Effective Methods of Teaching ICD-10 CM/PCS

by Julie Alles, DHA, RHIA, and Julia K. VanderMolen, PhD, CHES

Abstract

This study aimed to determine effective methods of teaching the International Classification of Diseases, Tenth Revision, Clinical Modification, and International Classification of Diseases, Tenth Revision, Procedure Coding System (ICD-10-CM/PCS). Quantitative and qualitative components, as well as evaluated and compared student evaluation from the two ICD-10 CM/PCS courses, were used to determine outcomes. The assessment concluded that students who were taught by Instructor B were more successful because of the course pack. The results of the comprehensive final exam assessment *t*-value were 2.2831, and the p-value was >0.0374, indicating a statistically significant difference. The results of the quantitative study provided evidence that the standard course pack was beneficial when studying for course quizzes and tests. It was identified that students preferred the real-life examples over the textbook's short sentence descriptions.

Keywords: ICD-10-CM/PCS; health information management; health information technology instructional design; health informatics/health information management instructional design; curriculum

Introduction

The International Classification of Diseases, Tenth Revision, Clinical Modification, and International Classification of Diseases, Tenth Revision, Procedure Coding System (ICD-10-CM/PCS) is the new coding system that replaced the current International of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM), which was implemented in 1979. ICD-10-CM/PCS was implemented in October 2015.[1] It improved the current practice because a coder selects codes that provide more specificity about a patient's diagnosis instead of using unspecified codes.[2] Implementing ICD-10-CM/PCS will assist in increased reimbursement for hospitals and physician practices. Specificity of the codes will provide more detail about what happened to the patient for third-party payers to adequately reimburse the provider for treatment. The current coding system, ICD-9-CM, has 13,000 codes, and ICD-10-CM/PCS offers more than 70,000 codes.[3] The codes allow for a more specific selection of the diagnosis documented by the physician.

The implementation of ICD-10 CM/PCS has prompted the need for effective teaching methods to prepare students to have the skills and knowledge needed for an entry-level coding position. The resources relating to root operations, which are a significant component of the procedural coding system, were not in excessive supply compared with ICD-9-CM resources. To ensure that students were prepared for a career in coding, instructors needed to provide supplemental materials.

This study aimed to determine effective methods of teaching ICD-10-CM/PCS. Students entering the field of health information management (HIM) need to obtain knowledge and skills related to the use of the new system so that can be considered for entry-level coding positions within the field of HIM. A

faculty-created course pack was developed because students were requesting more examples than the textbook offered. The faculty-created course pack included outlines of each chapter, additional coding exercises, ICD-10-CM/PCS coding updates, and diagrams of a variety of coding scenarios related to different body systems. Not all students will become coders; they may work in other areas of the revenue cycle, yet still need to have a sound understanding of ICD-10-CM/PCS.

The purpose of this study was to examine the teaching methods and compare the ICD-10-CM/PCS materials used by two faculty members within an accredited HIM program.

Background

Preparing Curriculum for ICD-10-CM/PCS

To prepare HIM students for ICD-10-CM/PCS, the American Health Information Management Association (AHIMA) suggested that HIM programs revise their curricula. However, the increased specificity of codes in ICD-10-CM/PCS required more in-depth knowledge of anatomy and physiology, pathophysiology, and medical terminology.[4] The rationale for a deeper understanding of these subjects is to ensure that the students have a solid knowledge base enabling them to apply the correct diagnosis or procedure code. AHIMA suggested that students complete a medical terminology course one semester before enrolling in a HIM program so that they could immediately apply the information learned in that course to the pathophysiology course.[5] Furthermore, AHIMA also suggested in a practice brief to adjust the hours of the coding course.[6] The HIM program at our university has dedicated 6 credits to ICD-10-CM/PCS to ensure that students are developing an understanding of the material and can apply the coding guidelines to scenarios and cases. The AHIMA practice brief also advised that faculty members should research and compare textbooks to determine if they meet both faculty and student needs.[7]

Methods

This study set out to examine effective ICD-10 CM/PCS teaching methods of two instructors. The quantitative component of this study evaluated and compared student evaluations from these instructors' two ICD-10-CM/PCS courses. Institutional Review Board (IRB) approval for the study was granted with exempt status. Exempt status at the university is defined as research conducted in established or commonly accepted educational settings, involving normal educational practices. Appendix A and Appendix B provide approval for the exempt study.

