Original Publication

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An Innovative Curriculum Using a Simulated Electronic Health Record to Teach Internal Medicine Residents About ICD-10-CM

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Abstract

Introduction: This module introduces learners to the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) coding system and its relevance to patient care, billing, and public health. Knowledge of this coding system is critical for residents about to enter independent practice. **Methods:** This case was developed for internal medicine residents at all levels of training and was delivered in three 50-minute sessions. Associated materials include a test given before and after the module, the answer key to that test, the clinical case and associated learning objectives, a faculty guide, and an evaluation form. This module features a simulated patient encounter in an electronic health record, the details of which are given in the faculty guide. **Results:** Eighty-eight percent of learners reported that they found this exercise useful, and there was a significant improvement in posttest scores after completion. Ninety-four percent of learners reported a commitment to using appropriate ICD-10-CM codes in their own practice after completion of the exercise. **Discussion:** This effective module has been integrated into our ambulatory curriculum. Knowledge of ICD-10-CM coding allows physicians to document specifically and appropriately as they move forward in their practice.

Keywords

Documentation, Electronic Health Records, ICD-10, International Classification of Diseases, Ambulatory Education

Appendices

A. Knowledge Assessment Test.docx

B. Knowledge Assessment Test Key.docx

C. Clinical Vignette - Learner .docx

D. EHR Vignette - Learner .docx

E. EHR Vignette & Clinical Vignette - Instructor.docx

F. Engagement Survey.docx

All appendices are peer reviewed as integral parts of the Original Publication.

Educational Objectives

By the end of the module, the resident will be able to:

1. Describe the characteristics of the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM).

2. Identify how the ICD-10-CM differs from the International Classification of Diseases, Ninth Revision, Clinical Modification.

3. Apply the appropriate ICD-10-CM codes to a clinical encounter.

4. Recognize the value of the ICD-10-CM to patient care and clinical practice.

5. Characterize the responsibilities of the physician in the implementation of ICD-10-CM codes.

Introduction

On October 1, 2015, all health care institutions in the US were required to upgrade their coding system from the International Classification of Diseases, Ninth Revision, Clinical Modification, to the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM). This change signifies a shift to a coding system that offers a more granular representation of procedures and services performed by providers. As updates occur in medical technology, the ICD-10-CM allows for addition of new codes. It also allows providers to enhance the specificity with which patient-related data are entered in the medical record, which can be used to improve patient outcomes, reduce errors, enhance quality data reporting, and promote accurate billing practices.[1]

Medical learners at both the undergraduate and graduate levels are increasingly required to use electronic health records (EHRs) to manage patient care. Although EHR use has been shown to have clinical benefits, little is known about the effects of the EHR on medical education. Tierney, Pageler, Kahana, Pantaleoni, and Longhurst attempted to identify benefits and challenges of the EHR in the context of the ACGME Core Competencies and found that aspects of EHR use relate to each competency.[2] However, educators are still learning and developing different strategies for leveraging this technology as a teaching tool. In an effort to engage our residents, we created an active learning module that utilized elements of the team-based learning (TBL) pedagogy.

At the Temple University Hospital, attending physicians underwent web-based training on ICD-10-CM. However, no hospital-mandated training was provided to our internal medicine residents. In an effort to introduce the rationale behind ICD-10-CM and teach its practical application to medicine trainees, we created a modified TBL curriculum using the EHR in a resident continuity practice. This curriculum is intended to introduce the purpose and value of the ICD-10-CM to residents through a simulated EHR experience. This module is intended for internal medicine residents in their outpatient practice but can be applied to medical students as well as physicians in training in other specialties. We are unaware of any similar resource currently available.

Methods

Team Formation

Approximately 20 internal medicine residents from PGY 1-PGY 3 are formed into four teams of five residents each. Residents are assigned by the faculty facilitator to teams, with an attempt to evenly distribute PGY training levels within the teams. These teams remain constant throughout the three sessions of the exercise.

Description of Advance-Preparation Resources

Residents are given an article on ICD-10-CM that is to be reviewed independently prior to the first session. The estimated amount of time to review the article is approximately 1 hour. The article chosen for the exercise is "The Road to ICD-10-CM/PCS Implementation: Forecasting the Transition for Providers, Payers, and Other Heathcare Organizations."[1] This article was selected because it provides a historical background for ICD-10-CM and the rationale for its implementation.

Description of Knowledge Assessment

Each resident is administered an eight-question multiple-choice test before and after the educational activities (Appendix A). Each resident has 10 minutes to complete the test and return it to the facilitator. This is a closed-book examination. There is no debriefing process after the initial administration of the test, as this same test is used at the end of the educational activity to assess knowledge improvement. These tests are reviewed and graded by the faculty after the session (Appendix B). The tests cover general principles of the ICD-10-CM that apply to outpatient internal medicine practice.

Description of Group Activities

There are three overall sessions held on 3 consecutive days. For the first session, learners are presented with a simulated case and their learning objectives (Appendix C). Learners then work in their assigned small groups to determine the answers to their learning objectives. A facilitator moves from group to group to help stimulate intrateam debate and assist with bringing groups to conlcusions. Teams have access to both the internet and the assigned reading during this time and can use these resources to prepare their answers to the learning objectives. Most teams complete the learning objective responses within the hour session; however, teams are permitted to continue to work outside of the classroom to complete the task.

