The halcyon days of Marcus Welby, when a doctor could simply “hang up a shingle” and be assured of a good living, are long passed. Physicians today must advertise, use lean management business practices, and, most importantly, code and bill effectively to have a financially healthy practice. This is particularly true for primary care physicians due to narrow margins and reliance on outpatient visits for the major source of their incomes. Accurate coding is also legally required for compliance with regulations from Medicare, Medicaid, and commercial payers.

The challenging financial situation found in non-graduate medical education (GME) primary care practices becomes even more critical for residency/GME-based primary care practices. The tenuous financial health of these practices is threatened by high educational costs, inefficiencies characteristic of training sites, and payer mixes that are usually at the low end of the reimbursement scale. In addition to correct coding for financial and compliance reasons, residents also have an educational need to learn how to code correctly.

Evaluation and Management (E&M) codes are the means by which physicians seek reimbursement from payers for the non-procedural services they provide for patients. More complicated visits result in higher E&M codes and greater reimbursement.¹

It is critical for busy resident physicians to understand E&M coding and to apply codes accurately to their outpatient encounters. Reasons for this include the funding needs of residencies, compliance with Medicare and Medicaid regulations, and educational objectives. Competency

From the Department of Family Medicine, University of Washington (Drs Evans, Cawse-Lucas, Allcut, Ms Andrilla, and Dr Norris); and PeaceHealth Southwest Medical Center, Ridgefield, WA (Dr Ruiz).

BACKGROUND AND OBJECTIVES: The financial margins for primary care clinics and residencies are narrow. It is important that residents bill properly for educational and financial purposes as well as for compliance. This study compares resident and attending Evaluation and Management (E&M) coding from family medicine residency programs across a five-state region, with established billing benchmarks.

METHODS: We collected established visit E&M codes for faculty and residents from a network of family medicine residencies in the Northwest United States over a 6-month period. Aggregated codes were compared to billing benchmarks from the Medical Group Management Association (MGMA) to estimate effects on revenue from these visits.

RESULTS: We obtained coding data for 131,788 established problem-focused visits from 353 residents and 186 faculty physicians in 16 of 18 eligible family medicine residencies. Both residents and faculty billed lower numbers of high complexity codes than MGMA benchmarks. PGY-1s coded higher numbers of high complexity codes than PGY-3s. Annual estimated revenue loss was $481,654 for the programs overall.

CONCLUSIONS: Residents do not bill established visits at the level of generally accepted benchmarks, which contributes to significant financial losses for programs and carries regulatory implications. The reasons for incorrect billing need to be established and interventions developed to overcome these barriers.
in coding/billing is a necessary critical career skill. To this end, the Accreditation Council for Graduate Medical Education in Family Medicine requires 100 curricular hours in practice management. Teaching billing and coding is an important part of this required curriculum.

Coding is more complex for family medicine and other primary care residents due to the widespread use of the Primary Care Exception (PCE). This rule was developed to allow primary care residents to see patients independently and to be seen by their patients as their primary care provider. The PCE allows residents to see less-complex patients independently in ambulatory primary care settings, only requiring attending physicians to see patients for higher-level visits and complete physical exams. Some programs apply the PCE to all patients regardless of insurance coverage, while others apply this to Medicare patients only.

Studies examining the coding accuracy of practicing family physicians show substantial error rates. Similar widespread studies have not been done on the issue of resident physician coding skill. Skelly et al studied 68 family medicine residents in a single institution over 6 years and found significant coding inaccuracies.

No study, to date, has compared family medicine resident coding to that of the residency faculty members who teach them. Nor are there comparisons of resident coding with accepted national benchmarks used by clinic administrators to assess the financial viability and productivity of practices. The financial health of resident teaching clinics and the future success of family medicine residency graduates depends on adequate assignment of E&M codes. This study compared resident and attending E&M coding from 16 family medicine residency programs across a five-state region of the northwestern United States, with established billing benchmarks from the Medical Group Management Association (MGMA). We hypothesized that residents do not code visits to the correct level of complexity compared to faculty or to practicing physicians, resulting in significant revenue loss to their teaching clinics.