Research Hypothesis

The following research hypothesis was proposed:

H_1: There is a statistically significant difference between the evaluations of teaching styles of the ICD-10-CM/PCS instructors.

Setting and Sample Size

The target population consisted of students who had a minimum GPA of 2.5 or above and had a C or better in anatomy/physiology and medical terminology courses at our university. The two sections of the course in the study had 16 students each. Thus, the study utilized a convenience sample.

Instrumentation and Measures

This section provides detail relating to the university's student evaluation feedback on teaching effectiveness. Data were collected from the student evaluations, which assessed the effective teaching methods of ICD-10-CM/PCS. The data includes student evaluations of the course, assignments, and assessments and teaching effectiveness. Eighteen questions of the student evaluation address teaching effectiveness. The instructor scores are out of 5.0, and student comments were compiled to identify any changes that should take place to the course.

Assignments and Assessments

Data collection for ICD-10-CM/PCS assignments was done by assigning the worksheets (Appendix C and Appendix D) in the course pack for homework and providing the students with several assessments throughout the semester.[8] The assessments included pop quizzes, tests about body systems, and a two-part final exam consisting of theory and practical application. Student grades were evaluated to determine retention and understanding of the guidelines and process of ICD-10-CM/PCS coding. Because the students are learning a skill, it is important that they can retain knowledge of the guidelines and apply it within the process of coding. The grades earned by students were through objective tests. Test questions were based on ICD-10-CM/PCS coding guidelines. Cumulative grades came from assessments and assignments. These assignments and assessments were reviewed and compared to the teaching techniques and ICD-10-CM/PCS coding guidelines to ensure student comprehension of the material. If inconsistencies were identified, the teaching techniques were re-evaluated and adjusted by adding more detail to the course pack or providing additional handouts for practice and retention.

Data Collection

Data collection for the effective teaching methods for ICD-10 CM/PCS included assignments, assessments and teaching evaluations. Assignment consisted of homework worksheets covering the guidelines and rules of coding. Assessments consisted of quizzes and test covering the different body systems, and inpatient and outpatient services. A second data collection was conducted, utilized by the university's teaching evaluation form. Data was collected from two individual courses instructed by two different faculty.

Data Analysis

A *t*-test was used to measure the scores of students on individual assignments and assessments taught by two instructors who the implemented and instructed the identical ICD-10-CM/PCS curriculum in the winter semester of 2015. A *t*-test was also used to compare teaching effectiveness based on the university's student evaluations of the teaching effectiveness of the two instructors. Teaching effectiveness was assessed in two ways: the progress on relevant objectives and overall ratings. The summary evaluation is the average of these two measures.

Results

A paired-samples *t*-test was conducted to compare the course results taught by two different instructors. Grades and assignments were collected from both instructors for comparison. A total of 32 students participated in this study: 16 from the Winter 2015 semester and 16 from the Winter 2016 semester. To have a paired-sample *t*-test, two student's scores from the highest and lowest of each assignment and assessment were removed from Instructor B's 2016 Winter semester course. After comparing the assignments, it was concluded that there was no statistical significance between the assignments. However, there was statistical significance between the assessments of the two semesters. Students who were in the Winter 2016 semester had a course pack that provided an outline and examples of each chapter that was covered.

