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Intraoperative Neurophysiological Monitoring Reimbursement Post International Classification of Diseases-10

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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Abstract

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

International Classification of Diseases the 10th Revision (ICD-10) was implemented October 1, 2015, and there was little knowledge how the transition to ICD-10 would impact the revenue cycle for intraoperative neurophysiological monitoring medical practices in Oklahoma. This correlational quantitative study examined the changes in dependent variables of reimbursements due to the change from ICD-9 to ICD-10 for independent variables of intraoperative neurophysiological monitoring procedure codes. The reimbursements from 2014 were compared to reimbursements from 2016. Prices were adjusted for inflation to 2016 dollar values. Annual reimbursements decreased for all intraoperative neurophysiological monitoring procedures examined except the remote monitoring code. The intraoperative neurophysiological monitoring procedure with the greatest mean annual decreases in reimbursement was the lower somatosensory evoked potentials. The intraoperative neurophysiological monitoring procedures with the least annual reimbursement decreases were transcranial electrical motor potential monitoring and electromyography. The findings of the budget-impact analysis and cost-effectiveness analysis indicated that reimbursement for procedures has steadily decreased from 2014 to 2016, causing a negative effect on practices' revenue cycle management. The findings of this study could benefit intraoperative neurophysiological monitoring companies in Oklahoma by supporting adjustments essential for healthcare leaders to maintain a financially sustainable intraoperative neurophysiological monitoring medical practice.

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Dedication

This Doctoral Study for the Degree of Doctor of Healthcare Administration is dedicated to Bo, my family, and for the industry that became my career. I would especially like to dedicate this to my father, who never stopped believing in me.

Acknowledgments

Acknowledgment to Committee Chair Suzanne Richins, DHA and Committee Member Melissa Green, DHA, without their continued guidance and support, the study would never have been completed. The sacrifices of my family and friends during this process is also acknowledged and greatly appreciated during the doctoral process.

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Section 1: Foundation of the Study and Literature Review

Introduction

The changes in medical coding from International Classification of Diseases (ICD) 9th to the 10th revision was a massive undertaking by physicians, hospitals, and clinics. The positive and negative effects of this change have been uncovered for specialties across the United States. This study will evaluate the changes in reimbursements due to the change from ICD-9 to ICD-10 for intraoperative neurophysiological monitoring in Oklahoma. There are several small intraoperative neurophysiological monitoring companies in Oklahoma and these changes may affect their livelihood. Without a study on the changes in reimbursement, these companies could cease to be financially solvent. The potential positive social change implications of the study will assist healthcare leadership to understand these changes to be able to make the necessary changes in business. It could also assist their revenue cycle management to ensure the stability and future of Oklahoma intraoperative neurophysiological monitoring companies. This section will cover the background, purpose, theoretical framework of the problem, and research questions.

Background

Knowledge regarding the business effects of reimbursement changes is fundamental for any healthcare organization. Without effective leadership, healthcare organizations can experience difficulty establishing processes to stay compliant and profitable (Colton & Wofford, 2013).

Rethinking revenue cycle management by understanding financial implications will allow intraoperative neurophysiological monitoring leadership to ensure competitive advantage and to grow (Hackbarth & Gamble, 2017). Revenue cycle management includes an office's medical claims processing, payments, and revenue generation. The office processes patient eligibility, collection of copays, claims coding, claims tracking, payment collection, and follow-up of denied claims (Bentley & Robinson, 2016). Loss of revenue and reimbursements occurs through inappropriate use of ICD-10.

Data analytics, contract management, coding, and denial of claims management represent key pieces of the revenue cycle management for a practice manager's review (Cerner, 2017). The concepts of business operations and implementation best practices can be lost, which affect the financial viability of the practice. This is because providers are too busy with patient care as they focus on clinical aspects instead of management (Healthcare Financial Management Association [HFMA], 2015).

Padarthy (2012) described the conversion of code sets as touching every aspect of the practice from patient care to data analysis. The conversion from ICD-9 to ICD-10 affects every part of healthcare business requiring an analysis to determine the overall effects. A financial impact analysis will assess the changes in reimbursement. The changes in reimbursements caused by the change from ICD-9 to ICD-10 must be studied to ensure the financial stability of the practice and specialty.

The estimated time and cost of the revenue cycle for an inpatient surgical procedure is 100 minutes with reimbursement of $215.10 per procedure, which accounts for 3.1% of total revenues (Tseng, Kaplan, Richman, Shah, & Schulman, 2018). With

administrative costs estimated at 25-31% of total health care expenditures in the United States (Tseng et al., 2018), an understanding of the changes in reimbursements will enable intraoperative neurophysiological monitoring company leaders to optimize revenues. The financial benefits of an effective revenue cycle management process comprise a linear relationship between the measurement of the effectiveness with positive outcomes (Singh, Mindel, & Mathiassen, 2017). Practice leaders need to understand the revenue and reimbursement requirements to effectively make decisions for the company (Fang & Li, 2015). The ICD-10 implementation affected everyone and all resources within a health system (Leenheer, 2012). Since the implementation of ICD-10 on October 1, 2015, I did not find literature regarding the effect to the revenue cycle for intraoperative neurophysiological monitoring.

Problem Statement

When ICD10 was implemented, there was little knowledge of how that transition would impact the revenue cycle for intraoperative neurophysiological monitoring medical practices in Oklahoma. The increased costs of implementing the ICD-10-CM were not studied previously to determine the effect on reimbursement rates for intraoperative neurophysiological monitoring medical practices in Oklahoma for healthcare leadership. Knowledge of the reimbursement changes and the effects on the business are fundamental for any healthcare organization to survive and to thrive in the market.

Without effective healthcare leadership, the organizations will have a difficult time establishing the required processes to stay compliant and profitable (Colton & Wofford, 2013). The intraoperative neurophysiological monitoring industry constantly

changes with new companies as well as acquisitions in the area and surrounding states such as the NuVasive, Inc. acquisition of NeuroNetwork, LLC for 98 million dollars (PR, 2017). The intraoperative neurophysiological monitoring market is expected to reach $3.6 billion by 2025, which caused intraoperative neurophysiological monitoring acceptance as a standard of care due to its benefits (PR, 2017). More research about the importance of accurate use was needed for healthcare administrators' use in intraoperative neurophysiological monitoring. The literature contains information on revenue cycle management, but it does not include specific information on intraoperative neurophysiological monitoring other than a few blogs.

