Family physicians frequently err when applying Current Procedural Terminology (CPT) evaluation and management (E&M) codes to their office visits, but there are few published prospective studies on educational interventions to improve coding.

Methods: Over a 6-year intervention period, 429 resident patient notes from return clinic visits were recoded by a faculty member with coding expertise. Feedback on coding accuracy and annual educational coding workshops were provided to the residents. Coding accuracy was calculated by subtracting residents’ code from that of the faculty. Coding accuracy was analyzed cross-sectionally using all available data and longitudinally for 14 residents with data from all 3 years of the residency.

Results: Analysis of codings by 68 residents found that residents undercoded their clinic visits by 0.49 levels of service. Higher training year of the resident was associated with more accurate coding. Improvement over time was also found with the longitudinal analysis. However, comparison of 23 residents’ coding from before the first feedback and didactic session to codings after starting feedback suggests that these improvements were not due to the intervention.

Conclusions: Residents improved in coding accuracy over time, but our educational intervention may not have been responsible for the improvement.

(Fam Med 2010;42(9):648-52.)

Background and Objectives: Family physicians frequently err when applying Current Procedural Terminology (CPT) evaluation and management (E&M) codes to their office visits, but there are few published prospective studies on educational interventions to improve coding.
was evaluated. Once yearly, all residents (n=20–28 per year) attended a 1-hour didactic interactive conference on CPT E&M coding, taught by a faculty member with expertise in coding. During this session, the residents were taught the basic rules and concepts related to CPT E&M coding and to reinforce this content, during the workshops, residents were asked to code several family medicine clinical notes copied from the medical records of active patients with the aid of a standardized coding tool. During this interactive session, a faculty then provided the correct coding for these clinical notes and used the coding tool to explain why. Additionally, each resident’s coding accuracy was assessed several times each year by reviewing two clinic notes of each resident, pulled at random, from their first day of clinic of the month selected. This re-coding of the residents’ notes was done by the same faculty member with expertise in coding who led the coding workshops and used the same standardized coding tool used in the workshops. Based on documentation available, each clinical note received a CPT E&M code by the faculty that was compared with the code assigned by the resident at the time of the clinical encounter. The clinical notes and faculty coding were returned to the residents as formative feedback several times each year in a random fashion.

The faculty coder’s accuracy was assessed by having a hospital compliance and coding specialist who is a certified professional coder separately recode 5% or 22 of the notes randomly selected from the 429 notes. Complete agreement was present in 18 of 22 re-coded notes, and on all 4 of the discordant notes, the two codings were within 1 point most commonly as in 99214 instead of 99213.

During the 6-year study period in which we used the audit and feedback intervention, we assessed the change of our residents’ performances over time. To assess whether the educational intervention resulted in improved coding accuracy, resident performances were assessed both cross-sectionally and longitudinally.

Data Analysis
The clinical encounters of only return patients that were coded using CPT E&M codes visits were used for this analysis. For each encounter, an error score was calculated by subtracting the faculty level of coding from the residents level. Thus, error scores could range from +4 to -4 with negative scores representing under-coding on the part of the resident. The error score data were then analyzed cross-sectionally using a one-way ANOVA with the resident’s year of training as the factor variable and accuracy of CPT E&M coding as the response variable. Newman-Keuls Multiple-Comparison Test was used as the analysis of variance technique. Data were also analyzed longitudinally using reported measures ANOVA for the group of residents for whom there are error score data for all 3 years of their participation in the training program. Residents did not have data from all 3 years if they left the residency program before completion, if they were in their second or third year of training at the time of the initiation of the coding intervention, or if they were not in their third year when we analyzed these data.

Because this was an educational intervention within a residency training program, there was no prospective control group. To assess the impact of the education intervention on residents’ coding accuracy, we used a baseline coding as the residents’ codings analyzed prior to their first didactic session on coding. This was used as a baseline control group. These residents were in all 3 years of training and had not received any formal feedback on their coding. A one-way ANOVA was undertaken with coding error as the dependent variable and resident year of training and before-and-after intervention status of the coding as the independent variables. Analyses were undertaken using NCSS 2007, and a P value less than .05 was considered statistically significant.