A paired-sample *t*-test was also conducted to identify the effective teaching methods used to educate students in preparation of ICD-10 CM/PCS. Analysis revealed that all but one of the assignments was not statistically significant. The following variables Chapter 1, 2, 4, Exercise 3, Exercise 5, PCS Worksheets, and Michigan Health Information Management Association MHIMA) PCS revealed to be not statistically significant. The first assignment worksheet addressed a basic introduction to ICD-10 CM/PCS, a review of the material regarding code structure, the proper way to verify a code number, and the differences between ICD-10 CM/PCS and ICD-9-CM. The t-value was 15.00, and the p-value results were >0.0001, which made the difference to be statistically significant. Table 1 provides a summary of the comparison of assignments between the Winter of 2015 and Winter of 2016 teaching methods.

The second set of assessments covered a series of chapters from the ICD-10-CM and ICD-10-PCS Coding Handbook.[9] Students were quizzed on each chapter. Quizzes were worth 30 points. Instructor A

had a mean of 3.50 and a standard deviation of 2.90. Instructor B had a mean of 29.88 and a standard deviation of 0.34. The t-value was 8.3543 and p-value results was >0.0001, which made the difference to be statistically significant. See Table 2 Comparison of Assessments Between Instructor A and Instructor B.

Discussion

The significance of the study relates to the teaching styles and the development of materials that were selected for the HIM course. Different teaching methods, such as lectures, textbook assignments, in-class procedure coding system (PCS) flashcard assignments, guest speakers, student-created coding scenarios, student journals, student organizational binders, research articles relating to ICD-10-CM/PCS, and additional exercises, were used for classroom instruction.

Students are required to keep a journal and create an organizational binder. The journal is meant for the students to write their thoughts about the course and identify how the course is going, what materials are they struggling with, and what information makes sense to them. The journal also serves as a teaching evaluation as the students do not always want to comment on the course or material directly to the instructor, and the information in the journal can allow the instructor to improve the course. The organizational binder is designed to create a tool that the students will use not only in the classroom but also in the practicum and in the profession of coding. The binder contains coding guidelines, examples, and notes taken during the course, and the students can continue to update and add pertinent information to it for years to come.

Limitations

No study is without limitations, and the following are noted by the authors: not meeting all student learning styles, teaching styles, student preparedness and the lack of training materials to instruct ICD-10-CM/PCS effectively. Teaching styles can become a limitation with regards to how students understand and learn the material. Not all teachers lecture and explain the course content the same way. If the instructor does not provide additional materials, the kinesthetic learner found it more difficult to learn and practice the skill of ICD-10-CM/PCS coding. This affected the scores of student's assignment and assessments in the course. Additionally, student preparedness for the content is a limitation when students are not prepared for the course. Students who do not retain the information before the coding class or review any previous material will struggle with ICD-10-CM/PCS. Preparation of foundation course work such as medical terminology is also a limitation. Students who completed a medical terminology course during high school, at a community college or as a transfer of credits will have a two to three-year gap between the medical terminology course and ICD-10-CM/PCS. Finally, the study did not take into account differences in study habits, learning disabilities or a student's prior knowledge.

There is a lack of adequate training materials to properly educate students on the concepts of ICD-10-CM/PCS. Textbooks are available to teach the new coding system, but they lack ancillary materials to provide experiential learning of ICD-10-CM/PCS coding. This is a limitation of the study because if more resources and materials were made available for the instructor, effective teaching could take place and allow the instructor to provide supplemental material of all varieties of ICD-10-CM/PCS coding. The development of a course pack to provide supplemental material is needed to effectively teach ICD-10-CM/PCS.

Conclusion

The results of this quantitative study provided evidence that the course pack utilized by Instructor B was beneficial for studying for the quizzes and tests. Instructor A did not utilize the course pack. The *p*-values proved to be statistically different in the teaching effectiveness between the two instructors. The study showed that students preferred the real-life examples provided by Instructor B in the course pack to the short sentence descriptions within the textbook. We found that a great deal of time was spent creating the course pack content for each chapter and not enough time was devoted to creating additional

worksheets. Some chapters may have had a worksheet, but the instructors did not have enough time to create one for each chapter.

