims (NPs = 129.6 days, PCPs = 139.3 days; $P < .001$).

Medical Costs

Table 3.2 presents comparisons of unadjusted actual and imputed total medical costs in the first 12 months, in addition to costs broken out by cost category and injury type. Replacing actual costs with what they would have been if NP services were reimbursed at the full fee schedule added \$26 on average to NP claims and \$2 on average to PCP claims (costs for any NP services were imputed for all claims, regardless of first attending provider type). There was no significant difference in total medical costs between NP and PCP claims, either actual (NP = \$1,905, PCP = \$1,985; $P = .35$) or imputed (NP = \$1,931, PCP = \$1,987; $P = .52$). In general, there were few significant differences. NP claims had significantly lower actual costs in the medical/NP services category due to the payment differential, but the difference was not significant when imputed costs were used. PCP claims had higher costs for physical therapy and chiropractic services, while NP claims had higher costs for outpatient facility services. When broken out by injury type, total imputed medical costs differed only in the category of other injuries (with costs higher for PCPs, perhaps due to higher heterogeneity in that category).

Costs were lower overall in the subset of claims with no attending provider transfers ($N = 24,683$), but using that sample gave the same general picture of the comparison between NPs and PCPs. Mean actual total medical costs were \$852 for NPs, and \$909 for PCPs ($P = .20$), and mean imputed total medical costs were \$876 for NPs and \$909 for PCPs ($P = .46$).

Disability

Table 3.3 presents the results of 3 unadjusted comparisons of time loss measures, both for all claims and for claims broken out by injury type. A lower percentage of NP claims involved any time loss (NP = 20.3%, PCP = 23.4%, $P < .001$). When evaluating duration of time loss within only those claims with any time loss, NP claims as a whole appeared to have about 5 more days of time loss on average than did PCP claims, but the difference was not significant (NP = 116.8 days, PCP = 111.4 days, $P = .42$). The combined effect of any time loss and time loss

duration appeared to be about 2 days less time loss on average for NP claims relative to PCP claims, but the difference was not significant (NP = 23.7 days, PCP = 26.1 days, $P = .15$). In general, there were no significant differences in mean time loss per claim, with the exception that time loss duration was longer for PCP claims in the unspecified/multiple injury category. It should be noted that all significant differences in likelihood or duration of time loss favored NP claims.

Similar patterns were seen in the subset of claims with no attending provider transfers, but with markedly lower likelihood of time loss and shorter time loss durations. 12.0% of NP claims had any time loss compared with 14.8% for PCPs ($P < .001$). For all claims in this subset, mean time loss days were only 8.7 for PCPs and 7.4 for NPs ($N = 24,683$, $P = .14$).

Regression Models

Results of the 3 primary regression models are presented in Table 3.4. Interactions between provider type and injury type were not significant and were dropped from all models.

Attending provider type was not a significant predictor of medical costs, though imputed costs appeared about \$62 lower on average per claim for NPs after controlling for covariates (95% CI: -\$320, \$196). As expected, this difference was larger (\$98 lower per claim for NPs; 95% CI: -\$255, \$59) in the subset of claims with no attending provider transfers, but was still not significant. Results of the models using the log transformed and winsorized dependent variables were roughly consistent with the results presented in Table 3.4. Among back sprain/strain cases only ($N = 4,417$), results were similar with and without including control for baseline radiculopathy.

NPs were significantly less likely to place claimants on time loss (OR 0.84, 95% CI: 0.72, 0.99) after controlling for covariates. The Cox proportional hazards regression model did not demonstrate a difference in time loss duration between NP and PCP claims (OR 0.99, 95% CI: 0.91, 1.08). A similar result was found in the subset of claims with no attending provider transfers. Findings for the models set up to

include claims with and without time loss were consistent; the Cox model using all claims (N = 29,949) and the 2 non-censored models that used all claims closed within 12 months (N = 26,772) revealed no significant difference in time loss duration. Among back sprain/strain cases with time loss (N = 1,477), results were similar with and without including control for baseline radiculopathy.

Discussion

This study examined the association of attending provider type with medical costs and disability outcomes in the first year following implementation of legislation expanding the role of NPs in the Washington State workers' compensation system. We found that NPs served injured workers with characteristics similar to those served by PCPs, but NPs were more likely to be located in rural areas and counties with extended high unemployment. The distributions of injury type and severity/complexity indicators were quite similar across provider type. Regardless of choice of sample or statistical model, we did not find significant differences in medical costs or disability outcomes for NP claims compared with PCP claims, except for a lower likelihood of any time loss compensation among NP claims. The coefficients for other covariates, though not of primary interest here, generally reflected what has been found in prior studies.²²⁻²⁴

The effect of health care may be small in comparison with that of sociodemographic, economic, psychosocial, employment, or administrative factors.²⁵⁻
²⁷ Provider type and associated practice differences have not been shown to be important determinants of outcomes for injured workers. For example, in studies of acute low back pain, outcomes were similar for patients of PCPs, chiropractors, and orthopedic surgeons.^{28, 29} Based on the minor impact of health care variables in this setting and the general similarity in outcomes between NPs and physicians in other settings, large differences between NP and PCP claims were not expected. However, it was not possible to power this population-based study to demonstrate equivalence, and the confidence intervals for cost differences were very wide. It is worth noting that all covariates except provider type were found to be significant in at least one of the

regression models at $P = .002$ or less. This suggests that provider type (NP/PCP) is simply not an important predictor of medical costs or disability for injured workers, in comparison with other factors such as sociodemographics, injury and medical history characteristics, and employment-related variables. Variation in unmeasured provider characteristics such as training in occupational health may be more important than provider type.

Selection Effects

It is unclear to what extent selection bias may have affected the findings of this observational study. Potential mechanisms for selection bias included the injured worker's choice of provider, scope of practice differences, or differences in the likelihood of keeping versus referring out chronically ill or severely injured workers. Although it has been suggested that the practice patterns and patient profiles of NPs do not fully overlap those of PCPs, perhaps being of lower average acuity or complexity,¹ convincing evidence of this was not found. NPs tend to care for a higher proportion of female and younger patients and tend to perform fewer invasive procedures than do physicians.^{11, 30, 31} [The higher proportion of female patients may be explained by provider demographics. In a survey of generalist health care providers in Washington, 92.7% of NPs were female, compared with 28.9% of physicians.³] On the other hand, there is evidence of general similarity in diagnoses^{32, 33} and complexity³⁴ for NPs as compared with physicians. Practice setting may have more influence than profession on practice patterns and case mix.³⁵ Although we cannot be certain that there were no important unmeasured differences, our data did not provide evidence for substantial systematic differences in case mix. Nor did we find higher rates of attending provider transfers among NP claims.

