Mastering International Classification of Diseases (ICD-10) Procedural Coding: Learning and Instructional Theories

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Abstract

This quantitative descriptive study explored frequencies of learning theories used in the mastery of ICD-10 procedural coding among American Health Information Management Association (AHIMA)–approved trainers. It further explored frequencies of instructional theories used in the training methodology by ICD-10 trainers when presenting ICD-10 procedural coding workshops. A self-designed survey questionnaire was used, featuring a 5-point Likert scale. Findings revealed that AHIMA Academy trainees rated self-regulated learning higher (n = 37; 66.1 percent) than other learning theories in their mastery of ICD-10 coding. As AHIMA-approved trainers, most (n = 62; 97.9 percent) indicated that they had provided verbal commentary as feedback to workshop attendees as the primary mode to facilitate learning. Information from this study may serve as a reference point for educators who wish to develop a comprehensive model of skill acquisition for the coding profession.

Keywords: ICD-10-CM/PCS, procedural coding, learning theories, instructional theories

Introduction

On October 1, 2015, the United States implemented the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM) and the International Classification of Diseases, 10th Revision, Procedure Coding System (ICD-10-PCS) after years of delays and robust debates. An estimated cost of between $1 billion and $1.5 billion was spent by the healthcare industry on training for the new coding system.[1] Despite the widespread investment in training, the most effective learning and instructional strategies for ICD-10 procedural coding have not been identified.

Background

The implementation of ICD-10 has been viewed as a significant opportunity to meet the demands of an increasingly complex healthcare industry in the electronic age.[2] In an attempt to raise awareness surrounding the transition to the new code sets, AHIMA sponsored nationwide Academy workshops that were instrumental in producing AHIMA-approved ICD-10-CM/PCS trainers. The role of learning theories in the mastery of ICD-10 procedure coding, however, has yet to be fully investigated. This article discusses five learning theories that may have influenced mastery of ICD-10 procedural coding among AHIMA-approved trainers. These theories constitute a conceptual framework and include behaviorism, social constructivist theory, social cognitive theory, self-regulated learning, and connectivism.

Major Learning Theories

According to Kropf,[3] a *learning theory* may be defined as a set of concepts that account for whatever has initiated observable changes in an individual's performance. An *instructional theory*, on the other hand, focuses on the design of a range of resources available to facilitate an individual's acquisition of learning. The five learning theories discussed in this article are defined as follows.

Skinner's Behavioral Theory and Operant Conditioning

An individual identifies with something that reinforces behavior, responding positively only in the presence of that particular stimulus.[4]

Social Constructivist Theory

Learning results when an individual interacts with the social environment. Tools within the social system, such as language and symbols, enable the learner's interactions with mentors and facilitate transition to self-regulated learning processes.[5]

Social Cognitive Theory

Observation and social modeling are key factors in the learning process. Individuals acquire knowledge and skills by observing the actions of others.[6]

Self-Regulated Learning

Individuals who are self-regulated strategize and set their own learning agendas. They may be intrinsically motivated and engage in learning tasks merely for the sake of sustaining interest or challenge,[7] or they may be extrinsically motivated as they seek attainment of an external reward.[8]

Connectivism

Individuals learn through information reservoirs via the Internet that include online classrooms, virtual reality learning platforms, and social networks.[9]

Rationale

Currently, there is a paucity of scientific research that illuminates how individuals master the new code sets within the context of traditional learning theories. Identifying the learning theory that best contributes to mastering ICD-10-PCS is instrumental in developing a comprehensive policy for effective training. Comprehensive training should be a major focus because ICD-10 is becoming the new standard for clinical documentation.[10] Training should be based on a recognizable learning theory (or theories) that would constitute a standardized educational policy across the healthcare system.