Furthermore, the findings of this study can be used to educate coding educators across the country. The AHIMA Faculty Development Institute/Assembly on Education offers an annual conference for educators. The findings of this study could help health information technology and HIM educators identify best practices for effective teaching of ICD-10-CM/PCS. Moreover, identifying different types of learning styles will help teachers to better engage students in learning the material related to the change to ICD-10-CM/PCS. Providing students with additional resources to understand ICD-10 CM/PCS coding guidelines and know how to apply them correctly can potentially make the students more marketable for future employment.

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Notes

1. Butler, Mary. "Analyzing Eight Months of ICD-10." *Journal of AHIMA* 87, no. 6 (2016): 16.
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Table 1

Comparison of Assignments Between Instructor A and Instructor B

	Instructor A.2015 Winter Semester			Instructor B. 2016 Winter Semester				
Variable	M	SD		M	SD	*t*	df	*p*
ICD-10 Worksheet	9.06	0.25		10	0.00	15.00	15	>0.0001
Chapters 1,2, 4 wks	14.88	0.34		15	0.00	.4639	15	<0.1639
Exercise 3	4.88	0.25		4.94	0.5649	1.8605	15	<0.5805
Exercise 5	9.81	0.40		10	0.5649	15	15	<0.0825
PCS Worksheet	9.94	0.25		9.88	0.34	0.5649	15	<0.5805
MHIMA PCS wks	9.81	0.40		10	0.00	15	15	<0.0825

Paired Sample *t*-test M=means, SD= standard deviation

Table 2

Comparison of Assessments Between Instructor A and Instructor B

	Instructor A.2015 Winter Semester			Instructor B. 2016 Winter Semester				
Variable	M	SD		M	SD	*t*	df	*p*
Quiz Chapters 1-4	23.5	2.90		28.5	3.37	3.6610	15	>0.0023
Test Chapters 1-7	59.50	3.41		62.13	1.86	2.7066	15	>0.0162
Test Chapters 8-10	35.13	1.54		36.25	1.13	2.3554	15	>0.0325
Final Exam	53.44	1.63		54.69	1.78	2.0717	15	>0.0560

Paired Sample *t*-test M=means, SD= standard deviation

Appendix A

GVSU IRB Approval

January 15, 2016

Dear Capella University IRB,

I have reviewed the proposed study "Effective Teaching Methods of ICD-10 CM/PCS," presented by Julie Alles, a doctoral student at Capella University. I understand that the purpose of the study is to determine effective teaching methods of ICD-10 Clinical Modification (CM)/ Procedure Coding System (PCS). The International Classification of Disease 10th (ICD-10) is a new coding system that will replace the current ICD-9-CM The last time the coding system was replaced was in 1979. ICD-10 CM/PCS has been delayed two times and estimated date of implementation is October 1, 2015. Students who are in the Health Information Management (HIM) degree need to obtain the knowledge and skills of this new system, so they can be successful within the field of HIM. The two questions that will be addressed are:

1. What are the effective teaching methods used to educate students in preparation for ICD-10 CM/PCS?
2. How proficient are the students coding accuracy while completing their coding projects on their practicum.

Targeted participants will include Grand Valley State University Health Information Management students who are enrolled in the HIM 361 Disease Classification System 1 course.

I have granted permission for the following research activities to be conducted at Grand Valley State University Allied Health Sciences Department Health Information Management program.

Student assessments, quizzes, and homework scores from the HIM 361 Disease Classification System 1 course will be collected and reviewed from the winter 2015 and 2016 semester to determine if effective teaching methods are being conducted. The winter 2015 assessments are located on the Blackboard learning management system and will be downloaded by the instructor who taught the course. The instructor will then de-identify the student information and provide the data to the Primary Investigator (PI).

I confirm that I have authority to grant such permission on behalf of Grand Valley State University.