In the second session, residents utilize a simulated patient case in the EHR in which they generate the most appropriate ICD-10-CM diagnoses for that case. We developed this simulated case with the assistance of support staff of the EHR software vendor. In this session, residents are again divided into

their teams and are assigned a computer station. Residents are given the clinical vignette with specific tasks to complete (Appendix D) and are required to log onto the training environment of the EHR and open up a simulated patient chart. Each team has approximately 15 minutes to answer and complete each of the learning objectives/tasks utilizing the EHR. Two facilitators are present to provide technical assistance and to facilitate intrateam debate. During the latter half of the session, the residents gather as a large group, and each team discusses its experience with the EHR. Faculty facilitate the report-back and debate following Appendix E and use a computer and projection screen to demonstrate how the teams completed the learning objectives in the EHR.

In the third session, the residents gather in their teams and report on their answers to the learning objectives provided in the first session. A faculty member is present to facilitate the discussion using Appendix E and to ensure that all teams participate. When prompted by a facilitator, teams are encouraged to bring a new fact or knowledge point to the discussion rather than deferring an answer. This report-back period lasts approximately 35 minutes. After report-back, residents are given 10 minutes to complete the knowledge assessment test (Appendix A). This is also a closed-book examination. During the final 5 minutes of the session, residents are given a survey to rate their facilitators, the educational quality of the exercise, and their own engagement (Appendix F). Results from this survey help guide future curriculum improvement.

Facilitation Schema

Session 1 (conference room):

- Introduction of goals and objectives (5 minutes).
- Knowledge assessment test (10 minutes).
- Formation of small groups and investigation of learning objectives (35 minutes).

Session 2 (computer lab):

- Introduction of simulated EHR clinical vignettes (5 minutes).
- Small-group breakout: Teams complete assigned tasks in simulated EHR (25 minutes).
- Report-back: Individual teams gather in large groups to discuss process (20 minutes).

Session 3 (conference room):

- Report-back: Individual teams gather in large groups to discuss Session 1 learning objectives (30 minutes).
- Knowledge assessment test (10 minutes).
- Evaluation survey (5 minutes).

Results

Seventy-six categorical internal medicine residents participated in this exercise, which was created and facilitated by four faculty members of the internal medicine residency program. Faculty members had previously undergone institutional training on the purpose and implementation of ICD-10-CM coding, in addition to self-directed education in the form of literature review.

The knowledge assessment test for this module took the form of a multiple-choice examination, which was administered prior to the computer exercise and case presentation. This test was also administered at the end of the module. The mean number of questions answered correctly for the pretest was 6.08 and for the posttest was 6.55 (p = .005). The mode increased from six out of eight correct on the pretest to a perfect score on the posttest.

The Table provides the details of the engagement survey administered at the end of the exercise. Approximately 88% of learners found the exercise useful, and 94% expressed commitment to appropriate ICD-10-CM documentation following the module. Two-thirds of the learners felt that the computer-based portion of the exercise was helpful, and 76% stated that they would like more exercises ofa similar nature.

Table. Percentage of Responses to Survey by Item (*N* = 76)

Survey Item	Response Percentage				
	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Residents were actively involved.	38	58	3	1	0
I was mostly a passive learner.	4	3	22	55	16
The information was helpful.	30	58	12	0	0
I actively participated.	39	55	5	0	0
I want more sessions like this.	36	41	20	4	0
Faculty were effective as facilitators.	64	36	0	0	0
Faculty assumed a lecture model.	13	13	4	53	17
The computer format was valuable.	25	42	25	8	0
I am committed to providing appropriate ICD-10 diagnoses.	42	53	5	0	0

Discussion

We used modified TBL strategy supplemented with a simulated patient encounter in the EHR to enhance both residents' knowledge about ICD-10-CM and their ease with using it in the outpatient setting. The simulation of tasks requiring knowledge of ICD-10-CM in the EHR was a unique intervention that put the body of knowledge into the context from which the residents would need to retrieve it when caring for their own outpatients. This aided the development in the learners' minds of an effective knowledge organization of ICD-10-CM. Our educational session coincided with the introduction of ICD-10-CM in the US, so that the residents were learning about ICD-10-CM at the same time that they were required to use this new system in the care of their patients.

The test scores demonstrated an incremental increase in knowledge among our learners from baseline to after completion of the learning module. In general, questions regarding the syntax and components of ICD-10-CM coding were answered correctly by most learners. Those questions that asked learners about the historical context of ICD-10-CM posed more of a challenge. Specifically, question number eight was answered incorrectly more than any other. The survey data also demonstrated the motivation of our learners to apply knowledge of ICD-10-CM to their clinical practice.

Learners did reasonably well with the simulated EHR exercise. The patient chart was intentionally designed to have patient problems and diagnoses throughout the record, rather than in a single section. This was done to reflect the reality of many patient records. Not surprisingly, learners would often miss specific nuances that were required to generate complete and accurate ICD-10-CM codes. These omissions frequently resulted in a discussion about the importance of complete and consistent documentation in the EHR.

There were limitations associated with our educational intervention. It was taught in the context of outpatient and not inpatient practice. We did not assess the knowledge of individual learners in a way that would allow us to provide targeted remediation to any who failed to achieve a minimum level of proficiency with ICD-10-CM. We did not perform prospective chart reviews after the educational intervention that would demonstrate the application and durability of what was learned from our focused intervention. We had also hoped that recognition from the residents about how the clinical history of their patients was stored in the electronic medical record would promote ownership of their patients' charts. We did not assess this hoped-for attitudinal change in any way.

In summary, we created a timely and relevant active-learning module supplemented with a simulated electronic medical record exercise to introduce our residents to the use of ICD-10-CM in outpatient practice. Future educational opportunities would include a more focused assessment of the knowledge of individual learners and the demonstration of improved use of ICD-10-CM codes and enhanced outpatient chart maintenance in the resident practice.

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