Significance

Implementation of ICD-10-CM/PCS has affected all segments of the healthcare industry.[11] As early as 2004, the RAND Corporation affirmed that the enhanced data contained in ICD-10 would expand knowledge about population health and contribute significantly to the goal of continuous process improvement.[12] The positive long-term ramifications of ICD-10 implementation include a decrease in healthcare costs and increased reimbursement to providers.[13]

The purpose of this quantitative, descriptive study was to explore which learning theories were employed in the mastery of ICD-10-PCS among AHIMA-approved trainers and ambassadors. In addition, a further purpose was to discover which instructional theories were employed in the training methodology used by ICD-10 trainers when presenting ICD-10 procedural coding workshops. Results from this study may help fill a current gap in the literature by identifying a skill acquisition model for clinical coding that would be valuable in designing professional development plans.

Methods

Research Design

This study used a quantitative, descriptive research method and design.

Study Participants

Participants were AHIMA members who had completed AHIMA's ICD-10-CM/PCS Academy, a three-day workshop designed to prepare experienced coders to become ICD-10 trainers. They were also professional coders who had gained experience in ICD-9-CM. A recruitment letter/email was sent to 115 members. The email briefly provided an introduction, the purpose of the study, a request for their participation, and a link to SurveyMonkey that enabled them to access the survey. The survey was open from August 30 to September 30, 2016.

Inclusion Criteria

Candidates who were credentialed were selected on the basis of membership in AHIMA and status as AHIMA-approved ICD-10-CM/PCS trainers and/or ambassadors.

Exclusion Criteria

Candidates were not included in the study if they were (1) nonmembers of AHIMA and noncredentialed or (2) coding professionals who were not AHIMA-approved trainers in ICD-10-CM/PCS.

Sampling Methodology

A nonprobability consecutive sampling methodology was utilized.

Institutional Review Board Approval

An application was submitted to the A.T. Still University Institutional Review Board, and approval of the research study was granted with exempt status.

Survey Development

Considerable research was conducted to locate a validated instrument among instrument databases, such as Health and Psychosocial Instruments (HaPI) and PsycTests, and among experts in the area of coding education. Because of the implementation of ICD-10-CM/PCS as recently as October 2015, a validated survey instrument could not be located. A self-designed survey instrument in the form of a survey questionnaire was developed.

Demographics

Variables of interest included age, sex, race/ethnicity, educational level, AHIMA certifications, number of years in the health information (HIM) profession, income level, and geographical location. For demographic items that were considered sensitive, such as sex, race/ethnicity, and annual income, participants were offered the option "prefer not to answer."

Learning and Instructional Theory Strategies Survey Design

The self-designed survey questionnaire featured 20 closed-ended items that addressed two research questions. Of the 20 questions, one required ranking of five anchors, while the remaining 19 questions used a 5-point Likert scale with assigned weights: (1) strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree, and (5) strongly agree. Participants were asked to respond to items that contained statements representative of five major learning theories (i.e., operant conditioning, social constructivist theory, social cognitive theory, self-regulated learning, and connectivism). The statements described learning strategies that participants may have used as they progressed from novice to expert coders. Other survey items focused on different instructional approaches participants may have used to facilitate learning in their own training workshops.

Validation

Because of time constraints and in the absence of a large sample, only face and content validity of the survey instrument were examined. Face and content validity were assessed by two AHIMA subject-matter experts who determined that the self-designed items relating to learning theories were adequate, clear, and essential; addressed the two research questions posed in the study; and were not open to misinterpretation.

Data Collection

Study participants were drawn from AHIMA's Engage Community online database, which contains email addresses of all active members. Participants were contacted via email. The email recruitment letter contained a hyperlink to the survey questionnaire in SurveyMonkey. The survey was open from August 30 to September 30, 2016, and required approximately 10 minutes to complete. Follow-up emails were sent every two weeks. Responses were collected anonymously. Raw data were stored in SurveyMonkey.

Statistical Analysis

Raw data were downloaded from SurveyMonkey and imported into IBM SPSS for Windows, version 23.0. Continuous variables were tested for normality using the Shapiro-Wilk test ($p < .05$), and based on results of normality testing, appropriate measures of central tendency and dispersion were determined and reported. For analyses of sample characteristics, variables included participant age, years in the HIM profession, and years as an AHIMA-approved trainer.