Purpose

The purpose of this correlational, quantitative study was to provide understanding specific for health care leaders regarding the changes in reimbursement following ICD-10 implementation in intraoperative neurophysiological monitoring companies in Oklahoma. In this project I addressed the lack of research specific to the administrative side of intraoperative neurophysiological monitoring. The results of this study may provide much-needed insights into the actual changes that affects this industry allowing healthcare revenue cycle managers and management to adjust business practices to stay profitable. There is a gap in studies on the changes in reimbursement following ICD-10 implementation in most specialties, especially intraoperative neurophysiological monitoring companies. The variables that will be studied will be the Current Procedural Terminology (CPT) codes for intraoperative neurophysiological monitoring and the reimbursements for each code specific to a variety of insurance companies, such as

Medicare, Medicaid, and average of commercial insurance carriers following the ICD-10 implementation years. The relationship between the CPT code and the reimbursement amount centers on payment differences to physicians and other providers who earn their income based on the services they provide (CPT) and were paid by insurance companies (reimbursements) based on the CPT codes performed and submitted. The ICD-10 coding is the major change in coding for the diagnosis or the reason for the CPT/procedure. The specification requirements for ICD-10 determine whether documentation by providers meets guidelines of payment codes. The physicians' in specialties such as orthopedics were at risk of losing revenue due to poor documentation (Lussier et al., 2016). This research may provide information for leadership to use for a better understanding of the effect of changes in reimbursements following ICD-10 implementation for intraoperative neurophysiological monitoring.

Research Questions and Hypothesis

The overarching research question is: What is the statistical significance, if any, between the changes in reimbursements from following the ICD-10 implementation in intraoperative neurophysiological monitoring companies in Oklahoma? The datasets will provide the reimbursements per CPT code for 2014 and 2016 to include before ICD-10 implementation and following. The CPT codes for the study are listed below in addition to the research questions. I included Medicare, Medicaid, and other commercial insurance carriers in this study.

Table 1

CPT Codes for Intraoperative Neurophysiological Monitoring

CPT Code	Description
G0453	Remote Intraoperative Monitoring
95925	Upper SSEP Bilateral
95926	Lower SSEP Bilateral
95938	Upper & Lower SSEP Bilateral
95927	Trunk/Head SSEP Bilateral
95928	TcMEP Upper Limbs
95939	TcMEP Upper & Lower Limbs
95937	NeuroMusclular Junction (TOF)
95861	EMG Two Extremity
95870	Trunk/Extremity EMG
51785	Anal Sphincter
95812	EEG 41-60 minutes
95813	EEG greater than 1 hour

Research Question1: To what extent was the difference, if any, between the independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables within the Medicare Fee Schedule for 2014 and 2016 for intraoperative neurophysiological monitoring companies in Oklahoma?

$H_0$1: There was not a statistically significant difference on independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables of the Medicare Fee Schedule for 2014 and 2016.

H_a1: There was a statistically significant difference on independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables of the Medicare Fee Schedule for 2014 and 2016.

Research Question 2: What was the difference between the independent variables of intraoperative neurophysiological monitoring CPT codes and the dependent

continuous variables of the rate paid by commercial carriers for 2014 and 2016 for intraoperative neurophysiological monitoring companies in Oklahoma?

$H_0$2: There was not a statistically significant difference between the independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables of the rate paid by commercial carriers for 2014 and 2016.

H_a2: There was a statistically significant difference between the independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables of the rate paid by commercial carriers for 2014 and 2016.

Research Question 3: How did the conversion from ICD-9 to ICD-10 (i.e., 2014 versus 2016) affect the revenue cycle management for intraoperative neurophysiological monitoring companies in Oklahoma?

$H_0$3: The conversion from ICD-9 to ICD-10 (i.e., 2014 versus 2016) positively affected the revenue cycle management for intraoperative neurophysiological monitoring companies in Oklahoma.

H_a3: The conversion from ICD-9 to ICD-10 (i.e., 2014 versus 2016) negatively affected the revenue cycle management for intraoperative neurophysiological monitoring companies in Oklahoma.

Theoretical Foundation

The theoretical base or conceptual framework that grounded the study is budget impact analysis and cost-effectiveness analysis. The changes in reimbursements for intraoperative neurophysiological monitoring requires a broad view of budget impact analysis and cost-effectiveness analysis for the effects on short-term and long-term

practice management and revenue cycle management considerations (Bilinski et al., 2017). Cost-effectiveness and budget impact analysis will enable practice managers to design the revenue cycle department for intraoperative neuromonitoring companies to be successful and closes the gap between cost-effectiveness and affordability (Bilinski et al., 2017). Cutler and Ericson (2010) used cost-effectiveness analysis with the social cost and posted prices in the pharmaceutical industry.

Nature of the Study

The nature of the study will be a quantitative research approach, which is appropriate for the topic identified in the problem statement of reimbursement rates in intraoperative neurophysiological monitoring. The independent variables of intraoperative neurophysiological monitoring CPT codes will be compared to the dependent variables of insurance reimbursements and the Medicare Fee Schedule for the year 2014 and 2016 through statistical testing of sample *t* test.

The variances in reimbursement for the CPT codes used in intraoperative neurophysiological monitoring from 2014 to 2016 will be analyzed, which is the period of the conversion from ICD-9 to ICD-10. To account for the possible yearly inflation allowed in the codes, a review of the allowable codes from each year will be used for comparison regarding what was paid and compared to the percentage of Medicare rates.