We ran all analyses a second time using the subset of claims with no transfers of attending provider. When a claim involves surgical intervention, L&I transfers attending provider status temporarily to the surgeon to facilitate global billing. This likely accounted for the much lower medical costs and time loss seen in this subset. The initial attending provider was more clearly responsible for overall costs and

outcomes in this subset of claims, but selection bias may have been exacerbated in favor of NPs (since claims involving higher initial severity or deteriorating conditions may have been more likely to involve transfers to a physician). However, in both samples, we saw the same general pattern of findings, providing evidence of robustness.

Increased severity is associated with increased disability,^{22, 23, 36, 37} however severity has been unmeasured in many studies.³⁸ We addressed this issue by excluding cases with high baseline severity and used available variables to control for injury type and severity/complexity. We found that less well-defined injury categories accounted for most significant differences found in unadjusted data. Lastly, the findings for back sprain/strain cases were similar with and without control for the presence of radiculopathy, which added a degree of assurance that selection bias with regard to severity was a minor issue.

Limitations

This study evaluated disability and medical costs from the payer (L&I) perspective, and there may have been unmeasured costs to the injured worker that differed by provider type (prescription of uncovered care, transportation costs, uncompensated time off work, etc.). Because of the short timeframe available, extended time loss and costs could not be evaluated. Data extraction occurred 3 months after the end of the follow-up period, though providers have a year to submit bills. Therefore, these results are likely to underestimate the average first year medical costs.

Relying on cumulative time loss as an outcome measure can underestimate disability burden.^{25, 26, 39} Provider influence on time loss duration may not have been fully captured because it was not possible to identify cases where light duty had been authorized by the provider unless accommodation was provided by the employer.

All analyses for this evaluation relied on existing administrative data subject to well-known limitations.⁴⁰⁻⁴² However, there are also important advantages to using administrative data, particularly the ability to link claim, medical billing, time loss,

and provider data at both individual and population-based levels.⁴²

Conclusions

This study, in conjunction with an earlier study examining changes in provider availability and administrative efficiency related to SHB 1691,⁴³ suggests that authorizing NPs as attending providers for injured workers may be a cost-effective approach to expanding the available workers' compensation provider workforce and improving access to health care. Although further research using more experimental designs and longer follow-up periods will be required to verify our findings, the Washington State workers' compensation environment allowed for a sensitive test of medical cost/utilization differences between NPs and physicians. We found no evidence, despite several different approaches, that medical costs were higher or outcomes worse for injured workers in the care of NPs compared with PCPs. In fact, costs should be lower for NPs than these findings suggest in the many settings where NP services are paid on a discounted fee schedule. From a societal perspective, expanding the use of NPs in appropriate settings is an efficient use of resources, since the cost of educating NPs is lower. Although the variation between states in NP scope of practice and workers' compensation regulations limits generalizability, there is very little research currently available regarding the role of NPs from a workers' compensation system perspective.⁴⁴ Research in this area is particularly important given the burgeoning interest across the United States both in expanding the role of NPs and in addressing the serious access, quality, and cost problems facing workers' compensation systems.

Table 3.1. Sample characteristics by attending provider type

Sample characteristics	NP (N = 2,921)	PCP (N = 27,028)	P
<i>Baseline claim characteristics</i>			
Mean age (years)	37.1	38.1	<.001
Median pre-injury monthly income* (dollars)	2,112	2,409	<.001
Mean county unemployment rate (percent)	6.2	5.6	<.001
	<i>Percent of claims</i>		
Married*	50.2	49.8	.88
1 or more dependents*	41.8	38.0	.07
Male	64.9	67.6	.003
Worker injured in rural county	53.8	27.9	<.001
Injury type:			.001
UE & LE cuts/contusions	23.6	22.9	
Back sprains/strains	13.0	14.9	
UE & LE sprains/strains	18.1	17.3	
Corneal abrasions/conjunctivitis	5.3	4.0	
UE & LE fractures	2.6	2.6	
UE & LE heat burns	1.3	1.0	
Other injury	16.9	18.4	
Carpal tunnel	1.9	2.3	
Hearing loss	0.8	0.9	
Other illness	2.5	2.8	
Unspecified/multiple	13.9	12.9	
Baseline radiculopathy†	2.9	3.3	.70
Coexisting conditions impacting recovery	3.4	3.2	.62
Prior treatment for same/similar injury	10.5	9.6	.26
Public sector employment	6.9	8.8	<.001
Retrospective rating group at time of injury	53.9	49.0	<.001
Small employer (< 25 FTE)	30.7	32.3	.09
<i>Claim characteristics over time</i>			
Time loss claim	20.3	23.5	<.001
Permanent partial disability payment	3.5	4.1	.09
Claim closed within 12 months	90.8	89.2	.01
Claim closed by end of study follow-up	94.0	93.5	.23
Claim reopened	0.5	0.6	.41
No attending provider transfers	83.6	82.3	.09

* Includes only time loss claims (N = 6,931)

† Within first week of treatment (back sprains/strains only, N = 4,417)

Table 3.2. Medical costs in first 12 months of claim, by cost category and injury type

Category	NP (N = 2,921)		PCP (N = 27,028)		P*
	n	Mean (SE)	n	Mean (SE)	
Total medical costs: actual	2,921	1905 (81)	27,028	1985 (28)	.35
Total medical costs: imputed†	2,921	1931 (81)	27,028	1987 (28)	.52
Cost category:					
Medical/NP services: actual	2,921	893 (35)	27,028	983 (12)	.02
Medical/NP services: imputed†	2,921	920 (35)	27,028	984 (12)	.08
Physical therapy and chiropractic	2,921	305 (17)	27,028	346 (6)	.03
Other professional/ancillary	2,921	199 (21)	27,028	169 (5)	.16
Pharmacy	2,921	66 (5)	27,028	59 (2)	.22
Vocational rehabilitation	2,921	106 (9)	27,028	115 (3)	.32
Inpatient facility	2,921	75 (19)	27,028	107 (11)	.14
Outpatient facility	2,921	261 (20)	27,028	207 (5)	.01
Injury type: total imputed costs†					
UE & LE cuts/contusions	690	612 (74)	6,200	524 (20)	.25
Back sprains/strains	381	2538 (294)	4,036	2677 (94)	.65
UE & LE sprains/strains	530	2826 (249)	4,674	2405 (68)	.10
Other	407	1895 (122)	3,478	2178 (48)	.03
Unspecified/multiple	913	2518 (235)	8,460	2757 (94)	.35