The mean and standard deviation were calculated for normally distributed variables. For variables that were not normally distributed, the median, interquartile range, and minimum and maximum values were reported. Frequencies and percentages were reported for sex, income, race/ethnicity, geographical region, certifications, and education.

In addition to analyses of sample characteristics, 19 survey questions were used to address two research questions. The Likert scale and ranking data were analyzed. Frequencies and percentages were reported for the highest-ranking order of learning theories used by ICD-10-PCS trainers to address the first research question.

Further, six additional Likert-scale items were analyzed to address the second research question, relating to instructional strategies most frequently used by ICD-10 trainers in their workshops. The median, interquartile range, and minimum/maximum values were reported for a variable that was not normally distributed per the Shapiro-Wilk Test ($p < .05$). The distribution of responses for the six items with corresponding frequencies and percentages were reported.

Results

Description of Sample

Out of 77 responses, 75 participants met the inclusion/exclusion criteria and were eligible to participate in the survey. A total of 67 participants submitted usable responses, for a completion rate of 89 percent and a usable response rate of 58 percent. The sample was predominantly Caucasian ($n = 49$; 73.1 percent) and female ($n = 62$; 92.5 percent). Age was normally distributed per the Shapiro-Wilk test ($p = .108$) with a mean age of 52.08 years (SD, 9.16), ranging from 33 to 67 years (see Table 1).

Participants were geographically diverse. Most (49.2 percent) lived in the Pacific, South Atlantic, and West South Central regions of the United States, while the remaining half resided in five different geographical regions (see Table 1). More participants (45.5 percent) reported earning an annual income of between $75,000 and $99,999, while only 4.5 percent earned an annual income of less than $50,000.

Number of years in the HIM profession was normally distributed per the Shapiro-Wilk test ($p = .068$) with a mean of 22.24 years (SD, 10.91), ranging from 5 to 46 years. The number of years spent as AHIMA-approved trainers was not normally distributed ($p = .002$), with a median of 3.00 (interquartile

range, 3), ranging from 1 to 7 years (see Table 1). The most frequently occurring AHIMA certification was Certified Coding Specialist (*n* = 50; 74.6 percent) followed by Registered Health Information Administrator (*n* = 28; 41.8 percent), although members who held multiple certifications were also noted and represented in the sample (see Table 1). More than one-third of the participants had earned a bachelor's degree (*n* = 23; 34.3 percent), while 9 percent (*n* = 6) had attended some college but had not earned a degree.

Research Question 1: Ranking of Major Learning Theories

Thirteen items were analyzed to determine the frequency with which learning theories were employed in the mastery of ICD-10 procedural coding among AHIMA-approved trainers and ambassadors. Because the self-designed survey instrument had no composite scales, the distribution of responses was displayed in a table with combined *strongly agree* and *agree* responses (see Table 2).

Participants were asked to rank five prominent learning theories on the basis of which one best described how they had mastered ICD-10 procedural coding (see Table 3). Self-regulated learning was assigned the highest ranking by more than half the respondents (*n* = 37; 66.1 percent), while connectivism received the lowest ranking (*n* = 17; 27.0 percent), suggesting that most participants were motivated to set their own conditions for learning rather than relying on Internet-based reservoirs of learning.