Literature Search Strategy

The literature review integrated comprehensive research on the topics of intraoperative neurophysiological monitoring and reimbursements. Various search methods were used on medical association websites, medical affiliated organizations

websites, government websites, and primary source reports. Peer-reviewed literature, studies, and dissertations were retrieved from Walden University's online library system, Google Scholar, PubMed, Medline, Proquest, and EBSCOHost using the keywords: *intraoperative neurophysiological monitoring with revenue, reimbursements, practice management, revenue cycle management, cash flow, financials, revenue stream, ICD-10, medical billing, and coding*. The search resulted in a limited number of scholarly references on the specific area of study of intraoperative neurophysiological monitoring and administrative terms. Research on intraoperative neurophysiological monitoring was found, but nothing on the administration (nonclinical) aspect. Research is available on ICD-10 implantation terms such as revenue cycle management, revenue stream and finance but not within the past 5 years. ICD-10 was announced by the United States Department of Health and Human Services on July 31, 2014, that ICD-10-CM and ICD-10-PCS will be implemented into the HIPAA mandated code set on Oct 1, 2015 (Nicoletti, 2014). The literature examined provided a knowledge base for the study.

Change in Reimbursement Studies

Eltorai et al. (2018) explored trends in Medicare reimbursements for orthopedic procedures from 2000 to 2016 and determined that there was a decrease in the reimbursements for the procedures but not the implants. The researchers used the most common orthopedic procedures and Medicare fee schedule to compare the data from 2000 and 2016 while adjusting the 2000 fees to the 2016 dollars (Eltorai et al., 2018). Eltorai et al. indicated the limitations to only using Medicare data, because there was no access to private commercial carriers. While Eltorai et al. conducted their study with a

theoretical background and timeframe similar to the current study, the specialty and geographical region was different.

Jones, Scott, Anoff, Pierce, and Glasheen (2015) studied the changes in the payer mix and physician reimbursement after the Affordable Care Act and Medicaid Expansion. They determined there was an increase in visits for Medicaid with a decrease in uninsured and commercial visits with a small increase in physician reimbursements. Jones et al. noted a major limitation on as single center analysis of data and suggested further research for hospital and physician practices in both Medicaid expansion and no expansion states on the impact of the ACA and Medicaid expansion on reimbursement (Jones et al., 2015). The changes in reimbursements after major modifications to the system needed to be study to determine the effects.

Riley, Withy, Rogers, DuBose-Morris, and Kurozawa (2017) studied the private insurance and Medicare reimbursement rates of CPT code 99213 (Established patient level 3 evaluation and management) for the year 2012 using secondary data to compare to the cost of living in the area for 490 localities across the United States. Riley et al. found that Hawai'i has the lowest physicians' annual wages in terms of the adjusted cost of living and reimbursements for 99213. Riley et al. indicated limitations of inability to compare data from multiple data sources and future research could include researching the satisfaction levels of physicians in areas with improved reimbursements.

Witte, MacPhee, Ginsburg, and Deshmukh (2017) studied Medicaid reimbursements from 2004 to 2014 to determine if the Patient Protection and Affordable Care Act from 2010 influenced coverage of the female condom. Witte et al. concluded

that 26 states reimburse and 14 do not, which constituted a 33% increase from 2007. The study limitations were indicated as data challenges for actual usage data for the states that provide reimbursement (Witte et al., 2017).

Hempstead, Sung, Gray, and Richardson (2015) studied the trends in provider reimbursements and patient obligations for Athena health providers between 2013 and 2014. More than 17 million visits to nearly 15,000 providers resulted in primary care payments increased by 3.8% and surgeries decreased 3.7%. The high out-of-pocket plans increased the practices bad debt obligations and further research was needed to monitor the changes in reimbursements as insurance companies change their low-income markets (Hempstead et al., 2015).

ICD-10 Implementation

The ICD-10 implementation delay from October 2014 to 2015 by the Centers for Medicare & Medicaid Services cost the healthcare industry was beneficial for providers who ignored the change. However, others had invested in the implementation, spent considerable amounts in training, and upgraded systems and staff with costs to the healthcare industry of approximately $1 billion to $6.6 billion, depending on the practice or health system size (Daly, 2014). Healthcare providers pushed for the delay with the support of an American Medical Association-sponsored report finding that implementation will be more expensive than previously estimated with costs in the range from $56,639 to $226,105 for small practices; $213,364 to $824,735 for medium-sized practices; and about $2 million to more than $8 million for large practices. The previous estimates were $83,290 for small practices, $285,195 for medium-sized practices and

more than $2.7 million for large ones (Robeznieks, 2014). Many practices exhausted their financial resources getting ready for the 2014 deadline that their budgets did not allow for additional costs associated with the delay to 2015 (Carney, 2014).

ICD-10 was an extensive shift in the coding system that affected every aspect of healthcare operation (Sanders et al., 2012). Practices prepared for a contingency plan in case the implementation was not smooth and if there was a significant decrease in revenue (Spear, 2015). The transition to ICD-10 was the largest mandate in U.S. healthcare history to date and required governance, education, and documentation (Goldstein, 2015).

After the ICD-10 Transition

The CPT changes as well as the new ICD-10 code-set was challenging for all providers regardless if practice or hospital-based in 2015 (Carney, 2014). Experts suggested practices have at least three months cash on hand if claims were slow to process after the implementation; with everyone converting at once, there were delays in processing (Carney, 2014). There were also changes in methodologies for payments for some providers and facilities, this change required improved documentation by providers (Carney, 2014). Medicare prolonged the specificity of ICD-10 (eg. C81 versus C81.00) until October 1, 2016 before rejecting claims for payment; ensuring the correct diagnosis and medical necessity were vital when billing (Dowling, 2015).

The Medical Group Management Association (MGMA) conducted a post-ICD-10 implementation survey and respondents listed the top 2016 priorities as optimizing revenue cycle management, working toward a value-based care model and automating

patient collections (Bradley, 2016). During the postimplementation period, healthcare leaders identified and resolved issues as quickly as possible such as claim denials, rejections, or coding backlogs to minimize declines in productivity and cash-flow (Tennant, 2013).

Revenue Cycle Management

Healthcare leaders needed to focus more on revenue cycle management while running a very efficient business to maintain profit levels while searching for new opportunities to enhance the practice (Rutherford, 2017). The demands of running a successful modern medical practice requires more staff and time than it did five years ago, requiring providers to use a successful revenue cycle management process (Bentley & Robinson, 2016). The healthcare revenue cycle includes more than just billing and collecting fees; it dealt with every aspect of the patient process and requires knowledgeable, efficient, organized, and dedicated administrative staff (Bentley & Robinson, 2016). The Centers for Medicare and Medicaid Services rejects nearly 26% of all claims and up to 40% of those claims were never resubmitted, which can account for a 10% of loss revenues for the practice (Bentley & Robinson, 2016). A successful revenue cycle management system could increase payments and decrease bad debt write-offs affecting the practice with revenue cycle optimization by utilizing technology, knowledge, and commitment to increase reimbursement from payers and patients in the shortest possible time (Bentley & Robinson, 2016).