I understand that this project will begin once the student has obtained Capella University's Institutional Review Board (IRB) approval. Julie Alles has agreed to provide my office a copy of the Capella University IRB approval or exemption letter before beginning any research activities.

I am aware that all data collected will be kept confidential. In accordance with Capella policy and best practices for ethical research. I understand that neither participants nor sites will be identified in any report of findings or in the published dissertation. Julie Alles has agreed to provide my office of the aggregate results from the study.

If the IRB has any concerns about the permission being granted by this letter, please contact me at the phone number or email address listed below.

Sincerely,

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Appendix B

Capella IRB Approval

CAPELLA UNIVERSITY

Date: February 18, 2016
From: The Institutional Review Board (IRB) Re: 2016-16
Study title: Effective Teaching Methods of ICD-10 CM/PCS
Submission type: Initial Submission
Review level: Exempt Dear Julie Alles,

On behalf of Capella University's Institutional Review Board (IRB), we are writing to inform you that your study has been approved as exempt. This approval also indicates that you have fulfilled the IRB milestone of Capella University's milestone process.

All research must be conducted in accordance with this approved submission, meaning that you will follow the research plan you have outlined here, use approved materials, and follow university policies.

Take special note of the following important aspects of your approval:

- Most programs have additional milestone requirements before data collection may proceed. You must complete those milestones before collecting data.
- Any changes made to your study require approval from the IRB Office before they can be implemented as part of your study. Contact the IRB Office at **irb@capella.edu** with your questions and/or proposed modifications.
- If there are any unanticipated problems or complaints from participants during your data collection, you must notify the Capella IRB Office **within 24 hours of the data collection problem or complaint**.
- Monitoring of the consent process or data collection and analysis may occur. The IRB will notify you if your study will be audited.
- Per the [Doctoral Learner policy](#), you are required to be enrolled during recruitment, data collection, and data analysis. If you are not enrolled, you must cease recruitment, data collection and analysis. Questions or concerns regarding this policy should be directed to the IRB Office.

The Capella University IRB is pleased to congratulate you on achieving this milestone. Best wishes as you conduct your research!

Regards,

Capella University Institutional Review Board

irb@capella.edu

Appendix C

ICD-10 CM/PCS Coding

Explain the ICD-10-CM Code Structure

First character is always: _____
The first three characters are called the _____
Characters 4-6 cover: _____, _____, _____
The seventh character is used for what (3) chapters in ICD-10-CM
1.
2.
3.

Characters 2-7 are either _____ or _____
What character is used to get to the seventh character if no characters are provided: _____

Guidelines:
Explain the difference between 'Rule Out" and 'Ruled Out'

Explain the difference between the admitting diagnosis and principal diagnosis.

Two or more diagnoses that equally meet the definition for principal diagnosis:

Two or more comparable or contrasting conditions:

A symptom followed by contrasting/comparative diagnoses:

Original treatment plan not carried out

Code Structure Terms:
Main Term
Subterm
Carryover line

What is the definition of principal diagnosis?

Why is the designation of the correct principal diagnosis so important?

Term #	DEFINITIONS	TERMS
	Used in both inclusion and exclusion notes after an incomplete term that needs one or more of the modifiers following this symbol in order for the term to apply	1. Due to
	Used when neither the diagnostic statement nor the medical record provides information that permits classification to a more specific code. Equivalent of unspecified	2. Parentheses
	When this appears under a code it is acceptable to use both the code and excluded code together. Means "not included here."	3. Excludes 1
	Used in either the index or tabular to indicate a causal relationship between two conditions is present	4. Excludes 2
	Encloses, synonyms, alternative wordings, abbreviations, and explanatory phrases. Also used to indicate that the number in this symbol can only be a manifestation and the other number must be assigned first for the underlying code	5. Dash
	Used to say there is no separate code for the condition even though the diagnostic statement may be very specific. Represents other specified.	6. Colon
	Used to enclose supplementary terms that may be present or absent in the diagnostic statement to be coded.	7. Square Brackets
	This note means 'NOT coded here." This instruction is used when two conditions cannot occur together and therefore both codes cannot be used together	8. Sections
	Four-character code numbers	9. Categories
	Three-character code numbers	10. Subcategories
	This symbol is used at the end of an index entry to indicate that additional characters are required	11. NEC
	Groups of three-character categories	12. NOS

The ICD-10-PCS code for the Medical and Surgical Section will have 7 characters. What does each character indicate?