Research Question 2: Frequency of Use of Instructional Strategies

Six additional Likert-scale items were analyzed to determine the frequency with which instructional strategies were employed in the training methodologies used by ICD-10 trainers and ambassadors when presenting ICD-10 procedural coding workshops. The data showed that 70 percent (*n* = 47) of respondents indicated they had conducted training workshops in procedural coding after becoming AHIMA-approved trainers. The number of training workshops conducted after completing AHIMA training did not follow a normal distribution ($p < .001$), according to the Shapiro-Wilk test, and ranged from 0 to 50 (median, 4.00; interquartile range, 10). The frequency of instructional strategies was displayed in a table (see Table 4). Most participants (*n* = 62; 97.9 percent) indicated they had provided verbal commentary as feedback to their workshop attendees (see Table 4), suggesting that they were well-positioned to facilitate intentional learning.[14]

Discussion

The majority of Academy trainees indicated that self-regulated learning was used most frequently in their mastery of ICD-10 procedural coding. Individuals engage in self-regulatory activities when they believe the activities will help them attain a goal.[15] Motivation has been defined as an essential component of self-regulated learning and the process that drives and sustains goal-directed activities.[16] According to self-determination theory and the hierarchical model of extrinsic and intrinsic motivation, constructs of motivation exist on a continuum and consist of (1) amotivation, (2) extrinsic motivation, and (3) intrinsic motivation.[17] In extrinsic motivation, an individual engages in a task because it leads to external outcomes (e.g., external rewards).

Participants in past Academy workshops had been empowered by their employers to master the ICD-10-CM/PCS code sets in preparation for nationwide ICD-10 implementation. After the Academy workshops, they were required to demonstrate their expertise in ICD-10 procedural coding after a period of study of up to 90 days. Trainees were required to take a comprehensive 100-question online assessment examination with a passing score of at least 80 percent to qualify as AHIMA-approved ICD-10-CM/PCS trainers. Academy participants, therefore, may have been extrinsically motivated as they sought to demonstrate coding competencies to their employers and to gain the privilege of conducting their own AHIMA-sponsored coding workshops.

In addition, after Academy trainees became trainers, most indicated that they had provided verbal commentary as feedback to attendees in their ICD-10 workshops as the primary mode of facilitating learning. In Vygotsky's sociocultural theory, learning occurs as a result of social interactions between individuals, notably through language, which is the most critical tool in knowledge exchange and

cognitive development.[18] In a study conducted at the Veterans Health Administration prior to ICD-10 implementation, a "learn as you go" mentoring method was effective in reducing anxiety among inexperienced coders who were gaining knowledge of ICD-10-CM/PCS on the job. Novice coders were allowed time to participate in group discussions of coding guidelines with their peers and supervisors.[19]

Only one other study has focused on the question of which learning theory may account for mastery of ICD-10. Sand and Elison-Bowers[20] posited that transfer of knowledge accounts for the acquisition of ICD-10-CM/PCS skills as a result of previous experience with ICD-9-CM. Although this suggestion may partially account for established coders' ability to quickly adapt to the ICD-10-CM diagnostic code set, it cannot fully explain rapid assimilation of ICD-10 procedural coding skills because ICD-10-PCS requires a total departure from the procedure classification structure in ICD-9-CM.

This study was based on individuals who are established clinical coders trained through one professional organization, AHIMA. The results, therefore, may not be generalizable to coders who obtained credentials from other professional organizations with different training methods, coders who are in training and have not yet taken national credentialing examinations, and coders who acquired coding skills in classification systems other than ICD-10-CM/PCS.

Implications of Findings

As the pace of change accelerates and coding resources become increasingly scarce, a comprehensive skill acquisition model for clinical coding will be a valuable asset for both healthcare organizations and educational institutions. The findings from this study are relevant to the promotion of research in coder education and curriculum design in higher education. Emerging technologies, new medications, and advances in medical interventions affect how medical records are coded in ICD-10-PCS, requiring coders to become increasingly adept in critical thinking and decision making.[21, 22] Critical thinking involves using a vast repertoire of learning strategies that are characteristic of highly motivated, self-regulated learners who display commitment and intuitive responsiveness.[23, 24]