Results
During the 6-year study period, 496 family medicine resident codings were analyzed for all residents. Forty-one visits were coded as new visits, and three were coded as preventive medicine visits. These codings were excluded from the analysis. An additional 23 codings were completed by residents before the first feedback and education session and were removed to be used as baseline controls. This left 429 returning patient visits that were reviewed for accuracy of coding. A total of 150 of these visits were completed by first-year residents, 147 were with second-year residents, and 132 were with third-year residents. The controls and intervention notes had a similar distribution of the 3 years of the residency (P=.66) A mean of 6.3 visits per resident were reviewed by the faculty member, with a range of 1 to 18 encounters per resident. The median number of visits reviewed was 4.5. These visits were provided by a total of 68 different family medicine residents. The CPT code 99214 was the most frequent in this dataset and made up nearly 75% of the visits. Further details of the coding can be found in Table 1.

Cross-sectional Analysis
The mean coding error score for these notes suggested that the residents systematically under-coded their visits by 0.49 levels of service (SD=0.65). The distribution of the error scores is shown in Figure 1. Residents’ errors were associated to the actual level of service (P<.001) as they tended to over-code simple visits and under-code more complex visits (Table 1). Cross-sectional analysis found that the training year of a resident was strongly associated with the mean
Table 1

Errors in CPT Coding by Residents of the 429 Return Patient Visits Included in This Study

<table>
<thead>
<tr>
<th>True CPT Coding</th>
<th>Number of Visits</th>
<th>% of Total Visits</th>
<th>Visits Coded Correctly (%)</th>
<th>Mean Coding Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>99212</td>
<td>4</td>
<td>0.9%</td>
<td>2 (50%)</td>
<td>+0.75</td>
</tr>
<tr>
<td>99213</td>
<td>90</td>
<td>21.0%</td>
<td>67 (74.4%)</td>
<td>+0.03</td>
</tr>
<tr>
<td>99214</td>
<td>317</td>
<td>73.9%</td>
<td>132 (41.6%)</td>
<td>-0.61</td>
</tr>
<tr>
<td>99215</td>
<td>18</td>
<td>4.2%</td>
<td>3 (16.7%)</td>
<td>-1.33</td>
</tr>
<tr>
<td>Totals</td>
<td>429</td>
<td>100%</td>
<td></td>
<td>-0.49</td>
</tr>
</tbody>
</table>

CPT—Current Procedural Terminology

True CPT coding was determined by the reviewing faculty.

Longitudinal Analysis

There was a subset of 14 residents with CPT E&M coding data from 191 visits over their 3 years of the residency program. This analysis, by repeated measures ANOVA, found significant variation in the coding accuracy by residents ($P=.001$). More importantly, we found a significant association between year of training and the coding accuracy of residents ($P<.001$). The mean deviation of first-year residents was -0.59, and this improved to -0.33 in the third year of training. These mean deviation scores were significantly different.

Before and After Intervention

While residents improved over time in their coding accuracy, a comparison of resident performance before and after the intervention suggest that the observed improvement in accuracy was not the result of the intervention. The coding accuracy for the 23 clinic visits before the intervention were used for this comparison. Postgraduate year (PGY) of the residents’ training was clearly associated with coding accuracy ($P=.01$) in both the pre- or post-intervention codings by residents ($P=.97$). A graph showing coding accuracy as a function of PGY of training and whether the accuracy was assessed before or after the intervention is shown in Figure 2.
Accurate CPT E&M coding is an essential skill for physicians. We found that residents routinely under-coded their patient visits in a family medicine clinic. This finding suggests that residency programs should introduce interventions to address this performance problem. Indeed, the Family Medicine RRC mandates that all training program will provide residents with feedback on their coding. Goals for teaching correct CPT coding include improvement in accuracy, increased interest in documenting correctly, and continued improvement in accuracy over time.

