

# Quality Measurement of Medication Monitoring in the “Meaningful Use” Era

Jennifer Tjia, MD, MSCE; Terry S. Field, DSc; Shira H. Fischer, AB; Shawn J. Gagne, BA; Daniel J. Peterson, MA, MS; Lawrence D. Garber, MD; and Jerry H. Gurwitz, MD

**T**he Institute of Medicine’s report *Crossing the Quality Chasm*<sup>1</sup> prompted significant efforts toward the pursuit of high-quality healthcare. As a result, major investments to improve healthcare quality have focused on 2 areas: (1) the development and public reporting of quality-of-care measures and (2) the promotion and adoption of electronic health records (EHRs).<sup>2</sup> The synergy of these 2 concurrent efforts was recently accelerated by the 2011 implementation of incentive payments for the meaningful use of certified EHR technology under the 2009 American Recovery and Reinvestment Act<sup>3</sup>; this synergy will have an important impact on healthcare in the United States.

The Centers for Medicare & Medicaid Services’ stage 1 rollout of “meaningful use” criteria for EHR in January 2011 aimed to reduce disparities in EHR use across healthcare deliverers by providing monetary incentives for EHR adoption.<sup>4</sup> While one of the goals in promoting the widespread adoption of EHR is to improve quality of care,<sup>5</sup> there is evidence to suggest that expanded EHR availability and meaningful data integration may impact quality based on changes in data capture and measurement, and not based on actual improvements in healthcare quality.<sup>2,6-8</sup>

For example, prior studies have shown that quality measures calculated from administrative claims alone are different from measures that incorporate medical record data.<sup>2,6-8</sup> As a result, “hybrid” administrative-medical record–based calculation methods were incorporated into some, but not all, Healthcare Effectiveness Data and Information Set (HEDIS) performance measures.<sup>7</sup> The implication is that healthcare enterprises without EHRs are disadvantaged,<sup>9-11</sup> while those equipped to readily capture medical record data for quality reporting have an advantage by being able to report higher numbers for performance measures than those using only administrative claims. While this phenomenon has been described for cancer screening and vaccination rates,<sup>2,6-8</sup> it has not been examined for the quality measurement of the laboratory monitoring of medications.

Since drug-induced injury is common<sup>12,13</sup> and failure to monitor high-risk medications is one of the leading factors contributing to adverse drug events,<sup>13</sup> the National Committee for Quality Assurance included medication monitoring

measures in HEDIS in 2006.<sup>14</sup> These standards recommend laboratory monitoring of high-risk, narrow therapeutic win-

**Objectives:** While the 2011 implementation of “meaningful use” legislation for certified electronic health records (EHRs) promises to change quality reporting by overcoming data capture issues affecting quality measurement, the magnitude of this effect is unclear. We compared the measured quality of laboratory monitoring of Healthcare Effectiveness Data and Information Set (HEDIS) medications based on specifications that (1) include and exclude patients hospitalized in the measurement year and (2) use physician test orders and patient test completion.

**Study Design:** Cross-sectional study.

**Methods:** Among patients 18 years and older in a large multispecialty group practice utilizing a fully implemented EHR between January 1, 2008, and July 31, 2008, we measured the prevalence of ordering and completion of laboratory tests monitoring HEDIS medications (cardiovascular drugs [angiotensin-converting enzyme inhibitors or angiotensin receptor blockers, digoxin, and diuretics] and anticonvulsants [carbamazepine, phenobarbital, phenytoin, and valproic acid]).

**Results:** Measures excluding hospitalized patients were not statistically significantly different from measures including hospitalized patients, except for digoxin, but this difference was not clinically significant. The prevalence of appropriate monitoring based on test orders typically captured in the EHR was statistically significantly higher than the prevalence based on claims-based test completions for cardiovascular drugs.

**Conclusions:** HEDIS quality metrics based on data typically collected from claims underestimated quality of medication monitoring compared to EHR data. The HEDIS optional specification excluding hospitalized patients from the monitoring measure does not have a significant impact on reported quality. Integration of EHR data into quality measurement may significantly change some organizations’ reported quality of care.