Professional development plans for coders might be framed by using a tiered ladder approach that implements five levels, each based on increased motivation and self-regulatory activities. The levels would proceed through the five stages of the Dreyfus model of skill acquisition: "novice," "advanced beginner," "competent," "proficient," and finally "expert."[25] Each level would be defined by an increasingly refined set of coding competencies (i.e., inpatient and outpatient coding skills) and capabilities that result from use of (1) learning strategies, (2) social models, (3) practice and feedback, and (4) self-evaluation of the coder's progress toward attainment of targeted learning goals.[26]

Limitations of the Study

The limitations of this study should be noted. The lack of a validated survey instrument may have diminished the validity and reliability of the study. In addition, the study utilized a small sample, which limits its generalizability to other coders and coding contexts. The number of nonresponses on the ranking question was high and may have been due to the wording of the learning theory descriptions.

Recommendations for Future Research

Sand and Elison-Bowers[27] noted that although a variety of learning theories are currently popular (e.g., cognitive and social learning methods), further research is required to identify the learning theory that is most applicable to coding education.

Healthcare organizations and educators need to understand the factors that influence learning and performance of ICD-10 coding. Phenomenological studies that draw on qualitative interviews to delineate how coders describe their own unique learning experiences remain to be undertaken. A qualitative research approach would facilitate understanding of the personal and environmental learning factors that contribute to an expert coder's high productivity and quality levels.

Conclusion

The purpose of this quantitative descriptive study was to explore frequencies of learning theories in the mastery of ICD-10-PCS among AHIMA-approved trainers. The further purpose was to explore frequencies of instructional theories in the training methodology used by ICD-10 trainers when presenting coding workshops. Most AHIMA-approved ICD-10-CM/PCS trainers who participated in this survey indicated that they had studied ICD-10 procedural coding principally because it was challenging. They rated self-regulation as the learning theory that best described how they had mastered ICD-10 procedural coding. The majority of respondents who became AHIMA-approved trainers in procedural coding extended verbal commentary as the principal method of providing feedback to trainees who attended their own ICD-10-PCS coding workshops. Motivation and self-regulation appear to influence acquisition of coding skills, especially in the attainment of a new goal—in this case, receiving the privilege of working as an AHIMA-approved trainer and conducting independent workshops. Future research studies and designs, however, need to identify a comprehensive and standardized approach to mastering ICD-10 procedural coding that can be used across the healthcare system. Establishing a learning environment that provides optimal approaches in the mastery of ICD-10-PCS is key if ICD-10-CM/PCS is to serve as the standard of coding for future generations.

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Notes

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Table 1

Demographic Characteristics of Respondents (N = 67)

Characteristic	Mean	SD	95% CI	Median	IQR	Range	No.	Percentage
Age[a] (years)	52.08	9.16	(49.82, 54.33)					
Years in HIM profession	22.24	10.91	(22.58, 27.90)					
Years as AHIMA-approved trainer				3	3	1–7		
Sex								
Male							4	6.0
Female							62	92.5
Prefer not to answer							1	1.5
Income[a]								
$49,999 or less							3	4.5
$50,000–$74,999							12	18.2
$75,000–$99,999							30	45.5
$100,000–$124,999							12	18.2
$125,000 and above							5	7.6
Prefer not to answer							4	6.1
Race/ethnicity								
American Indian or Alaskan Native							1	1.5
Asian/Pacific Islander							2	3.0
Black or African American							8	11.9
Hispanic							7	10.4
White/Caucasian							49	73.1
Geographical Region								
New England							0	0
Middle Atlantic							7	10.4
East North Central							8	11.9
West North Central							4	6.0
South Atlantic							10	14.9
East South Central							6	9.0
West South Central							10	14.9
Mountain							9	13.4
Pacific							13	19.4
Certification[b]								
CCA							1	1.5
CCS							50	74.6
CCS-P							9	13.4
CDIP							11	16.4
RHIT							27	40.3
RHIA							28	41.8
Others							9	13.4
Education								
No degree/some college							6	9.0
Associate							17	25.4
Bachelor							23	34.3
Master							21	31.3

Abbreviations: AHIMA, American Health Information Management Association; CCA, Certified Coding Associate; CCS, Certified Coding Specialist; CCS-P, Certified Coding Specialist, Physician-based; CDIP, Certified Documentation Improvement Practitioner; HIM, health information management; IQR, interquartile range, RHIT, Registered Health Information Technician; RHIA, Registered Health Information Administrator. [a] n = 66. [b] AHIMA members may hold more than one professional certification.