Our program designed to improve resident coding performance utilized regular faculty review of residents’ coding combined with delayed formative feedback to individual residents and formal didactics about coding for all residents. Audit and feedback interventions are widely used in clinical medicine, and research suggests that these interventions can improve professional practices although these interventions are not always effective.

We did find that residents significantly improved as they advanced in their training. However, our intervention may not be responsible for the improvement in coding accuracy. Although we only have a small number of resident codings from before starting our coding didactics and the faculty feedback, we find a similar coding accuracy after our intervention and a similar pattern of improvement as residents advanced in their training. All the reasons for their improvement over time are not clear but could include resident educational exposure within the act of patient care with preceptor input.

It is not accurate to conclude, based on our findings, that residents do not need any structured instruction on coding. While our residents might have improved independently of our intervention, we still find that they systematically under-coded in their final year of residency. Lastly, we do not know the coding proficiency of our residents as they leave our program and enter practice.

While we did not demonstrate the positive impact of our intervention of audit, feedback, and educational workshops on CPT E&M accuracy, others have reported success. While these studies found improvement in coding accuracy, compared to our study, resident performance was monitored over shorter periods of time than we did and the interventions were generally more intense with more frequent educational or feedback sessions. These studies also used a before and after intervention design to assess the effect of the intervention.

In considering interventions to improve coding accuracy, our data suggest that undercoding of complex (99214 and 99215) visits should receive considerable attention. This is where we found most of the coding errors. Although residents accurately coded the great majority of their 99213 visits, most of the undercoded complex visits were coded by residents as 99213. Thus, we would recommend that if resources were limited that faculty should preferentially focus their reviews on the visits that their residents code as 99213.

This research has several limitations that should be considered when attempting to generalize our findings. The first is that these data are from one residency program. In addition, the number of pre-intervention codings is small, being only about 5% of the data. Having a larger control group would provide greater confidence in our conclusion that the intervention was not effective. Ideally, a control group of residents whose coding practices could be followed throughout
training without our formal teaching and ongoing feedback would more clearly demonstrate whether our intervention is definitely having an impact. However, the RRC requirements make this difficult when ongoing feedback is required in some form.

While our education and feedback intervention might not have been sufficiently intense to be successful, there are non-education-based interventions we could have considered that have been reported to enhance coding accuracy. Implementing clinician-coder double reading improves accuracy and increases revenue. Although there is additional cost associated with this approach, captured revenue can make this cost-effective. Others have offered different coding tools to enhance coding accuracy. There are a small number of studies on the impact of having residents use note templates to improve CPT coding. These job aids have been found to have a positive effect on coding accuracy, but it is unknown whether they would continue to increase coding accuracy over long time periods. The EMR also has been shown to have potential as a way to increase coding accuracy and improve charge capture. Our project differed from these studies because we used a coding aid for our educational workshops but did not attempt to have residents use the instrument while working in the clinical setting.

Conclusions

Over a 6-year study period we found significant evidence that residents improved in their CPT E&M coding of return patient visits as they progressed in the residency program. This improvement occurred concurrently with an educational intervention involving interactive coding workshops and delayed formative feedback to residents on their coding performance in a family medicine clinic. Our data also suggest the improvement in coding accuracy we observed might not be the result of our workshops and feedback to residents. Coding accuracy is an important outcome of a residency program, and development of effective educational interventions that can be implemented for long periods of time should be pursued using rigorous research methodologies.

Acknowledgments: The authors thank Rozanne Murphy, CPC (certified professional coder), for her work on this project.

Corresponding Author: Address correspondence to Dr Skelly, University of Iowa, Department of Family Medicine, 200 Hawkins Drive, Iowa City, IA 52242. 319-384-5197. Fax: 319-384-7822. kelly-skelly@uiowa.edu.

REFERENCES