* For the difference in means using t-tests accounting for unequal variance

† NP services were paid at 90% of the fee schedule; costs were imputed at 100%

Table 3.3. Time loss by injury type

Injury type	All claims: Percent with any time loss (N = 29,949)			Claims with any time loss: duration of time loss in days (SE) (N = 6,930)			Mean time loss in days (SE) (N = 29,949)		
	NP	PCP	P	NP	PCP	P	NP	PCP	P
All injuries	20.3	23.4	<.001	116.8 (6.3)	111.4 (2.0)	.42	23.7 (1.6)	26.1 (0.5)	.15
UE & LE cuts/contusions	6.8	6.5	.74	57.1 (14.6)	55.6 (5.6)	.93	3.9 (1.3)	3.6 (0.4)	.82
Back sprains/strains	27.8	34.0	.02	109.6 (15.3)	109.9 (4.5)	.98	30.5 (4.9)	37.3 (1.7)	.19
UE & LE sprains/strains	28.7	27.8	.66	125.2 (12.4)	107.1 (4.1)	.17	35.9 (4.3)	29.8 (1.3)	.17
Other	20.6	26.3	<.001	127.2 (11.9)	111.9 (3.2)	.21	26.2 (3.0)	29.4 (1.0)	.30
Unspecified/multiple	24.8	28.5	.12	119.9 (15.1)	140.8 (5.7)	.20	29.7 (4.5)	40.1 (1.9)	.04

Table 3.4. Models for medical costs, likelihood of time loss, and time loss duration

Variable	Linear regression: Medical costs (imputed dollars) (N = 29,949)		Logistic regression: Any time loss (N = 29,949)		Cox regression: Time loss duration (N = 6,930)	
	Coefficient	P	Odds Ratio	P	Hazard Ratio	P
NPs (compared with PCPs)	-62.18	.64	0.84	.04	0.99	.82
Prior treatment for injury	1281.79	<.001	1.70	<.001	0.82	<.001
Co-existing conditions	1314.86	<.001	1.50	<.001	0.77	<.001
Injury type*	†	<.001	†	<.001	‡	n/a
UE & LE cuts/contusions	-1346.94	<.001	0.23	<.001	n/a	n/a
Back sprains/strains	402.28	<.001	1.40	<.001	n/a	n/a
UE & LE sprains/strains	337.62	<.001	1.15	.002	n/a	n/a
Unspecified/multiple	499.24	<.001	1.07	.12	n/a	n/a
Male	-174.71	.003	1.05	.14	1.12	<.001
Age§	¶	<.001	¶	<.001	¶	<.001
25-34	640.37	<.001	1.37	<.001	0.71	<.001
35-44	1155.59	<.001	1.62	<.001	0.61	<.001
45-54	1341.49	<.001	1.76	<.001	0.63	<.001
55-70	1526.07	<.001	1.71	<.001	0.59	<.001
Month filed	31.04	<.001	1.01	.001	n/a	n/a
Rural provider	-259.23	.002	0.92	.15	1.03	.42
COHE provider	-71.14	.50	0.75	<.001	1.04	.44
County unemployment rate	80.87	.004	1.05	.001	0.97	.02
Public employer	-141.03	.13	1.15	.009	1.21	<.001
Small employer (<25 FTE)	355.79	<.001	1.32	<.001	0.87	<.001
Retrospective rating group	-20.00	.73	0.89	<.001	1.03	.34
Higher volume provider	-2.92	.97	0.78	<.001	0.97	.28
Intercept	126.73	.57	n/a	n/a	n/a	n/a

* Reference group: Other injuries/illnesses

† Injury type joint test

‡ True stratification for injury type precluded providing hazard ratios for injury type

§ Reference group: 18-25

¶ Age category joint test

Notes to Chapter 3

1. Cooper RA. Health care workforce for the twenty-first century: the impact of nonphysician clinicians. *Annu Rev Med* 2001;52:51-61.
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Nurse Practitioners as Attending Providers for Workers with Uncomplicated Back Injuries: Using Administrative Data to Evaluate Quality and Process of Care

The quality of occupational health care has been linked to outcomes such as duration of work-related disability and is therefore increasingly receiving attention in efforts to improve outcomes and reduce costs in workers' compensation systems.^{1,2} Workers' compensation-related health care is in particular need of quality improvement; outcomes, medical costs, and patient satisfaction are generally worse than for medical care in general.^{2,3} However, monitoring and improving quality of care is challenging, and there is much variation between jurisdictions in terms of both the specifics of how workers' compensation benefits are provided and the data available to conduct system-level research.²

Administrative data offer an efficient way of tracking quality improvement efforts, but have been underutilized to date in the workers' compensation arena.⁴ The use of administrative databases to assess quality of care requires clarity regarding how quality and process of care might be represented in available data, a plausible link with outcomes, and careful consideration of the constraints of the data structure.⁵ Nevertheless, administrative data can be used to evaluate both system-level and provider-level processes that affect work-related disability.⁶

In Washington State, most health care for injured workers is supervised by a single public payer, the Washington State Department of Labor and Industries (L&I), and therefore substantial leverage can be brought to the development, implementation, and evaluation of innovative community-wide health delivery interventions aimed at improving quality and preventing disability.⁷ L&I has previously conducted a formal evaluation of a statewide managed care pilot project and is in the process of evaluating an innovative quality improvement pilot project that offers financial incentives for occupational health best practices in two large regions of the state, the Washington State Centers of Occupational Health and Education (COHE) project.^{2,7} In 2004, the Washington State legislature enacted a 3-year pilot program that authorized nurse

practitioners (NPs) to function as attending providers for injured workers. The formal evaluation of this program offered the opportunity to examine the utility of several potential quality/process of care measures available from L&I's administrative databases.

A primary goal of this study was to identify quality/process of care indicators available in administrative workers' compensation data and document their association with work disability outcomes. A second goal was to demonstrate the application of these indicators by using them to assess whether NPs performed differently than did primary care physicians (PCPs) in serving as attending providers for workers with uncomplicated back injuries.

Methods

Study Setting

Approximately 70% of non-federal employees in Washington are covered by the State Fund (the state-administered workers' compensation insurance fund). Self-insured employers account for the balance. Injured workers can select the health care provider of their choice, but the provider must enroll with L&I before billing for workers' compensation-related services. Providers of workers' compensation-related care in Washington are legally required to file an accident report within 5 days of identifying a work-related injury or illness, and the provider that files the accident report is recorded as the first attending provider. Workers have the right to change attending providers with notice to L&I. The attending provider is responsible for ensuring adequate monitoring and care for the injured worker, including both health care and disability management. In Washington State, a claimant becomes eligible for time loss compensation after losing more than 3 days from work. (Time loss refers to compensated time away from work for a work-related injury or illness.)