Character 1: _____   Character 5: _____

Character 2: _____   Character 6: _____

Character 3: _____   Character 7: _____

Character 4: _____

Match the following approaches with its appropriate definition:

Approach	Definition
___Via Natural or Artificial Opening (7)	a. Procedures performed directly on the skin or mucous membrane and procedures performed indirectly by the application of external force through the skin or mucous membrane
___Open (0)	b. Entry of instrumentation through a natural or artificial external opening and entry, by puncture or minor incision, of instrumentation through the skin or mucous membrane and any other body layers necessary to aid in the performance of the procedure
___External (X)	c. Entry of instrumentation through a natural or artificial external opening to reach and visualize the site of the procedure
___Via Natural or Artificial Opening Endoscopic (8)	d. Entry of instrumentation through a natural or artificial external opening to reach the site of the procedure
___Percutaneous (3)	e. Entry, by puncture or minor incision, of instrumentation through the skin or mucous membrane and any other body layers necessary to reach and visualize the site of the procedure
___Via Natural or Artificial Opening with Percutaneous Endoscopic Assistance (F)	f. Entry, by puncture or minor incision, of instrumentation through the skin or mucous membrane and any other body layers necessary to reach the site of procedure
___Percutaneous Endoscopic (4)	g. Cutting through the skin or mucous membrane and any other body layers necessary to expose the site of the procedure

Match the following root operations with its appropriate definition.

Root Operation	Definition
___Detachment (6)	a. Cutting out or off, without replacement, a portion of a body part
___Release (N)	b. Cutting off all or part of the upper or lower extremities
___Extirpation (C)	c. Pulling or stripping out or off all or a portion of the body part by the use of force
___Transplantation (Y)	d. Taking or cutting out solid matter from a body part
___Excision (B)	e. Freeing a body part from an abnormal physical constraint by cutting or by use of force
___Reposition (S)	f. Putting in or on all or portion of a living body part taken from another individual or animal to physically take the place and/or function of all or a portion of a similar body part
___Extraction (D)	g. Moving all or a portion of a body part to its normal location or other suitable location
___Dilation (7)	h. Altering the route of passage of the contents of a tubular body part
___Removal (P)	i. Expanding an orifice or the lumen of a tubular body part
___Bypass (1)	j. Taking out or off a device from a body part
___Revision (W)	k. Correcting, to the extent possible, a malfunctioning or displaced device
___Repair (Q)	l. Visually and/or manually exploring a body part
___Fusion (G)	m. Restoring, to the extent possible, a body part to its normal anatomic structure and function
___Inspection (J)	n. Joining together portions of an articular body part rendering the articular body part immobile

What is the definition of principal procedure?

Appendix D

Root Operations

Additional Root Operation Coding   Name: _____

Root Operations That Take Out Some or All of a Body Part:
Excision (B), Resection (T), Detachment (6), Destruction (5), Extraction (D)

1. Non-excisional debridement of skin ulcer of back _____
2. Right ankle joint amputation _____
3. Cryotherapy of three warts on left hand and one wart on right hand_____
4. Percutaneous needle biopsy of right breast followed by right total mastectomy, open_____
5. Excision of malignant melanoma from the skin of the right upper arm, and right hand_____
6. Laparoscopic cholecystectomy converted to complete cholecystectomy, open_____
7. Sigmoidoscopy with sigmoid polypectomy _____
8. Laparoscopy with ablation of endometriosis, endometrium, and bilateral fallopian tubes
_____