For the implementation of ICD-10, providers needing to educate themselves about electronic records, practice management systems, clinical documentation, ICD-10

code-set conversion, cash flow and how to research new payment models (Carney, 2014). Practice managers reviewed data from the first post transition months to help optimize revenue by identifying denial and rejection trends (Bradley, 2016).

Definitions

The following terms were defined for the purpose of this study:

Allowed amount: The amount an insurance plan will pay for a covered health care service (HealthCare.gov, n.d.).

Current procedural terminology (CPT): Current procedural terminology refers to codes used to record what procedures were being completed in healthcare. First published in 1966 and were developed, maintained, and copyrighted by the American Medical Association (AMA). Thousands of CPT codes were in use, and they were updated annually (AMA, 2018).

Commercial payer: Insurance companies that receive premiums from the patients to provide coverage that was provided by private companies, such as United Healthcare, Aetna, Cigna, and Blue Cross and Blue Shield (Archer & Marmor, 2012).

Government payer: Federally or State funded insurance plans for those with low income or disabilities, such as Medicare and Medicaid (Archer & Marmor, 2012).

International Classification of Diseases (ICD): The International Classification of Diseases was the standard diagnostic tool for epidemiology, health management, and clinical purposes in the United States was established by the World Health Organization (WHO) and updated annually (WHO, 2018).

International Classification of Diseases, 9th Revision (ICD-9): The 9th revision was adopted in United States in 1979. The code set was updated annually. ICD-9 was approximately 17,000 3-4 numeric or alpha-numeric data set (AAPC, 2018a)

International Classification of Diseases, 10th Revision (ICD-10): International Classification of Diseases, 10th Revision, Clinical Modification replaced ICD-9 codes on Oct 1, 2015, with 141,000 alpha numeric code set up to 7 characters to include diagnostic and in-patient procedural codes. (AAPC, 2018b)

Intraoperative neurophysiological monitoring: Attempts to minimize neurological morbidity during surgical procedures by monitoring changes in brain, spinal cord, and peripheral nerve functions (American Society of Neurophysiological Monitoring, 2018).

Medical coding: Medical coding was the conversion of diagnosis, procedures, medical services, and equipment for into universal medical alphanumeric codes for claims submission to insurance carriers (AAPC, 2018c).

Medical billing: Medical billing was submitted with follow-up on claims with insurance companies to receive payment for services rendered (AAPC, 2018d).

Reimbursement: Providers were paid on a "fee-for-service" basis, the insurance carriers pays the provider a certain amount based on the service provided and the allowed amount (Humana, 2018).

Revenue cycle: The entire cycle of a patient encounter from scheduling to final payment (Singh, Mindel, & Mathiassen, 2017).

Assumptions

The believed assumptions of this study, but cannot be demonstrated to be true, that were critical to the meaningfulness of this study were that the data collected by the two intraoperative neurophysiological monitoring companies was reported precisely and correctly. The data provided from the Medicare fee schedule were not a concern, but if the data from intraoperative neurophysiological monitoring companies for the commercial data were incorrect, the commercial analysis of the reimbursements would be affected. There was no assumption that the codes were bundled affecting the reimbursements. The change in the Medicare Fee Schedule will be calculated at the inflation rate of 1.4% from the year 2014 to 2016 to address assumptions in inflation or deflation of pricing. (U.S. Inflation Calculator, 2018).

Scope and Delimitations

The scope of the study was to understand the difference between reimbursements for intraoperative neurophysiological monitoring after the implementation of ICD-10 in Oklahoma and does not include outside of the state. The specific focus was chosen because these changes were key components for healthcare leadership to effectively run a practice. Research was completed on the implementation costs and effects on medical practices, but not the aftermath, in specific medical specialties.

The delimitations of the study is the inability to compare the data of commercial reimbursements for other intraoperative neurophysiological monitoring companies in Oklahoma, as this was proprietary information. Potential generalizability will be avoided

as most intraoperative neurophysiological monitoring companies will need this study for their survival.

Significance, Summary, and Conclusions

The preliminary evidence to justify the study was the lack of previous studies on neuromonitoring for ICD-10 conversion, reimbursements, administration, or even revenue cycle management; although, there were several studies that focused on the clinical aspect. Research of literature produced a paucity of studies, which provide a supporting argument for research in this area. This study may contribute to the intraoperative neurophysiological monitoring leadership practices by providing changes in reimbursement to allow management to successfully operate the business. The practical applications for this study will aid in the viability of the small intraoperative neurophysiological monitoring companies through sustainability of business and possible growth which will lead to positive social change.

Section 2: Research Design and Data Collection

Introduction

The study may provide an understanding specific for health care leaders regarding the changes in reimbursement from following the ICD-10 implementation in intraoperative neurophysiological monitoring companies in Oklahoma. The methods and procedures described in this section describe the research including sampling size, analysis plan, and threats to validity.

Research Design and Rationale

The study variables were intraoperative neurophysiological monitoring CPT codes (Figure 1), the reimbursements from Medicare, and other commercial insurance companies for those codes. The quantitative research design was correlational in order to study the relationship between the different reimbursement rates on intraoperative neurophysiological monitoring CPT codes before and after the implementation of ICD-10. The study can be completed with minimal time and resource constraints to interpret the relationship between the reimbursements and CPT codes. Correlational research determines the relationship, if any, between two or more variables using statistical data to interpret (Creswell, 2009). In this study I found a relationship between the changes in reimbursements related to the implementation of ICD-10 for intraoperative neurophysiological monitoring for the state of Oklahoma.