Methods

Participants
The University of Washington Family Medicine Residency Network is comprised of 22 diverse family medicine residencies across Washington, Wyoming, Alaska, Montana, and Idaho (WWAMI). In 2013 these ACGME-accredited 3-year programs trained 446 residents annually in their associated outpatient clinics. Residents are supervised in the clinics by both paid professional faculty and volunteer community faculty. A host institution with its own faculty and staff independently manages all Network residencies. The 18 Network residencies that had PGY-1 through PGY-3 classes for the academic year 2011–2012 were eligible for inclusion in this study.

Instrument
We used a Microsoft Excel 2008 spreadsheet to collect data (Figure 1). The spreadsheet was refined by four former residency program directors prior to distribution. Data was requested on the number of visits coded with the established visit, problem-focused E&M codes 99211, 99212, 99213, 99214, and 99215 for PGY-1, PGY-2, and PGY-3 resident physicians and for faculty physicians. Information was also requested regarding the number of residents and faculty in the program.

Data Collection
The data collection instrument was e-mailed to residency program directors at the 18 eligible programs. E&M codes were requested for the 6-month period from January 1, 2012, through June 30, 2012. Program directors obtained the data by working with their billing support staff and either querying the electronic medical record or doing a hand count of billing totals. All reported problem-focused established E&M codes were included. The second half of the academic year was selected because, according to Centers for Medicare and Medicaid Services (CMS), PGY-1s may be released to see patients under the same rules as...
more senior residents after 6 months of postgraduate training. No data on individual physicians were requested.

Benchmark E&M billing data for practicing family physicians was obtained from the Medical Group Management Association (MGMA). The MGMA sub-categorizes family medicine data into four distinct groups (family medicine with obstetrics, family medicine without obstetrics, family medicine outpatient only, and family medicine sports medicine). We used MGMA family medicine with obstetrics for our benchmark group as all of the WWAMI Family Medicine Network residency programs teach obstetrics.

Statistical Analysis
Based on E&M codes reported on the described residency billing spreadsheet, each visit was categorized into either low/mid complexity (99211, 99212, 99213) or high complexity (99214, 99215). The overall proportion of visits that fell into each category was calculated for PGY-1, PGY-2, and PGY-3 residents and attending physicians. We then compared the proportion of visits in each category that were provided by each year of residents and attending physicians to MGMA benchmarks separately and to each other using t tests and chi-square analysis.

Revenue Calculation
Total Relative Value Units (tRVU) are a common means of measuring physician productivity. tRVUs consider the relative level of time, training, and intensity of providing a service as well as malpractice and overhead involved in delivering the service.

To estimate the potential revenue difference between resident visits from our sample to the MGMA family medicine with obstetrics benchmark, we utilized the 2013 national Medicare conversion factor of $34.023 per tRVU. The estimated maximum allowable reimbursement dollar amount was determined by multiplying this conversion factor by the 2013 total RVU for a non-facility setting for each of the E&M codes, 99211–99215. The resident visits (73,596 visits) at the actual distribution of levels in our sample were then multiplied by the maximum allowable reimbursement for each code to estimate actual revenue. We then adjusted the resident visit volume to match the E&M code distribution of the MGMA family medicine with OB benchmarks. These adjusted visit numbers were then multiplied by the maximum allowable reimbursement for each code to estimate adjusted revenue. The difference between the estimated actual revenue and the adjusted revenue is our revenue loss over the 6-month study period.

This study was reviewed by the University of Washington Human Subjects Division and determined not to be Human Subjects Research.