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RESULTS

**Test Ordering by Clinicians Including and Excluding Hospitalized Patients**

Approximately 10% of each population of medication users had a hospitalization in the observation year, except digoxin users, approximately 20% of whom were hospitalized (Table 2). There were no statistically significant differences in the prevalence of appropriate test monitoring when we compared estimates based on the sample including hospitalized patients with estimates based on the sample excluding hospitalized patients. For example, 93.9% of hospitalized patients prescribed digoxin had appropriate test monitoring, compared with 92.3% of patients who were not hospitalized ( $P = .18$ ).

**Test Ordering by Clinicians Compared With Overall Test Completion**

The prevalence of test completion for all drugs was lower than that of physician test ordering because patient adherence to test orders ranged from 85.6% to 93.3% (data not shown). When we examined the sample that included hospitalized patients and compared physician test orders with overall test completion, there were statistically significant differences between these 2 measures for the cardiovascular drugs, but not the anticonvulsants. For example, for diuretics, 92.3% of physicians ordered the appropriate monitoring test, but only 80.2% of all indicated tests were completed ( $P < .001$ ; Table 3). These differences were statistically insignificant when the drug was less commonly used.

DISCUSSION

This study examines 2 aspects of HEDIS quality measurement for medication monitoring. We found that the selection of the outcome measure can affect the reported quality of a physician. In contrast to HEDIS recommendations, it does not appear that the decision of whether or not to include hospitalized patients in the measure estimates has a significant impact. These results have implications for quality-of-care measurement.

Our findings are consistent with those of other studies that indicate that measured performance varies depending upon the source of information, whether administrative data, the EHR, or a combination.<sup>2,6-8,17</sup> Institutions relying solely on administrative data may underreport HEDIS quality-of-care measures.<sup>6,7</sup> For example, among 283 commercial health plans that submitted HEDIS data, 178 had a greater

■ **Table 1.** HEDIS Medication Monitoring Recommendations<sup>a</sup>

Medications Examined	Annual Monitoring
ACE inhibitors/ARBs Digoxin Diuretics	Serum potassium and either serum creatinine or blood urea nitrogen
Carbamazepine Phenobarbital Phenytoin Valproic acid	Anticonvulsant drug serum concentration

ACE indicates angiotensin-converting enzyme; ARB, angiotensin receptor blocker; HEDIS, Healthcare Effectiveness Data and Information Set.  
<sup>a</sup>For patients 18 years and older on persistent medications (at least 180 days). Optional exclusion: anyone with a hospitalization in the measurement year.

than 10% point difference in the prevalence of postmyocardial infarction beta-blocker use when the HEDIS measure used administrative plus medical record data compared with use of administrative data alone.<sup>7</sup> We build on this literature by showing that it is important to disentangle physician ordering behavior from patient test completion behavior. For example, if a physician appropriately ordered a test 100% of the time, but patients failed to complete the test 20% of the time, the physician would be judged to have an 80% monitoring rate, the same as a physician who ordered a test only 80% of the time but had patients who always completed tests. If HEDIS measurements are meant to be reflective of physician quality<sup>18</sup> regardless of patient adherence,<sup>19</sup> then this distinction is important for quality reporting. Alternatively, if the HEDIS measure is meant to reflect the practice's ability to achieve monitoring through proper education, provision of convenient testing, and following up with no-shows, then using administrative claims to report completion only may be appropriate.

Although HEDIS has taken the precaution of preventing potential undermeasurement of monitoring due to hospitalization, it appears that going to the effort to exclude hospitalized patients from outcome measurement does not make a significant difference. Our overall findings of the rates of testing are consistent with those of several previous studies that report variable, and sometimes low, rates of laboratory monitoring of anticonvulsant medications. For example, previous studies report that monitoring for anticonvulsant valproic acid ranged from 39.8% to 62%,<sup>20-22</sup> while monitoring ranged from 60% to 70% for cardiovascular and nonstatin lipid-lowering drugs<sup>23</sup> and from 75% to 90% for statins.<sup>20,23</sup>

A review of the literature<sup>24</sup> shows that healthcare systems differ in their measurement of the medication-monitoring metric, basing their estimates on test completion rates from claims data<sup>23,25-28</sup> in some cases and on physician test orders from EHRs in other cases.<sup>29,30</sup> Most administrative claims-based studies include only test completion because test ordering might depend

■ **Table 2.** Prevalence of High-Risk Medications Use, Listed by Total Number of Users Between January 1, 2008, and July 31, 2008<sup>a</sup>