Methodology

The methodology for the study included the population, sampling, secondary data sets, and variances in reimbursement for the CPT codes used in intraoperative

neurophysiological monitoring from 2014 to 2016. The period of the conversion was from ICD-9 to ICD-10. Accounting for the possible yearly inflation allowed in the codes, a review of the allowable codes from each year used for comparison regarding what was paid and compared to the percentage of Medicare rates.

Population

The population for this study includes more than 10,000 CPT codes created and maintained by the AMA (2018) and the Centers for Medicare and Medicaid Services Fee Schedule.

Sampling

The sampling of the population includes 15 intraoperative neurophysiological monitoring codes of CPT with and without modifiers with the specific fee schedule for the state of Oklahoma from the Centers for Medicare and Medicaid Services Fee Schedule for the years 2014 and 2016. Medicare rates were adjusted based on the practice costs to provide the service per area (CMS, 2018). For example, the cost for intraoperative neurophysiological monitoring in New York would be higher than Oklahoma due to the cost of living for salaries and insurance. The codes listed in Table 1 were the inclusion and the codes that were not related to intraoperative neurophysiological monitoring were the exclusion. The fee schedules for states other than Oklahoma were also an exclusion.

The procedures for recruitment, participation, and data collection associated with the secondary data set of the Medicare fee schedule was published on their website. The possible commercial insurance reimbursement rates data will be provided by two

Oklahoma intraoperative neurophysiological monitoring companies. Permission to gain access to the data of intraoperative neurophysiological monitoring companies' proprietary commercial reimbursements was requested verbally and approved.

Instruction and Operationalization of Constructs

The published data sets were the Centers for Medicare and Medicaid Services fee schedule for the years 2014 and 2016. These were appropriate for the current study to determine if there were any changes in reimbursements due to the change from ICD-9 to ICD-10. The data was available to the public not requiring specific permissions for use. The Centers for Medicare and Medicaid Services fee schedule was a governmental published dataset that was reliable, valid, and relevant to every healthcare provide in the United States.

Operationalization

The variables of intraoperative neurophysiological monitoring CPTs (Figure 1) included the description of the code. Each variable was measured on the geographic practice cost index and the relative value units for work, practice expense, and malpractice to determine the rate in the Centers for Medicare and Medicaid Services fee schedule (CMS, 2018). An example was that code 95813 was valued at $25.14 for 2014 in the Centers for Medicare and Medicaid Services fee schedule.

Data Analysis Plan

The data analysis plan explained how the data for the study was cleaned, transformed, and analyzed. The cleaning of data removed any univariate outliers, missing data, and assess for normality. The variables of the fee schedule were assessed

for univariate outliers with a standard deviation of greater than ±3.29 from the variable's mean. Missing data was addressed by eliminating the observation where possible.

The software used for the analyses was SPSS® and Microsoft Excel. The data sets were downloaded from the public websites for Medicare, Medicaid, and Workman's Compensation. The specific data was extracting the specific intraoperative neurophysiological monitoring CPT codes from the different fee schedule datasets to import into SPSS® for 2014 and 2016. Manual review and extraction of reimbursements for commercial carriers were entered in SPSS® for analysis after data cleaning and screening. The data cleaning and scrubbing will ensure there was no patient identifiers available in the data. The CPT code reimbursements from 2014 will be compared to those from 2016 to determine the statistical difference, if any for Medicare and the commercial carriers. This study could be replicated with the Medicare Fee Schedule for other states or specialties except for the proprietary commercial reimbursements.

Research Questions

The restated research questions and hypotheses as written in Section 1.

Research Question1: To what extent was the difference, if any, between the independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables within the Medicare Fee Schedule for 2014 and 2016 for intraoperative neurophysiological monitoring companies in Oklahoma?

$H_0$1: There was not a statistically significant difference on independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables of the Medicare Fee Schedule for 2014 and 2016.

H_a1: There was a statistically significant difference on independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables of the Medicare Fee Schedule for 2014 and 2016.

Research Question 2: What was the difference between the independent variables of intraoperative neurophysiological monitoring CPT codes and the dependent continuous variables of the rate paid by commercial carriers for 2014 and 2016 for intraoperative neurophysiological monitoring companies in Oklahoma?

$H_0 2$: There was not a statistically significant difference between the independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables of the rate paid by commercial carriers for 2014 and 2016.

$H_a 2$: There was a statistically significant difference between the independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables of the rate paid by commercial carriers for 2014 and 2016.

Research Question 3: How did the conversion from ICD-9 to ICD-10 (i.e., 2014 versus 2016) affect the revenue cycle management for intraoperative neurophysiological monitoring companies in Oklahoma?

$H_0 3$: The conversion from ICD-9 to ICD-10 (i.e., 2014 versus 2016) positively affected the revenue cycle management for intraoperative neurophysiological monitoring companies in Oklahoma.

$H_a 3$: The conversion from ICD-9 to ICD-10 (i.e., 2014 versus 2016) negatively affected the revenue cycle management for intraoperative neurophysiological monitoring companies in Oklahoma.

Statistical Tests

Sample *t* tests were used to test the hypotheses above as the variables were related. The CPT code was related to the respected fee schedule amount for that code. The variables continuous and will be comparing the means on each CPT code for the reimbursements from 2014 and 2016. Multiple tables will clarify the multiple statistical sample *t* tests for the difference between Medicare and commercial reimbursements for the two years. The study should not have any covariate or cofounding variables due to its nature. The final stage of the analysis plan was the interpretation of the research. A summary of the quantitative data was provided with the statistical information visually displayed to increase understanding.

Threats to Validity

Due to the nature of the study and use of secondary statistical data, a known threat to external, internal, or construct validity would be scrubbing or cleaning of the data. The data were carefully scrubbed and cleaned to ensure no patient identifiers will be available.

Ethical Procedures

The datasets were from open-sourced peer-reviewed and government sources causing no ethical concerns. The datasets were specifically financial with no human participant involvement. Ethical procedures were taking into consideration to protect confidential data to ensure the data was secure with minimal access. There were no ethical concerns related to recruitment materials and processes as described in secondary

data set materials. The use of commercial insurance carrier reimbursement data from intraoperative neurophysiological monitoring companies in Oklahoma was proprietary and therefore anonymous. The only ethical concern could possibly be using secondary data within the author's own work environment for the commercial insurance reimbursement research question.