Results
We obtained established visit E&M coding data from 16 of the 18 eligible programs (89%). Program types, as defined in the American Academy of Family Physicians Residency Program Directory, included one military program, one medical school-based program, and 14 community-based, medical school-affiliated programs. During the 6-month study period there were a total of 131,788 visits from 353 residents (73,596 visits) and 186 faculty physicians (58,192 visits) at the 16 participating programs. The distribution of E&M codes is presented in Table 1.

Billing patterns differed between residents, faculty, and MGMA benchmarks (P<.0001) (Figure 2). Residents coded significantly fewer high complexity visits than the MGMA benchmark data (23.9% and 35.7% respectively, P<.0001). Faculty physicians also coded significantly fewer high complexity codes than benchmark (35.2% versus 35.7%, P=.022). However, faculty coded significantly more high complexity codes compared to residents (35.2% and 23.9% respectively, P<.0001). PGY-1 residents coded significantly more high complexity codes when compared to PGY-3 residents (24.4% and 23.4% respectively, P=.019).

Using the 2013 national Medicare conversion factor and the tRVU for each level of service, we calculated the estimated revenue generated by the residents during the 6-month study period was $5,835,958. If the

Table 1: Number of E&M Codes by Postgraduate Year and Attending Physicians

<table>
<thead>
<tr>
<th>Total number of doctors</th>
<th>PGY-1</th>
<th>PGY-2</th>
<th>PGY-3</th>
<th>Faculty</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Established E&amp;M code 99211</td>
<td>27 (0.2%)</td>
<td>85 (0.4%)</td>
<td>264 (0.7%)</td>
<td>2,609 (4.5%)</td>
<td>2,985 (2.3%)</td>
</tr>
<tr>
<td>99212</td>
<td>763 (6.4%)</td>
<td>1,181 (5.1%)</td>
<td>1,719 (4.4%)</td>
<td>2,309 (4.0%)</td>
<td>5,972 (4.5%)</td>
</tr>
<tr>
<td>99213</td>
<td>8,201 (69.0%)</td>
<td>16,076 (70.0%)</td>
<td>27,716 (71.5%)</td>
<td>32,770 (56.3%)</td>
<td>84,763 (64.3%)</td>
</tr>
<tr>
<td>99214</td>
<td>2,867 (24.1%)</td>
<td>5,540 (24.1%)</td>
<td>8,984 (23.2%)</td>
<td>20,013 (34.4%)</td>
<td>37,404 (28.4%)</td>
</tr>
<tr>
<td>99215</td>
<td>36 (0.3%)</td>
<td>66 (0.3%)</td>
<td>71 (0.2%)</td>
<td>491 (0.8%)</td>
<td>664 (0.5%)</td>
</tr>
<tr>
<td>Total</td>
<td>11,894</td>
<td>22,948</td>
<td>38,754</td>
<td>58,192</td>
<td>131,788</td>
</tr>
</tbody>
</table>

E&M—Evaluation and Management
residents’ billing profile had matched the MGMA benchmarks, the adjusted revenue generated would be $6,076,785. The resulting loss for the 16 participating programs from the residency network was estimated to be $240,827 for the 6-month study period. Table 2 details the values used for the calculation.

In addition to the aggregate revenue loss for the Network, we calculated the estimated revenue loss for each residency program. This calculation shows considerable variation in revenue loss/gain among network programs. Three programs had revenue estimates exceeding those predicted by MGMA benchmarks. The remaining 13 showed revenue loss, with three programs demonstrating an estimated loss of over $50,000 during the 6-month study period. Figure 3 shows the revenue loss/gain per program over the 6-month study period.