Root Operations That Take Out Solids, Fluids, or Gases from a Body Part:
Drainage (9), Extirpation (C), Fragmentation (F)

1. Forceps removal of foreign body in the left nostril _____
2. ERCP with lithotripsy of common bile duct stone _____
3. Open right hip arthrotomy with drain placement _____
4. Foreign body removal, skin of right index finger _____
5. Diagnostic percutaneous paracentesis for ascites _____

Root Operations Involving Cutting or Separation Only:
Division (8), Release (N)

1. Right open carpal tunnel release _____
2. Division of left Achilles tendon, percutaneous _____
3. Open osteotomy of the capitate and lunate bones, right hand
_____

Root Operations That Put In/Put Back or Move Some/All of a Body Part:
Transplantation (Y), Reattachment (M), Transfer (X), Reposition (S)

Qualifier Choices:

Type of Transplant	Qualifier Character	Definition
Allogenic	0	Taken from different individuals of the same species
Syngeneic	1	Having to do with individuals or tissues that have identical genes, such as identical twins
Zooplastic	2	Tissue from an animal to a human

1. Left foot open flexor digitorum brevis tendon transfer _____
2. Reattachment of severed left ear _____
3. Open fracture reduction, displaced fracture of right humeral head _____
4. Liver transplant with donor matched liver _____
5. Right knee arthroscopy with reposition of anterior cruciate ligament _____

Root Operations That Alter the Diameter/Route of a Tubular Body Part:
Restriction (V), Occlusion (L), Dilation (7), Bypass (1)

Device Choices for Bypass:

Type of Tissue	Device Character	Definition
Autologous	9 or A	Referring to a graft in which the donor and recipient areas are in the same individual
Synthetic Substitute	J	Any type of synthetic substitute
Nonautologous Tissue Substitute	K	Nonautologous allogeneic donor tissue implanted from one human to another

1. Clipping of anterior cerebral artery aneurysm via craniotomy _____
2. PTCA of two coronary arteries. RCA with stent and LAD without stent_____
3. PTA of right radial artery stenosis _____
4. Laparoscopy with bilateral occlusion of fallopian tubes using extraluminal clips _____
5. Colostomy formation, open, descending colon to abdominal wall _____
6. CABG of LAD using left internal mammary artery, open; off pump _____

Root Operations That Always Involve a Device:

Insertion (H), Replacement (R), Supplement (U), Change (2), Removal (P), Revision (W)

1. Percutaneous placement of pacemaker lead into left atrium _____
2. Total left knee arthroplasty with insertion of total knee prosthesis, with bone cement_____
3. Aortic valve replacement using porcine valve, open _____
4. Change Foley urinary catheter _____
5. Laparoscopic right inguinal hernia repair with Marlex mesh _____
6. Tracheostomy tube exchange _____
7. Open revision of left hip replacement, with readjustment of the prosthesis _____

8. Removal of external fixator, left humeral head fracture _____

9. Cystoscopy with retrieval of right ureteral stent _____

Root Operations Involving Examination Only:

Inspection (J), Map (K)
1. Colonoscopy to the descending colon _____
2. Heart catheterization with cardiac mapping _____
3. Ureteroscopy with unsuccessful removal of left ureteral stone _____

Root Operations That Define Other Repairs:

Control (3), Repair (Q)
1. Suture repair of right median nerve laceration, open _____
2. Control of postoperative retroperitoneal bleeding via laparotomy _____
3. Closure of skin laceration, left external ear _____

Root Operations That Define Other Objectives:

Fusion (G), Alteration (0), Creation (4)
1. Bilateral breast augmentation with silicone implants, open _____
2. Interphalangeal fusion of right great toe, percutaneous pin (internal fixation) fixation ___
3. Creation of penis in female patient using synthetic material _____
4. Creation of vagina in male patient using tissue bank donor graft _____

Coding Note: Creation

Body Part…   Started As…   Female
Qualifier…   Going To…   Male