Summary

The methods and procedures described in this section describe the research including sampling size, analysis plan, and threats to validity for the study on the changes in reimbursement from following the ICD-10 implementation in intraoperative neurophysiological monitoring companies in Oklahoma. The results and findings of this study will be ne interpreted in the results and findings section.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this correlational, quantitative study was to provide understanding for health care leaders regarding the changes in reimbursement following the ICD-10 implementation in intraoperative neurophysiological monitoring companies in Oklahoma. The overarching research question was as follows: What was the statistical significance, if any, between the changes in reimbursements from following the ICD-10 implementation in intraoperative neurophysiological monitoring companies in Oklahoma? The hypothesis for the research question was that there was a statistical significance in the change of reimbursements. In the following section, I will describe the data collection of secondary data sets and the results.

Data Collection of Secondary Data Sets

The time frame for data collection was 3 business days as Medicare, Medicaid, and Workman's Compensation data was available from their public websites. The data response rates from all carriers was 100% indication for a confidence interval for the study.

There were no discrepancies in the use of the secondary data set from the plan presented in Section 2. The baseline descriptive and demographic characteristics of the sample include CPT codes and the appropriate allowed amount per the insurance carrier or the reimbursement amount from their fee schedule. The sample of the intraoperative neurophysiologic monitoring CPT codes and reimbursements was a representative

sample of the population of the over 8,000 total CPT codes. The sample includes all the intraoperative neurophysiologic monitoring CPT codes.

Results

The descriptive statistics from the data on the changes in reimbursements for intraoperative neurophysiological monitoring are represented in Table 2 per CPT code. Due to the type of data studied, standard deviations were high and not consistent. Data on the reimbursements for intraoperative neurophysiological monitoring CPT codes from the Oklahoma Workman's Compensation, and some of the commercial carriers had no change in reimbursements from 2014 to 2016. The lack of change affected the mean, median, and mode, adding to the variety of standard deviations in the data.

Table 2

Descriptive Statistics

Code	Description	Mean	Median	Mode
G0453	Remote Intraoperative Monitoring	$1.95	$0.15	$0
95925	Upper SSEP Bilateral	$-18.38	$-7.83	$0
95926	Lower SSEP Bilateral	$-18.88	$-3.20	$0
95938	Upper & Lower SSEP Bilateral	$-1.59	$0	$0
95927	Trunk/Head SSEP Bilateral	$-12.03	$-8.86	$0
95928	TcMEP Upper Limbs	$-20.58	$-12.31	$0
95939	TcMEP Upper & Lower Limbs	$-20.05	$-8.71	$0
95937	NeuroMusclular Junction	$-0.51	$0	$0
95861	EMG Two Extremity	$-2.89	$0	$0
95870	Trunk/Extremity EMG	$-1.55	$0	$0
51785	Anal Sphincter	$-4.74	$0	$0
95812	EEG 41-60 minutes	$-29.96	$-22.12	$0
95813	EEG greater than 1 hour	$-26.27	$-13.94	$0

The statistical assumptions appropriate to the study are the scale of measurement, simple random sample of the total population, normal distribution, and homogeneity of variance. The statistical analysis findings organized by CPT code and carrier indicated that there was an overall decrease in reimbursements among all carriers from 2014 to 2016, especially when adjusted for the 1.4% inflation rate. The carriers that did not have a change in reimbursements from 2014 to 2016 indicated a 1.4% decrease because of the inflation rate.

Some CPT codes showed an increase but not enough to outweigh the decrease as a whole. When combing all data as a whole, there was an average of 10% decrease in reimbursements of the carriers that had a change in reimbursements. Overall with the carriers with no change in reimbursements but adjusted with the 1.4% inflation rate, the overall change on reimbursements was -6%.

The highest percentage of change per procedure code and insurance carrier was 11% for remote monitoring (G0453) for a commercial carrier and the lowest was -46% for lower somatosensory evoked potentials (95926) for Medicaid. Medicaid had the largest change in reimbursements of -18% and the smallest change of Medicare at -6%. The changes in reimbursements from 2014 to 2016 are indicated in Table 3.

Table 3

Percentage of Change from 2014 to 2016

Code	Description	Medicaid	Medicare	Commercial
G0453	Remote Intraoperative Monitoring	11%	1%	19%
95925	Upper SSEP Bilateral	-38%	-11%	-26%
95926	Lower SSEP Bilateral	-45%	-5%	-32%
95938	Upper & Lower SSEP Bilateral	-8%	2%	4%
95927	Trunk/Head SSEP Bilateral	-25%	-14%	-14%
95928	TcMEP Upper Limbs	-26%	-12%	-15%
95939	TcMEP Upper & Lower Limbs	-12%	2%	-2%
95937	NeuroMusclular Junction	-6%	-4%	4%
95861	EMG Two Extremity	-12%	2%	-2%
95870	Trunk/Extremity EMG	-14%	6%	-4%
51785	Anal Sphincter	-13%	3%	-3%
95812	EEG 41-60 minutes	-20%	-23%	-9%
95813	EEG greater than 1 hour	-15%	-19%	-5%
Averages		-18%	-6%	-7%

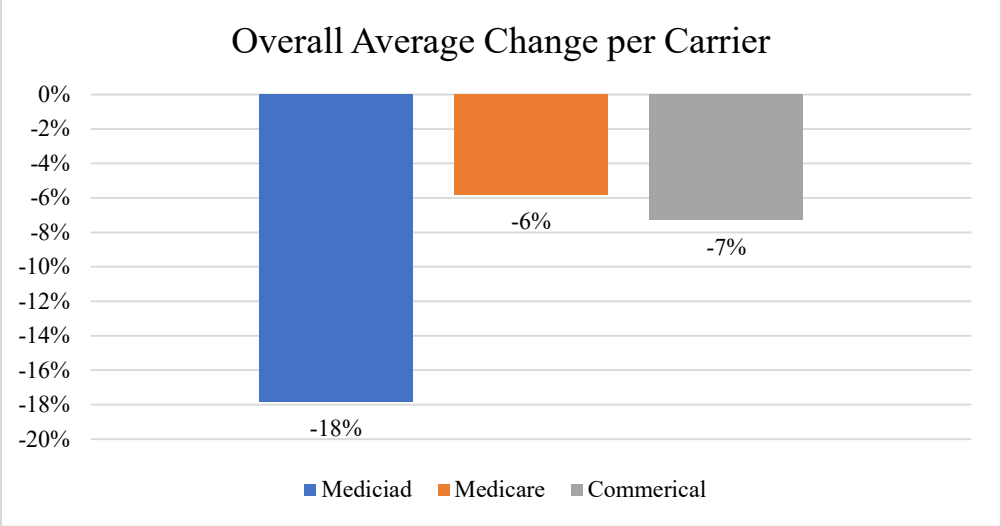

Figure 1. Overall average change per carrier.