Table 2

Frequency of Learning Theories and Approaches Employed in the Mastery of ICD-10 Procedural Coding among AHIMA ICD-10 Academy Trainees

Learning Theories and Approaches	**No.**	**Percentage**
While learning to code, received positive feedback from others.	48	72.7
Positive reinforcement led to improved performance.	45	67.2
Interaction with Academy instructors helped change coding approach.	31	46.2
Learned best while observing others (in workplace).	21	31.3
Social networking or webinars helped to heighten skill level.	50	74.7
Previous coding experience helped to master procedural coding.	39	58.2
Used only problem-solving scenarios in Academy workbook.	13	19.4
Studied because procedural coding was challenging.	61	92.4
Learned best by studying independently and setting own hours.	52	77.6
Enrolled in college/online course to help master procedural coding.	12	17.9
Enrolled in massive online open course (MOOC) to help master procedural coding.	9	13.5

Note: Frequencies represent combined *strongly agree* and *agree* responses on a 5-point Likert scale.

Table 3

Highest Ranking Order of Learning Theories Used by ICD-10-PCS Academy Trainees (*N* = 67)

Theory	No.	Percentage
Operant conditioning (*n* = 37) Reinforced behavior in the form of positive feedback.	23	62.2
Social constructivist (*n* = 41) Tools within the social system and interactions with others through social negotiation.	15	36.6
Social cognitive (*n* = 51) Observing the modeled actions of others, especially professionals who are similar to you.	19	37.3
Self-regulated learning (*n* = 56) Strategizing and carrying out your own learning tasks at your own pace and in your own time.	37	66.1
Connectivism (*n* = 63) Drawing on learning reservoirs via the Internet: online classrooms, massive open online courses (MOOCs), virtual reality learning platforms, or social networks (e.g., YouTube, podcasts, videocasts, Facebook, Twitter).	17	27.0

Table 4

Frequency of Instructional Strategies Used by AHIMA-Approved ICD-10-PCS Trainers (N = 47)

Variable	Median	IQR	Range	No.	Percentage
Number of training workshops conducted after becoming an AHIMA trainer	4	10	0–50		
Survey items					
Used e-learning materials to help attendees understand procedural coding.[a]					
Strongly disagree				4	8.7
Disagree				6	13.0
Neither agree nor disagree				4	8.7
Agree				23	50.0
Strongly agree				9	19.6
Used the same workbooks used by AHIMA trainers during the Academy classes.[a]					
Strongly disagree				2	4.3
Disagree				4	8.7
Neither agree nor disagree				3	6.5
Agree				16	34.8
Strongly agree				21	45.7
Used a variety of teaching methods.					
Strongly disagree				0	0
Disagree				1	2.1
Neither agree nor disagree				2	4.3
Agree				23	48.9
Strongly agree				21	44.7
Provided verbal commentary as feedback to workshop attendees.					
Strongly disagree				0	0
Disagree				0	0
Neither agree nor disagree				1	2.1
Agree				15	31.9
Strongly agree				47	66.0
Encouraged interaction among attendees in small groups to facilitate learning.					
Strongly disagree				0	0
Disagree				1	2.1
Neither agree nor disagree				2	4.3
Agree				16	34.0
Strongly agree				28	59.6
Encouraged attendees to set their own learning agendas after the workshop was over.					
Strongly disagree				0	0
Disagree				4	8.5
Neither agree nor disagree				4	8.5
Agree				12	25.5
Strongly agree				27	57.4

Abbreviations: AHIMA, American Health Information Management Association; IQR, interquartile range.

[a] n = 46.