Substitute House Bill (SHB) 1691 (Chapter 65, Washington State Laws of 2004) took effect July 1, 2004 and authorized NPs to independently perform those functions of an attending physician within their scope of practice, with the exception of rating permanent impairment. This program was implemented due to concerns

about timely access to health care for injured workers in rural areas, delays in work-related injury reporting, and efforts by NPs to expand their scope. Prior to SHB 1691, NPs could be reimbursed for providing health care to injured workers but were restricted from performing some functions related to disability management (such as signing accident report forms and certifying time loss benefits). Many studies have documented that NPs provide safe and cost-effective care, generally equivalent in quality to that of physicians,⁸⁻¹⁵ but little information is available regarding care provided by NPs specifically to injured workers.¹⁶

Study Population and Data Sources

The study population included workers 18 to 70 years of age who were injured on or after July 1, 2004 and had both (1) a first medical visit at a primary care facility (e.g., office, clinic, urgent care), and (2) an accepted State Fund workers' compensation claim filed by an NP or PCP, between July 1, 2004 and June 30, 2005 (the first year after implementation of SHB 1691). PCPs were defined as allopathic and osteopathic physicians (MDs and DOs) specializing in general practice, family practice, or internal medicine. (L&I does not record specialty for NPs.) Claims were included only if the injury occurred in Washington and the first attending provider was located in Washington. Providers reporting more than 500 claims in the year after implementation were excluded, as such high claims activity likely reflected a more specialized practice of occupational health rather than primary care. Providers participating in the COHE project were also excluded, due to the financial incentives offered for occupational health best practices.

In order to appropriately assess differences in process indicators across provider type, the identification of a relatively homogeneous sample of claimants with a prevalent disorder was desirable.^{5,17} The injury category of back sprains/strains was selected for this study (using American National Standards Institute Z16.2 coding¹⁸) because it was the largest in absolute numbers and accounted for the largest proportion of medical costs and time loss days. To increase homogeneity, the sample was further restricted by excluding those claims with evidence of high baseline severity or

complexity. To this end, fatalities and claims with total permanent disability were excluded (based on claims data), as were claims with inpatient, ambulance, or emergency department services at the first medical visit (based on medical billing data). Claimants presenting with baseline radiculopathy (based on medical billing data), coexisting conditions that might delay recovery, or who had received prior treatment for the same or similar condition were also excluded. Information on prior treatment and coexisting conditions was obtained from the provider via the accident report form.

L&I provided claimant, provider, and medical billing data through June 30, 2006, resulting in 12 to 24 months of follow-up data for each claim. Data was extracted on October 2, 2006 to allow for 3 additional months of bill processing time. The University of Washington Human Subjects Division reviewed and approved this study.

Study Design and Data Analysis

This study used administrative data to compare the performance of NPs with that of PCPs in order to assess the potential impact of SHB 1691's expansion of the definition of attending provider on quality of care for injured workers.¹⁹ Claims were assigned to the NP or PCP group based on the initial attending provider type, and the two groups were compared using a two-sample test of proportions for each process indicator.

Standardization has been recommended when assessing quality in a diverse population.¹⁷ Although we controlled for injury type and severity via exclusion and there was little difference in employment-related variables across provider type, NPs in this sample were more likely to be responsible for the care of claimants who were younger and female (see Results). We used direct standardization on the basis of age (categorized as 18-24, 25-34, 35-44, 45-54, and 55-70) and sex to generate the proportion of claims for which each process of care indicator was met, using the entire population-based sample as the reference population. Therefore, the standardized results reflect theoretical proportions that would hold if NPs and PCPs were

responsible for the care of injured workers with the same age and sex distribution (that of the overall sample). Direct standardization is a reasonable alternative to logistic regression when the number of comparison groups is small and a straightforward presentation of proportions is preferable to odds ratios.²⁰ Findings based on direct standardization were compared with findings from logistic regression models in which robust variance estimates were used to account for heteroskedasticity and standard errors were adjusted to account for any correlation of outcomes within a specific provider's practice (which could be related to unmeasured factors such as office procedures and training in occupational health). All statistical analyses were conducted using Stata 8.2 for Windows (StataCorp, College Station, TX).

Claim Characteristics

A number of claim characteristics were compared across attending provider type. These included: (1) whether a claimant received any time loss compensation, (2) whether there was a permanent partial disability payment, (3) whether the claim remained open at six and twelve months after report filing, (4) whether a closed claim had been reopened, (5) whether there were any transfers of attending provider over the life of the claim, (6) whether the claimant had attorney representation, and (7) whether any claim disputes (protests or appeals) had been filed by the claimant, provider, or employer. These comparisons are presented to give a picture of possible differences in case mix and administrative friction between NP claims and PCP claims, but these characteristics are only partially under the control of the attending provider. They could also be affected by unmeasured worker, injury, and employment characteristics, and are intertwined with claim costs and disability in complex ways. For each of these indicators, a lower percentage would be considered "better" (theoretically associated with lower potential friction cost, dissatisfaction, disability, etc.).^{21, 22}

Quality/Process of Care Indicators

The following quality/process of care indicators were identified for use in this study based on meeting the criteria of availability in administrative data, relevance to assessing differences in quality and process of care across provider type, and plausible

association with work-related disability: (1) whether the first visit occurred within 1 day of injury, (2) whether the accident report was filed within 7 days of the first visit, (3) early telephone communication about care coordination or treatment, (4) whether work-relatedness was specified on the accident report, and (5) regularity of care while on time loss. Variants of these indicators were evaluated for use in the COHE project via a systematic review of the best available data and the development of formal consensus among clinical experts,^{2, 7, 23} and were among the quality and performance measures for process of care suggested by Pransky, et al.¹

Each process indicator was framed as a binary variable, so that each claim either met or did not meet the criteria for each indicator. The association of the first four process indicators with disability was described in two ways: (1) the percent of claims involving any time loss compensation, and (2) the median number of compensated time loss days for those claims with any time loss compensation. These were baseline indicators, in the sense that they were met (or not) very early in the natural history of a claim, so that associations with the presence or duration of time loss can be at least tentatively interpreted as causal. The association of the more downstream regularity of care indicator with time loss compensation was described using only median number of time loss days, since the denominator included only claims with any time loss compensation. As a step toward further validation of these indicators, association with claim volume was assessed, since volume has often been associated with quality and performance in clinical settings.^{24, 25} Providers who were responsible for more than an average of 2 claims per month in the year following implementation were considered higher volume providers (as a proxy for familiarity with the L&I system, since this might affect a provider's efficiency or knowledge of best practices).

Each of the 5 selected quality/process of care indicators is described in more detail below. This includes the rationale for selecting the indicator and the criteria used to determine whether each indicator was met.

First visit within 1 day of injury. Reducing delays in diagnosis and treatment

may shorten work absence.^{26,27} The Washington State Department of Labor & Industries (L&I)'s Attending Doctor's Return to Work Desk Reference lists same-day scheduling for work-related injuries or illnesses as a best practice.²⁸ We considered this indicator to be met if the first medical visit occurred within 1 calendar day of the injury, since we had no information on the time of day that the injury occurred.