Monitoring Test and Drug	Test Ordering				P <sup>b</sup>
	With Hospitalized Patients		Without Hospitalized Patients		
	No. of Users	Tests Ordered, n (%)	No. of Users	Tests Ordered, n (%)	
<b>Serum potassium and either serum creatinine or blood urea nitrogen</b>					
ACE/ARB	8765	7982 (91.1)	7886	7115 (90.2)	.06
Diuretics	9380	8661 (92.3)	8297	7586 (91.4)	.03
Digoxin	1015	953 (93.9)	805	743 (92.3)	.18
<b>Serum drug concentration</b>					
Carbamazepine	193	113 (58.5)	174	99 (56.9)	.75
Phenobarbital	52	30 (57.7)	47	26 (55.3)	.81
Phenytoin	313	234 (74.8)	276	206 (74.6)	.75
Valproic acid	248	110 (44.4)	224	95 (42.4)	.67

ACE indicates angiotensin-converting enzyme; ARB, angiotensin receptor blocker.

<sup>a</sup>Comparison of physician test ordering between samples calculated with and without hospitalized patients.

<sup>b</sup>P value by  $\chi^2$  test.

■ **Table 3.** Physician Test Orders Compared With Overall Completion Among All Patients Using Specified HEDIS Medications

Monitoring Test and Drug	No. of Users	Test Orders and Test Completions		P
		Tests Ordered, % (n)	Tests Completed Overall, % (n)	
<b>Serum potassium and either serum creatinine or blood urea nitrogen</b>				
ACE/ARB	8765	91.1 (7982)	84.3 (7390)	<.001
Diuretics	9380	92.3 (8661)	80.2 (7520)	<.001
Digoxin	1015	93.9 (953)	80.4 (816)	<.001
<b>Serum drug concentration</b>				
Carbamazepine	193	58.5 (123)	54.4 (108)	.41
Phenobarbital	52	57.7 (30)	53.8 (28)	.69
Phenytoin	313	74.8 (234)	62.9 (197)	.001
Valproic acid	248	44.4 (110)	40.3 (100)	.36

ACE indicates angiotensin-converting enzyme; ARB, angiotensin receptor blocker; HEDIS, Healthcare Effectiveness Data and Information Set.

on the availability of electronic medical record data. Ordering rates necessarily exceed completion rates, so using completion rates based on administrative claims data may underreport physician performance when compared with using ordering rates based on electronic medical record data. Ordering rates, however, are likely unavailable for many providers that do not have an EHR. Because HEDIS standards do not specify which measure—ordering or completion—is required, there is the potential to compare health plan performance on an apples-to-oranges basis. A key issue is that the differences in the data elements available, and a shift in the data capture abilities due to meaningful use, will likely affect the reporting of quality measurements. Therefore, it will be important to understand

whether temporal trends in quality of care are due to actual improvements in care or due to changes in quality measurement.

Limitations of our study deserve to be noted. First, our study was conducted in a single multispecialty group practice, limiting the generalizability of our findings to other settings. Second, we were unable to confirm patient adherence to drugs and therefore were unable to identify patients who did not complete tests because they were no longer using the medication.

The widespread use of EHR data for quality measurement has been delayed due to a variety of problems with interoperability, lack of standardized coding schema, and the inability to retrieve some critical data electronically. Integration of EHR data into quality metrics is only now being actively pursued by a

large section of the healthcare community.<sup>4,5</sup> Our findings, taken together with the study of Pawlson et al showing that quality ranks of health plans based on HEDIS hybrid performance measures differed from their ranks based on administrative-only data,<sup>7</sup> suggest that reported quality of care will improve over time as integrated administrative/EHR-based measures are more widely used. Further, if quality-of-care measurements improve concurrently with EHR rollout, it will be difficult to interpret whether that reflects improvements in healthcare quality or simply differences in quality measurement methodology. One strategy to address this issue may be to measure both administrative-only and administrative-plus-EHR measures concurrently so that we can discern the changes going forward.

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**Author Affiliations:** From University of Massachusetts Medical School (JT, TSF, SHE, JHG), Worcester; Meyers Primary Care Institute (JT, TSF, SJJ, DJP, LDG, JHG), Worcester, MA.

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**Address correspondence to:** Jennifer Tjia, MD, MSCE, Assistant Professor of Medicine, Division of Geriatric Medicine, University of Massachusetts Medical School, Biotech Four, 377 Plantation St, Ste 315, Worcester, MA 01605. E-mail: jennifer.tjia@umassmed.edu.

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