**Discussion**

Appropriate E&M coding is an important skill for both residents and practicing physicians. It is the means by which descriptions of services are communicated to payers and thus is critical to payment. Reimbursement issues are vital to any practice as they are a major contributor to financial performance. Our study of 131,788 visits provided by 353 residents and 186 faculty physicians across 16 residency programs

<table>
<thead>
<tr>
<th>E&amp;M Code:</th>
<th>99211</th>
<th>99212</th>
<th>99213</th>
<th>99214</th>
<th>99215</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total RVU</td>
<td>0.6</td>
<td>1.29</td>
<td>2.14</td>
<td>3.14</td>
<td>4.2</td>
<td>—</td>
</tr>
<tr>
<td>Maximum allowable reimbursement (dollars)</td>
<td>20.41</td>
<td>43.89</td>
<td>72.8</td>
<td>106.82</td>
<td>142.88</td>
<td>—</td>
</tr>
<tr>
<td>Actual resident E&amp;M codes</td>
<td>376</td>
<td>3,663</td>
<td>51,993</td>
<td>17,391</td>
<td>173</td>
<td>73,596</td>
</tr>
<tr>
<td>Adjusted resident E&amp;M codes</td>
<td>1,406</td>
<td>4,813</td>
<td>41,096</td>
<td>25,177</td>
<td>1,089</td>
<td>73,581</td>
</tr>
<tr>
<td>Estimated revenue—actual (dollars)</td>
<td>7,674</td>
<td>160,769</td>
<td>3,785,090</td>
<td>1,857,707</td>
<td>24,718</td>
<td>5,835,958</td>
</tr>
<tr>
<td>Estimated revenue—adjusted (dollars)</td>
<td>28,690</td>
<td>211,250</td>
<td>2,991,789</td>
<td>155,628</td>
<td>155,628</td>
<td>6,076,785</td>
</tr>
<tr>
<td>Six-month revenue difference (dollars)</td>
<td>21,016</td>
<td>50,481</td>
<td>-793,301</td>
<td>831,721</td>
<td>130,910</td>
<td>240,827</td>
</tr>
</tbody>
</table>

E&M—Evaluation and Management
demonstrates significant differences in billing for higher complexity visits between residents and a commonly used billing benchmark. We estimate that this resulted in an aggregate revenue loss of $481,654 annually for the participating programs. Additionally, our data demonstrate marked variation in billing patterns among the 16 studied residency programs.

The ongoing sacrifice of revenue for residency clinics is important when margins are narrow. At a time when funding for GME is threatened, our estimated loss of nearly a half million dollars per year over 16 of the programs in the residency network is financially significant. Thirteen of the 16 residency programs demonstrate a revenue loss. Much of this is attributed to the billing patterns of three programs, but 10 of the 13 programs show more than $10,000 estimated annual losses. When budgets are tight, these are meaningful dollars, especially for work that has been done. Our estimate is likely to be conservative, since we used the national Medicare conversion factor of $34.023 for all visits. Residency practices with more diversified payer mixes may have a higher conversion factor. Maximizing revenue while maintaining billing compliance and the integrity of teaching environments is vital to the sustainability of our teaching clinics.

In private practice, personal income of physicians is directly dependent on timely reimbursement. In larger group practices, productivity is often measured by E&M coding with salary and bonus structures attached to a specified benchmark. Additionally, payers legally require proper billing, and non-compliance with billing rules carries significant consequences. This comparison of resident E&M coding to MGMA coding benchmarks contributes to the cross-specialty discussion of resident coding inadequacy and potential causes of this long-time challenge.