Report filed within 7 days of first visit. Delays in accident report filing are associated with longer work absence.^{27,29,30} Providers of workers' compensation-related care in Washington State are legally required to file the accident report within 5 days of identifying a work-related injury or illness, however compliance is inconsistent. Time from the first visit to filing of the accident report was identified in the COHE quality indicator report as a useful performance indicator, and the COHE project uses 2 days as a benchmark for incentives.^{23,27} We considered this indicator to be met if the accident report was received by L&I within 7 calendar days of the first medical visit, reflecting the 5-day requirement and a 2-day allowance for weekends.

Telephone communication about case at the first visit. Return to work can be facilitated by improving communication between health care providers, employers, and injured workers, and communication failures are linked with poor outcomes.^{26,31,32} We considered this indicator to be met if there was a submitted and allowed bill for discussing or coordinating care or treatment with the injured worker, department staff, nurse case manager, department medical consultant, or employer by telephone on the first medical visit date. (Telephone calls for authorization, resolution of billing issues or ordering prescriptions are not payable and were not included.) The COHE quality indicator report recommended the use of 2-way communication with the employer at the first visit when the worker is off or expected to be off work.²³ However, the special billing codes created for the COHE project and used to identify such calls were unavailable to the non-COHE providers in this study. We did not limit the denominator to claims resulting in compensated time loss, since it was feasible that early communication could prevent time loss of more than 3 days via arrangements for modified work. However, we also recognized that many claims would not require such

communication.

Work-relatedness specified on report. Absent or inadequate documentation of work-relatedness on the accident report can delay claim approval and delay payment for medical care and time loss.²³ We considered this indicator to be met if Question 48 on the accident report form [*Was the diagnosed condition caused by this injury or exposure? Yes, Probably, Possibly, No*] was answered rather than left blank. This measure reflects the care taken by a provider to document whether an illness is work-related, and was recommended in the COHE quality indicator report.²³ The COHE report also recommended the use of 2 other aspects of work-relatedness documentation (documentation of the presence or absence of a disorder and adequate description of relevant work or incident history), but those aspects were not available in the administrative data.

Regularity of care while on time loss. Continuity of care, defined variously as transfers of care, regularity of visits, intensity of care, breaks in contact, etc.,³³ has been linked with improved outcomes and less unnecessary utilization.³⁴⁻³⁶ The COHE quality indicator report²³ recommended that continuity of care be operationalized as the percentage of workers who had a health care provider visit every 2 weeks for the first 2 months while they had not yet returned to work (this is also considered a measure of regularity of care³⁷). The COHE report also recommended there be at least one visit 2 to 4 weeks following return to work; however, the date of return to work was not available in the administrative data. Only claims with more than 2 weeks of time loss were included in the denominator for this indicator. Any visit (other than the first medical visit) was considered qualified if it was billed using an Evaluation and Management CPT code and was allowed by L&I. We considered this indicator to be met if any of the following were true:

- At least 2 but less than 4 weeks of time loss and at least one qualifying visit within 2 weeks of the first visit
- At least 4 but less than 6 weeks of time loss and at least one qualifying visit in each of the first two 2-week periods

- At least 6 but less than 8 weeks of time loss and at least one qualifying visit in each of the first three 2-week periods
- More than 8 weeks of time loss and at least one qualifying visit in each of the first four 2-week periods

Results

Provider Characteristics

85 NPs and 974 PCPs were recorded as first attending providers for the 2,779 eligible back sprain/strain claims filed during the year after SHB 1691 implementation (some providers filed accident reports for more than one claimant). Of the PCPs, 17% were internists, 68% were family practitioners, and 15% were general practitioners. (L&I does not record specialty for NPs.) NPs tended to be responsible for fewer claims; 64.7% of NPs were responsible for an average of fewer than 2 claims per month over the first year after implementation, compared with 47.0% of PCPs ($P = .002$).

Claimant/Employer Characteristics

Of the 2,779 eligible back sprain/strain claims, 217 were filed by NPs and 2,562 by PCPs. Mean age was 34.8 for claimants seeing NPs, compared with 37.0 for those seeing PCPs ($P = .004$). Male claimants were more likely to have PCPs as their attending provider (see Table 4.1). Median pre-injury monthly income was \$1,936 for claimants seeing NPs, compared with \$2,227 for those seeing PCPs (computed using only the 870 claims involving time loss; $P = .08$). Median claim duration (measured from accident report filing to claim closure) was 91 days for both NP and PCP claims. The distribution of employment related variables was quite similar between NP and PCP claims (see Table 4.1).

Claim Characteristics

NP claims were less likely to have any time loss compensation than were PCP claims (see Table 4.2). There were no significant differences in other claim characteristics across provider type. Crude percentages and P -values were almost identical to those derived (and presented in Table 4.2) using direct standardization by

age and sex.

Quality/Process of Care Indicators

There were fairly strong associations of these process indicators with disability (see Table 4.3). Claims for which there was a first visit within a day of injury were less likely to have any time loss, and among those with time loss, duration was shorter. Time loss duration was shorter when the accident report was filed within 7 days. Claims for which there was telephone communication at the first visit were less likely to have any time loss, but time loss duration was not affected. Claims for which work-relatedness was specified on the accident report tended to have a shorter duration of time loss, though there was no association between documentation of work-relatedness and whether there was any time loss. Lastly, regularity of care while on time loss was associated with shorter time loss duration.

There were also strong associations of these process indicators with claim volume (see Table 4.4). Providers responsible for fewer claims were significantly less likely to meet every process indicator, with the exception of regularity of care.

Age and sex standardized percentages of claims meeting each process indicator by provider type are presented in Table 4.5. There was wide variation in the percentage of claims meeting each indicator, from under 5% for telephone communication at the first visit to over 95% for documentation of work-relatedness on the accident report. In general, there were few significant differences between NP and PCP claims. Claimants seeing NPs were somewhat more likely to be seen within 1 day of injury (52.4% compared with 44.4% for those seeing PCPs, $P = .03$). Logistic regression models that controlled for age and sex and accounted for the correlation of outcomes within a specific provider's practice did not provide evidence for significant differences between NP and PCP claims in the odds of having met any of these indicators.

Discussion

This study developed a number of quality/process of care indicators available in Washington State workers' compensation administrative data. There were fairly

strong associations of these indicators with claim volume and with measures of disability outcomes (any time loss and duration of time loss). We then used these indicators to evaluate the impact of pilot legislation authorizing NPs to function as attending providers. Previous studies evaluating this pilot program did not find evidence for any negative impact on medical costs or disability outcomes and suggested that authorizing NPs as attending providers for injured workers may be a cost-effective approach to address access barriers.^{38, 39} However, process measures provide a more appropriate and sensitive “closer to the source” assessment of provider practice differences than do outcome measures.⁴⁰⁻⁴² Using this set of indicators, we found no evidence of systematic differences in the care provided to claimants with uncomplicated back injuries based on first attending provider type (NP/PCP).