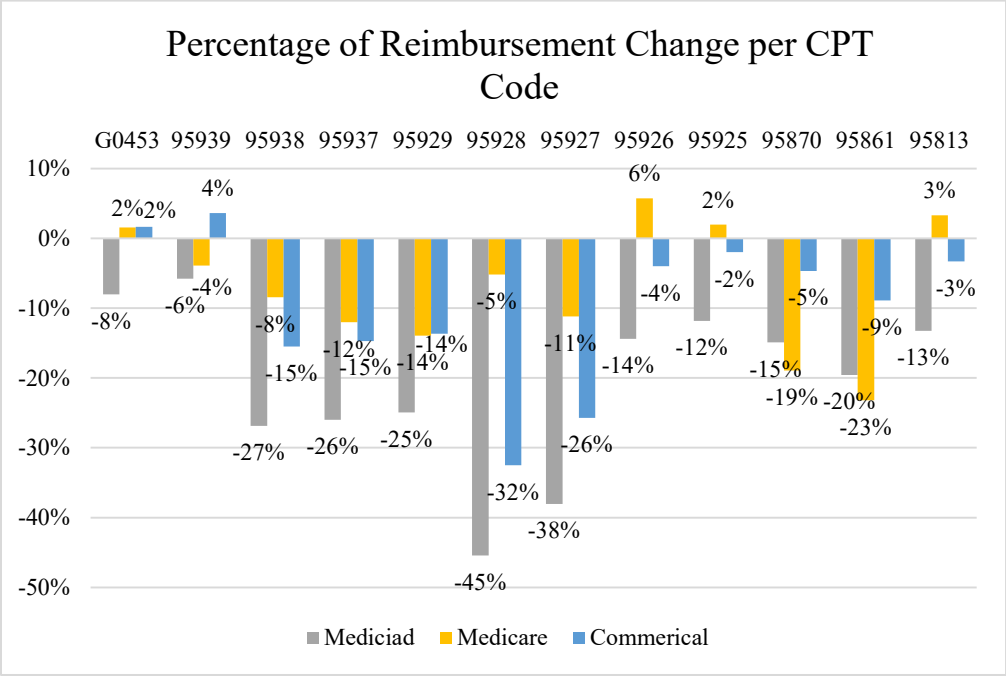

Figure 2. Percentage of reimbursements change per CPT code.

The intraoperative neurophysiological monitoring procedure with the greatest mean annual decreases in reimbursement was the lower Somatosensory Evoked Potentials (SSEP) with -28% amongst all carriers. The intraoperative neurophysiological monitoring procedures with the least annual reimbursement decreases were transcranial electrical motor potential (TcMEP) monitoring and Electromyography (EMG) with -2% amongst all carriers.

Table 4

Percentage of Change from 2014 to 2016 Mean

Code	Description	Mean
G0453	Remote Intraoperative Monitoring	11%
95925	Upper SSEP Bilateral	-25%
95926	Lower SSEP Bilateral	-28%
95938	Upper & Lower SSEP Bilateral	-2%
95927	Trunk/Head SSEP Bilateral	-18%
95928	TcMEP Upper Limbs	-18%
95939	TcMEP Upper & Lower Limbs	-4%
95937	NeuroMusclular Junction	-2%
95861	EMG Two Extremity	-4%
95870	Trunk/Extremity EMG	-4%
51785	Anal Sphincter	-4%
95812	EEG 41-60 minutes	-17%
95813	EEG greater than 1 hour	-13%

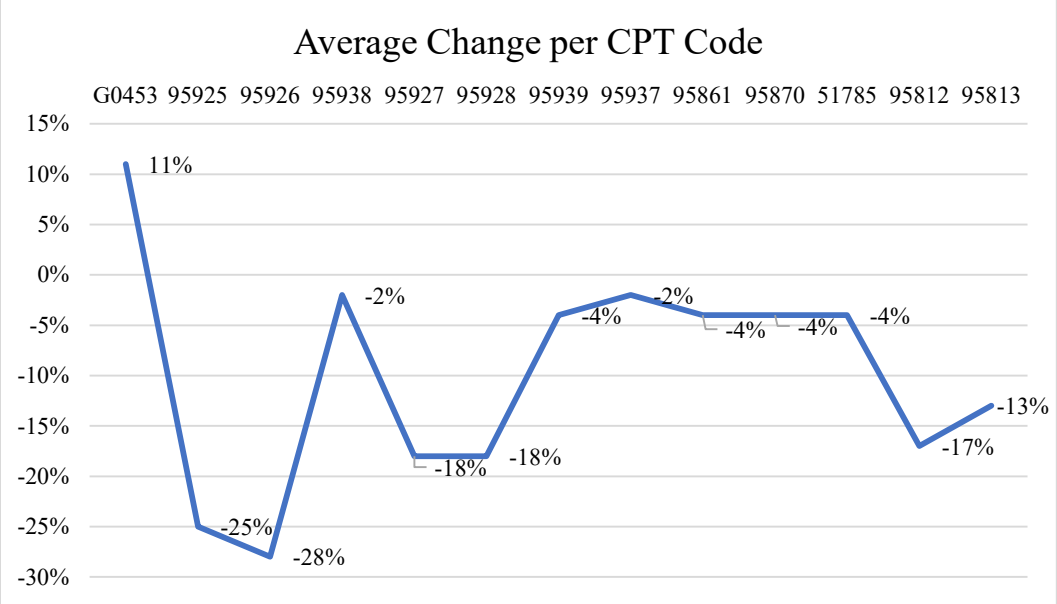

Figure 4. Average change per CPT code.