Residents in general surgery, orthopedics, emergency medicine, and pediatrics have observed that their training in billing and coding feels inadequate. Studies of resident coding accuracy confirm this perception. Residents in multiple specialties, including family medicine, pediatrics, orthopedic surgery, and emergency medicine have demonstrated poor coding skills. Dezfuli compared orthopedic surgery resident clinic visit coding to Medicare normative benchmarks. Data were extrapolated to estimate coding level distribution and subsequent billing discrepancies. A significantly higher percentage of level 3 visits, and fewer level 2 and 4 visits were billed compared to benchmark, with an estimated revenue loss from fewer level 4 visits alone of over $81,000 for 1 year. Coding accuracy studies most often use certified professional coders to review resident and practicing physician charts for coding errors.
Our study recognizes that coding inaccuracy exists. We compared resident and faculty E&M coding with national benchmarks because benchmarks are the means by which most physician productivity is compared in practice and can be related to eventual compensation. We found that faculty physician coding is aligned significantly more closely to MGMA benchmarks than resident coding. While faculty members bill fewer high-level codes than do MGMA physicians, they do approximate the MGMA code distribution. This finding suggests that resident use of low-level codes is not a systemic problem but rather a resident issue. The reasons for the discrepancy between faculty and MGMA coding is an area for further research. We found that senior residents recorded fewer high-level codes than PGY-1s. While only a 1% difference, it is curious that PGY-3s in their last 6 months of training do not code more like experienced physicians. They should have more coding experience and education than a PGY-1. However, across multiple specialties, studies of educational coding interventions have shown mixed results with respect to improvement of coding accuracy. Our finding, along with existing literature, suggests that lack of coding knowledge may not be the only barrier to appropriate use of E&M codes. This is the first study in primary care training programs that compares resident and attending billing to practical and widely used billing benchmarks. Additionally, this study is the first to quantify the financial loss associated with inadequate family medicine resident billing practices. Data from multiple programs in a five-state region is likely to be generalizable to other family medicine residency programs. We note several possible limitations. We were unable to allow for potential variances in the patient mix of the individual residencies that could explain some of the differences between the study population and benchmarks. The high number of visits in this study across 16 residency programs minimizes this possibility. It is also possible that faculty are seeing a different group of patients than the residents. By comparing faculty and residents in the same program, we believe that the patient sets are likely similar. In addition, while all of the 16 studied programs are from the Northwest and participate in a residency network, they are distinct entities. Individual programs may differ in use of electronic medical records, how residents are taught billing and coding, and even in the physical layout of clinics and accessibility of preceptors. While we used benchmarks to compare relative proportions of billing codes between residents and the greater family medicine community, this does not directly address coding accuracy. Accuracy of coding requires review of individual charts for assessment of the three elements that define E&M level of service—extent of medical history, physical exam performed, and the complexity of medical decision-making. Further, it is possible that the patient population within our study group does not reflect that of the benchmark data.

These study findings are important to multiple stakeholders. Inappropriate billing by residents and the resulting financial losses for residency clinics, sometimes in excess of $150,000 per year, are important to clinic managers, program directors, and department chairs who are responsible for clinic and departmental fiscal well-being. Analysis of individual residency clinics might help to determine where revenue-generating opportunities exist. Additionally, the study results raise many questions regarding the factors that influence resident billing. The decline in high-level coding seen in PGY-3s compared to PGY-1s suggests that factors other than coding education are at work. Educators and researchers must further explore barriers to coding beyond lack of coding knowledge. There is evidence that multiple factors lead students and residents to de-value primary care services, and this may reflect in resident billing.

Different residency programs vary in their interpretation of the PCE, ranging from applying it to Medicare patients only to applying it to all patients regardless of insurance status. Time-crunched residents may down-code to avoid real time precepting, creating both revenue and coding compliance issues. Investigation of resident time constraints, availability of preceptors, billing practices as a proxy for self-worth, and program application of the PCE are areas for further exploration. Further investigation into “best practices” at the higher-performing residencies and trouble shooting at the lower-performing programs would be institutional.

Conclusions
In many ways, the medicine practiced by Dr Welby disappeared with black and white television sets. In a world of high definition color, clinical practice has grown in complexity, as has the business of medicine. Residents do not code well, and the evidence does not support solving the problem with more or better education. Meanwhile, training clinics sacrifice needed revenue. To ensure the success of our residents when they enter the practice environment and to ensure the financial health of residency clinics, educators must not only teach trainees to code well but must also remove barriers to their coding success.

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