Although not intended to be definitive measures of quality or of provider performance, these indicators demonstrated some potential as metrics for tracking system performance and improving disability outcomes. We limited our sample to back sprains/strains to maximize homogeneity, however these indicators are generic and could be applied across conditions. Providers responsible for fewer claims were significantly less likely to meet every process indicator, with the exception of regularity of care. (Even for regularity of care, the direction of effect was as expected and lack of significance may have been a function of fewer observations due to including only claims with over 2 weeks of time loss.) This is consistent with prior research showing a relationship between volume and quality indicators.²⁴ Based on the literature supporting an association between volume and outcomes,²⁵ these findings suggest a need for further research into the relationship between volume, quality, and outcomes in occupational health care. It is worth noting that although NPs were responsible for fewer claims on average, their group performance on these indicators (relative to PCP performance) did not appear to be negatively impacted.

As anticipated, there was wide variation in the percentage of claims meeting each indicator (Table 4.5). The highest compliance was found for documentation of work-relatedness on the accident report. This was unsurprising (since a claim cannot

be processed without this information), but even small rates of missing information can lead to delays that can negatively impact workers. Telephone communication at the first visit had the lowest percentages, which was also unsurprising since most simple claims would not require such communication. An injured worker being seen within 1 day of injury is a best practices goal, but is perhaps less likely to occur for uncomplicated back injuries where there may tend to be a delay between the date of injury and the date a worker contacts a health care provider. The 2 metrics that appear most in need of and perhaps most amenable to intervention are (1) timely filing of the accident report and (2) regularity of care while on time loss. Approximately half of claims did not have at least one of these two important indicators met, despite the regulatory requirement that the accident report be filed within 5 days and the high risk for extended time loss that work-disabled claimants face if their care is not closely monitored. Data from the COHE project suggest that providing incentives for meeting quality improvement indicators can substantially increase compliance and, in turn, may substantially improve disability outcomes.^{29, 30}

Limitations

The usefulness of the indicators evaluated in this study may vary across jurisdictions, depending on local workers' compensation regulations and data availability. There were also conceptual and measurement issues with each indicator that must be taken into account in further development. For example, time from injury to the first visit was considered as a possible quality indicator for the COHE project, but the ability to track when the worker first contacted the provider's office was considered critical in order to assess individual provider performance.²³ As another example, a higher prevalence of telephone communication billing codes on the first visit date could mean that the attending provider type was more likely to call the employer or others involved in the case to discuss or coordinate care, or was more likely to have cases requiring such calls, or simply was more likely to bill for such phone conversations.

Despite the inclusion of all eligible claims filed in the year after

implementation of SHB 1691, we had a relatively small (though population-based) sample of claims filed by a relatively small number of NPs. This study had 80% power to detect differences of approximately 5 to 10 percentage points in the quality indicators. More work is needed to determine what a clinically significant difference in these indicators might be, and to validate their use with clinical data and in larger samples of claims.⁵

This observational study included statistical control for case mix and controlled for injury type and severity by restriction. Selection bias remained of some concern due to the potential for unmeasured differences in worker choice of attending provider. However, there was little difference in case mix between NPs and PCPs in this sample, and direct standardization by age and sex had little impact on the findings. NP claims were less likely to have any time loss compensation than were PCP claims, but there were essentially no differences in other potentially costly claim characteristics across provider type.

The use of administrative data may have contributed error in several well-known ways.^{43, 44} The exclusion of self-insured companies may have led to underestimates of claim volume. NPs certified as occupational health specialists were not identifiable as such, and there may be associated practice differences.^{11, 16} The data do not allow for a full understanding of the reasons that process indicators were not met. In addition, NPs and physicians may tend to code or bill differently for the same care.

Despite the limitations inherent in relying on administrative data, there were important advantages, particularly the population-based nature of this study and the ability to efficiently link enrolled provider data with claim and injury, medical billing, and time loss data.⁴⁵ Another strength of this study was the implementation of variants of quality indicators that had previously been vetted by expert panels for use in Washington State.⁷

Conclusions

We took advantage of the implementation of SHB 1691 to evaluate the use of

several generic quality/process of care indicators that were available in Washington State worker's compensation administrative data, including: (1) whether the first visit occurred within 1 day of injury, (2) whether the accident report was filed within 7 days of the first visit, (3) early telephone communication about care coordination or treatment, (4) whether work-relatedness was specified on the accident report, and (5) regularity of care while on time loss. Using these indicators, we found no evidence of systematic differences in the care provided by attending NPs and PCPs to workers with uncomplicated back injuries. However, these indicators were strongly associated with work-related disability and there was considerable room for improvement, suggesting that targeted incentives could substantially improve outcomes.

Table 4.1. Sample characteristics by attending provider type

Claimant/employment characteristics	Percent of NP claims (N = 217)	Percent of PCP claims (N = 2,562)	<i>P</i>
Male	57.6	66.2	.01
Industry*			.68
Agriculture/forestry/fishing	8.3	6.0	
Services	30.9	30.0	
Construction/mining	13.4	16.2	
Manufacturing	11.5	11.2	
Transportation/communications/utilities	4.2	5.1	
Wholesale/retail trade	25.8	24.1	
Finance/real estate/administration	6.0	7.4	
Public sector employment	5.5	8.4	.14
Retrospective rating group at time of injury†	54.4	50.3	.25
Small employer (< 25 FTE)	29.5	28.0	.64

*Based on collapsed Standard Industrial Classification (SIC) codes

†Retrospective rating group reflects employer participation in an optional L&I financial incentive program intended to encourage employers to control their workers' compensation costs

Table 4.2. Claim characteristics by provider type

Claim characteristics	Percent of NP claims* (N = 217)	Percent of PCP claims* (N = 2,562)	<i>P</i>
Time loss claim	25.3	31.8	.047
Permanent partial disability payment	1.6	2.6	.37
Claim still open at 6 months	18.6	22.3	.21
Claim still open at 12 months	9.1	11.0	.39
Claim reopened	1.3	0.9	.56
Transfers of attending provider	19.3	20.1	.78
Attorney representation	0.7	1.8	.23
Claim disputes	15.2	12.9	.33

*Age/sex standardized

Table 4.3. Association of quality/process indicators with disability/time loss

Quality/process indicator	N	Claims with any time loss (percent)	P	N	Median time loss duration* (days)	P
<i>Baseline:</i>						
First visit within 1 day of injury	2,678	28.9	.01	840	16.0	.02
Met		33.4			23.0	
Not met		30.1	.07	843	18.0	.03
Report filed within 7 days of first visit	2,681	33.4	<.001	870	26.0	.28
Met		9.5			79.0	
Not met		32.1	.92	870	20.0	.02
Telephone communication at first visit	2,779	31.3			19.5	
Met		31.9			80.0	
Not met						
Work-relatedness specified on report	2,779					
Met						
Not met						
<i>Downstream:</i>						
Regularity of care while on time loss†	N/A		N/A	503	31.0	<.001
Met		N/A			142.0	
Not met		N/A				