The research questions and hypotheses as written in Section 1 were as follows:

RQ 1: To what extent was the difference, if any, between the independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables within the Medicare Fee Schedule for 2014 and 2016 for intraoperative neurophysiological monitoring companies in Oklahoma?

$H_0$1: There was not a statistically significant difference on independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables of the Medicare Fee Schedule for 2014 and 2016.

H_a1: There was a statistically significant difference on independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables of the Medicare Fee Schedule for 2014 and 2016.

H_a1 was the supported hypothesis with a 6 % decrease in Medicare reimbursements for intraoperative neurophysiological monitoring CPT codes for 2014 and 2016.

RQ 2: What was the difference between the independent variables of intraoperative neurophysiological monitoring CPT codes and the dependent continuous variables of the rate paid by commercial carriers for 2014 and 2016 for intraoperative neurophysiological monitoring companies in Oklahoma?

$H_0$2: There was not a statistically significant difference between the independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables of the rate paid by commercial carriers for 2014 and 2016.

H_a2: There was a statistically significant difference between the independent variables of intraoperative neurophysiological monitoring CPT codes and dependent continuous variables of the rate paid by commercial carriers for 2014 and 2016.

H_a2 was the supported hypothesis with an overall decrease of 3% of intraoperative neurophysiological monitoring CPT codes for 2014 and 2016.

RQ 3: How did the conversion from ICD-9 to ICD-10 (i.e., 2014 versus 2016) affect the revenue cycle management for intraoperative neurophysiological monitoring companies in Oklahoma?

H_03: The conversion from ICD-9 to ICD-10 (i.e., 2014 versus 2016) positively affected the revenue cycle management for intraoperative neurophysiological monitoring companies in Oklahoma.

H_a3: The conversion from ICD-9 to ICD-10 (i.e., 2014 versus 2016) negatively affected the revenue cycle management for intraoperative neurophysiological monitoring companies in Oklahoma.

H_a3 was the supported hypothesis with an overall decrease in reimbursements of 6% when including the carriers with no change and a 10% decrease with the carriers that had changes in reimbursements.

Summary

The methods and procedures described in this section represented the results of the study on changes in reimbursements for intraoperative neurophysiological monitoring CPT codes for 2014 and 2016. H_a1 was the supported hypothesis for RQ 1, with a 6%

decrease in Medicare reimbursements for intraoperative neurophysiological monitoring CPT codes for 2014 and 2016. H_a2 was the supported hypothesis for RQ 2, with an overall decrease of 3% of intraoperative neurophysiological monitoring CPT codes for 2014 and 2016. H_a3 was the supported hypothesis for RQ 3, with an overall decrease in reimbursements of 6% when including the carriers with no change and a 10% decrease with the carriers that had changes in reimbursements. The findings of the study indicated an overall decrease in reimbursements after implementation of ICD-10 for intraoperative neurophysiological monitoring. In Section 4, I will present the application for professional practice and social change.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The purpose and nature of this correlational, quantitative study was to provide health care leaders with an understanding of the changes in reimbursement following ICD-10 implementation in intraoperative neurophysiological monitoring companies in Oklahoma. The findings of the study indicated an overall 6-10% decrease in reimbursements for intraoperative neurophysiological monitoring after implementation of ICD-10.

Interpretation of the Findings

The decrease in reimbursements does not offset the high costs of ICD-10 implementation. Healthcare leaders will need to find additional revenue-generating options while keeping costs down. Medicare had an overall decrease of reimbursements of 6%, whereas Medicaid had a much larger decrease of 18%. The results of this study are comparable to the study by Eltorai et al. (2018) on orthopedic procedures with a decrease in reimbursements. The continued increase in costs and decrease in reimbursements are compounding the challenges for healthcare leaders for cost-effective business. Other revenue-generating options will need to be considered to sustain business.

Limitations of the Study

There were limitations due to the physician-contracted rates with the payers, as some providers could have contracted higher rates than those studied. Limitations might include payer mix variations per carrier. Participation was limited by geographic location

of Oklahoma and did not include outside of the state. There could be limitations pertaining to no control over the providers who participated in the study.

Recommendations

Recommendations for further research, grounded in the strengths and limitations of the current study as well as the literature reviewed, would be to research the changes in intraoperative neurophysiological monitoring for other states and other specialties.

Professional Practice

Recommendations for professional practice include continued monitoring of reimbursement changes to ensure the decrease levels out in following years. If the decrease does not level out, renegotiating the commercial carrier contracts will be required by healthcare leaders to offset the carriers that have a set fee schedule that is not negotiable, such as Medicare and Medicaid. Contract management will be key to maintain reimbursements with the rising costs of business. Changes in reimbursements affect the cash flow of the practice and other operating capital.

Positive Social Change

The ICD-10 implementation delay from October 2014 to 2015 by the CMS was welcomed by providers that were ignoring the change, not by others that had already invested in the implementation, spending considerable amounts in training, upgrading systems, and staff with overall costs to the healthcare industry of approximately $1 billion to $6.6 billion (Daly, 2014). ICD-10 was an extensive shift in the coding system that will affect every aspect of healthcare operation (Sanders et al., 2012). Healthcare leaders need to focus more on revenue cycle management while running a very efficient

business to maintain profit levels while searching for new opportunities to enhance the practice (Rutherford, 2017). These changes affect their livelihood of several small intraoperative neurophysiological monitoring companies in Oklahoma. This study on the changes in reimbursement from ICD-9 to ICD-10 assisted healthcare leadership to make the necessary changes in business and their revenue cycle management to ensure the stability and future of the Oklahoma intraoperative neurophysiological monitoring companies.

Conclusion

This study evaluated the changes in reimbursements due to the change from ICD-9 to ICD-10 for intraoperative neurophysiological monitoring in Oklahoma. The transition from ICD-9 to ICD-10 was a massive undertaking by physicians, hospitals, and clinics with high costs and without a clear understanding of the future impact. Healthcare leaders can effectively manage their practice and revenue cycle management with the information provided from this study to stay profitable and compete within the market.

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