*Denominator limited to claims with any time loss

†Denominator limited to claims with more than 2 weeks of time loss

Table 4.4. Association of quality/process indicators with claim volume

Quality/process indicator	N	Percent of low volume provider claims* (N = 661)	Percent of higher volume provider claims† (N = 2,118)	P
<i>Baseline:</i>				
First visit within 1 day of injury	2,678	35.8	47.6	<.001
Report filed within 7 days of first visit	2,681	52.8	62.5	<.001
Telephone communication at first visit	2,779	0.3	4.4	<.001
Work-relatedness specified on report	2,779	96.1	98.0	.006
<i>Downstream:</i>				
Regularity of care while on time loss‡	503	40.9	44.3	.50

* < 2 claims/month

† ≥ 2 claims/month

‡ Denominator limited to claims with more than 2 weeks of time loss

Table 4.5. Association of quality/process indicators with provider type

Quality/process indicator	N	Percent of NP claims* (N = 217)	Percent of PCP claims* (N = 2,562)	P
<i>Baseline:</i>				
First visit within 1 day of injury	2,678	52.4	44.4	.03
Report filed within 7 days of first visit	2,681	57.5	60.5	.39
Telephone communication at first visit	2,779	4.7	3.3	.28
Work-relatedness specified on report	2,779	96.2	97.7	.17
<i>Downstream:</i>				
Regularity of care while on time loss†	503	46.2	43.1	.73

*Age/sex standardized

†Denominator limited to claims with more than 2 weeks of time loss

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Conclusion

The goal of occupational health services research has been identified as the promotion of “the adoption of policies and procedures that ensure that all injured workers have access to the best possible care with a goal of minimizing disability and maximizing functional status, employability, and quality of life.”¹ This dissertation project addressed many important facets of occupational health services research in the evaluation of SHB 1691: health policy, access to health care for injured workers, system efficiency, quality/process of care, medical costs, and injured worker outcomes.

Summary of Findings

In the first year after implementation, NPs were the first attending provider for 7% of the accepted claims filed by primary care providers (which nearly parallels the estimate that NPs provide 10% of generalist outpatient visits in Washington State).² With the notable exception that NPs were more likely than PCPs to serve workers in rural and distressed areas, there were not substantial differences in case mix between NPs and PCPs. The distributions of injury type and severity/complexity indicators were quite similar across provider type.

Regardless of choice of participation metric (attending provider status, provider billing activity, or new enrollment applications), or choice of denominator (land area, injury claims, or employed population), there was an observed increase in NPs participating with L&I after implementation of SHB 1691, particularly in rural areas (in contrast to findings for PCPs). SHB 1691 was associated with a 16 percentage point improvement in timely accident report filing for claimants seeing only NPs at the first medical visit, with a similar effect in rural and urban areas.

Regardless of choice of sample or statistical model, there were not significant differences in medical costs or disability outcomes for NP claims compared with PCP claims (except for the likelihood of any compensated time loss). This suggests that provider type (NP/PCP) is simply not an important predictor of medical costs or disability for injured workers, in comparison with other factors such as

sociodemographics, injury and medical history characteristics, and employment-related variables.

Several quality/process of care indicators that were available in Washington State worker's compensation administrative data were evaluated, including: (1) whether the first visit occurred within 1 day of injury, (2) whether the accident report was filed within 7 days of the first visit, (3) early telephone communication about care coordination or treatment, (4) whether work-relatedness was specified on the accident report, and (5) regularity of care while on time loss. Using these indicators, there was no evidence of systematic differences between NPs and PCPs in the care provided for claimants with uncomplicated back injuries. Although they were not intended to be definitive measures of quality or of provider performance, these indicators were associated with both work-related disability and claim volume. The administrative data available did not allow for assessing injured workers' satisfaction with care directly, however three claim characteristics that might be loosely associated with satisfaction (transfers of attending provider, disputed claims, attorney representation) did not differ across provider type.³

Administrative Data

All of the analyses presented in this dissertation depended on administrative data, which presented particular challenges. In general, administrative databases are not designed nor maintained to maximize data quality for research purposes.⁴ Data fields that are not reimbursement-related may tend to be less accurate or complete.⁵ Coding systems or variable meanings may tend to change over time, reflecting administrative needs for efficiency or convenience rather than research needs for historical continuity.⁴ These issues, in combination with the high likelihood of human error (data entry errors, miscoding, missing data), can mean that information bias is a serious consideration when interpreting findings.⁶ In addition, administrative data generally cannot measure the interpersonal quality of care, the technical quality of care processes, the appropriateness of care, or identify most errors of omission or commission.⁷ Reliance on administrative data restricted the ability to evaluate factors

such as injured workers' satisfaction with their health care or their providers, or provider satisfaction with the rule changes induced by SHB 1691.

Despite the limitations inherent in relying on administrative data, there are important advantages, particularly the ability to link enrolled provider data with claim and injury, medical billing, and time loss data, both at the individual and population-based levels.⁸ Administrative data have been underutilized in the workers' compensation arena,⁹ but can be used to efficiently evaluate processes that affect work-related disability and to develop and implement policies and incentives to improve quality at a system level, without requiring the ongoing use of resource intensive methods such as medical record review.

Stakeholder Involvement

The evaluation of SHB 1691 was seen by a number of stakeholders as central to the decision-making process regarding a replacement bill. Because of the political nature of this evaluation, it was important to communicate with stakeholders beginning early in the process.¹⁰⁻¹² A theoretical stakeholder analysis was developed prior to stakeholder contacts and then updated based on information obtained via contacts and interviews. (Stakeholder analysis is the process of identifying and prioritizing stakeholders and mapping their values and interests relative to a particular organization, project, or policy.¹³) In the context of this evaluation, conducting a stakeholder analysis was useful in gaining a fuller understanding of the political context of this legislation and for the development of an evaluation plan that incorporated the ideas and interests of stakeholders as inclusively as possible.

Stakeholders were prioritized in consultation with key contacts at L&I, consistent with the prioritization in other workers' compensation-oriented stakeholder analyses.^{10, 12} Stakeholder contact began with initial introductory phone calls, followed by semi-structured interviews. Interview topics included: official and/or unofficial position on the bills and the rationale for that position, perspective on the political process, comments on the details of implementation and on any noted early impact, and specific input regarding the evaluation design. The preliminary evaluation design

was refined based on information from these interviews, and a brief summary was provided to stakeholders in August of 2005 with a formal request for comments. In general, stakeholders were very interested in maintaining communication about the evaluation approach and the proposed measures. The following stakeholder organizations were contacted:

- Workers' Compensation Advisory Committee (WCAC)
- Association of Washington Business (AWB)
- Washington Self-Insurers Association (WSIA)
- ARNPs United of Washington State (AU)
- Washington Academy of Physician Assistants (WAPA)
- Washington Osteopathic Medical Association (WOMA)
- Washington State Chiropractic Association (WSCA)
- Washington State Labor Council, AFL-CIO (WSLC)
- Washington State Medical Association (WSMA)
- Washington State Nurses Association (WSNA)

Following this process, a presentation of the evaluation plan was made to the L&I Workers' Compensation Advisory Committee (WCAC) on September 26, 2005. (The WCAC advises and serves as a sounding board for the Director of L&I and the Assistant Director for Insurance Services on matters pertaining to the state's workers' compensation system. Members include representatives from business, organized labor, self-insured employers and the Board of Industrial Insurance Appeals.)

Policy Impact

The stakeholder interviews revealed both shared and divergent values and interests, converging into a few categories. Table 5.1 presents the values expressed by key stakeholders and the position they originally took on this legislation. NPs supported SHB 1691 and were its primary source of advocacy. ARNPs United (an advocacy group for NPs in Washington State) had been working on this issue for several legislative sessions but faced strong opposition by organized medicine and employer groups. Organized medicine initially opposed the bill based on stated

concerns about quality of care (and perhaps also due to scope of practice issues). Employer organizations were strongly opposed, expressing concern that expansion of the attending provider pool might lead to increased utilization and costs due to less qualified or experienced providers, and also concern that NPs might be more empathetic than physicians, potentially increasing both the numbers of claims filed and time loss costs. Organized labor was generally supportive of this bill because they were interested in increased access to health care for their members. However, they were also concerned about whether NPs would provide care to injured workers that would be equivalent in quality to that provided by physicians. L&I was officially neutral. SHB 1691 ultimately passed subsequent to some political compromises, including the addition of the 3-year sunset clause and language mandating the evaluation of outcomes, claim costs, and disputed claims prior to sunset.

The policy impact of this research was assessed using the framework described by Lavis et al.,¹⁴ with a particular focus on whether stakeholders' decisions reflected (at least in part) the research available to them. Information about changes in position that might be related to the findings of this research was drawn from communication with stakeholders and from the public record of stakeholder positions on House Bill 1666, which eliminated SHB 1691's sunset date and made the rule changes due to SHB 1691 permanent (those positions are reported in the last column of Table 5.1). NP and labor representatives did not change their positions. The Association of Washington Business (AWB) changed their position from opposition to support. According to several stakeholders, this change was key to ensuring smooth passage of the replacement bill. AWB was comfortable with the content and findings of the evaluation and felt it adequately addressed their concerns about NPs serving as attending providers. This was a clear-cut example of instrumental use of research.¹⁴ The Washington State Medical Association changed their position from opposition to neutrality. L&I was originally neutral, however they supported making the rules permanent based on the results of the evaluation. House Bill 1666 unanimously passed the House and Senate and was signed into law by the Governor on May 2, 2007.

This project had an impact on all four levels of the impact pyramid described by the Agency for Healthcare Research and Quality (AHRQ),¹⁵ by (1) contributing to the health care knowledge base, (2) resulting in a permanent policy change in Washington and perhaps elsewhere, (3) changing patterns of care (placing NPs in a new attending provider role), and (4) affecting health outcomes directly by impacting the continuance of rules that shortened accident report filing times and increased access to care. A number of factors may have contributed to this research having the impact it did. Interaction between researchers and policymakers and the existence of an accountable “receptor” function in government are conditions that favor the use of health services research,¹⁶ and both were present in this project. There was ongoing collaborative communication between the research team and stakeholders in defining the research questions and developing a research design, and attention to thorough dissemination of the results.¹⁷ Weiss described a set of circumstances conducive to research having a direct influence on policy: a well defined decision situation, a set of policy actors with responsibility and jurisdiction to make the decision, an issue whose resolution depends to some extent on information, identification of the requisite informational need, research that provides information in terms that match the circumstances within which choices will be made, and research findings that are clear-cut, timely, comprehensible and understood, and that do not run counter to strong political interests.¹⁸ Although Weiss stated that the confluence of all these factors would likely be rare, all of these circumstances were present to at least some degree for this project.

Research Gaps

As is typical in health services research, this research was constrained by a short time frame.¹⁹ Due to the sunset clause and evaluation timeline there was inadequate time to allow for full diffusion or to measure changes in long-term outcomes. Further research after more time has passed and using more experimental designs would be useful in confirming these findings.

The association of the quality/process of care indicators with volume suggests

the need for research into the relationship between volume, quality, and outcomes in workers' compensation-related health care. The strong association of these indicators with disability outcomes, and the generally poor overall performance in meeting them, suggests the need to develop targeted incentives to improve outcomes.

In addition, it was not possible to identify NPs certified as occupational health specialists using L&I data, and further research specifically among providers specializing in occupational health would be informative. It is possible that specialized occupational health training may be more important than provider type.

Implications

Although generalizability is limited by the variation between states in NP scope of practice and workers' compensation regulations, this evaluation provides important new information regarding the role of NPs in meeting existing challenges to workers' compensation systems in the areas of health care access and delays, quality, outcomes, and costs. These issues are of pressing importance to state and federal policy makers.²⁰ For example, Oregon is in the midst of a similar policy experiment and legislation that would expand the Federal Employees Compensation Act's definition of physician to include NPs and PAs is currently under consideration.

Conclusions

Authorizing NPs to function as attending providers for injured workers was not associated with any negative impact on medical costs or disability outcomes, and appeared to positively affect provider enrollment, availability of authorized attending providers in rural areas, and administrative efficiency. In addition, by increasing access to providers willing to care for injured workers and improving the timeliness of accident report filing, SHB 1691 may have improved system costs and outcomes via the link between timely intervention and less work-related disability.²¹⁻²⁴ From a societal perspective, expanding the use of NPs in appropriate settings is an efficient use of resources, since the cost of educating NPs is lower. This research suggests that authorizing NPs as attending providers for injured workers may be a cost-effective approach to expanding the available workers' compensation provider workforce.

Table 5.1. Stakeholder values and positions relative to SHB 1691

Stakeholder	Protect scope	Improve access	Low costs	Quality care	System efficiency	Original position	Current position
NPs	X	X		X	X	Support	Support
Physicians	X			X	X	Oppose	Neutral
Workers		X	X	X	X	Support	Support
Employers			X		X	Oppose	Support
L&I			X	X	X	Neutral	Support

Notes to Chapter 5

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