

# Quality measurement in oncology practices

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The prolonged, ubiquitous use of practice management systems and the more recent use of electronic medical record systems in oncology have led to the accumulation of significant repositories of financial, operational, and clinical data. This article examines the use of these data to provide peer-to-peer benchmarking of operational and financial information and a series of data-driven national indices of clinical treatment patterns in oncology. Although not directly a measure of the presence or absence of managerial excellence or clinical quality outcomes, these benchmarks and indices do measure the degree to which processes in place may be beneficial to higher quality management of clinical, financial, and operational outcomes.

**I**ncreasing pressure to contain rapidly rising healthcare expenditures has affected, and will continue to affect, oncology practice. The need for managerial quality measurement is as critical to the success of a practice as is clinical quality measurement. Don Berwick, the founder of the Institute for Healthcare Improvement, eloquently said, "To fix medicine, we need to do two things: measure ourselves and be more open about what we are doing."<sup>1</sup>

In October 2003, six oncology practices met in Dallas and began the Oncology Circle, a peer-to-peer benchmarking service. This small group agreed to share clinical, operational, and financial data with each other in a blinded environment to enable each practice to learn from the others. Billing data available in every practice management system (PMS), as well as financial and operational data such as the number of full-time equivalent (FTE) staff, were used to produce these quality measures.

With time, the Oncology Circle has grown to 35 practices, with each having a minimum of four medical oncologists. There is only one member practice per Metropolitan Statistical Area. Each member contributes practice management and financial information twice a year. Oncology Metrics benchmarks each member's data to nationally published data as well as data from other Oncology Circle members. Benchmarked data are blinded, and laws regulating anti-competitive behavior and price fixing are strictly observed. Applicable "safe harbors" for these regulations are maintained.

## Benchmarking

The goal of benchmarking is to promote discovery and adoption of best practices. Benchmarks are

quantitative ratios of the rate of production divided by production capacity. Some of the important rate-of-production measures in oncology practices are the volume of new patients, number of chemotherapy administrations, total revenue collected, total expenditures on drugs, and labor costs in various departments. Useful measures of production capacity are the number of FTE staff in various positions and departments and the count of chemotherapy chairs.

Often, a measurement of production capacity can become a measure of production rate in another metric. For example, the revenue from chemotherapy administration per FTE chemotherapy nurse is a measure of production per nurse, whereas the number of FTE chemotherapy nurses per chemotherapy chair is a measure of the balance between these two components of chemotherapy production. Similarly, the number of new patients per FTE physician is a measure of physician work production, whereas the number of nurses per new patient is a measure of nursing efficiency and/or capacity.

The Oncology Circle continuously modifies existing benchmarks and adds new ones; however, it has developed a standard set, as follows:

**Benchmark 1: New patients per FTE physician** The numerator of this metric includes both hospital and office consultations and is the count of the units billed in the accounting period. An FTE physician is defined as one who is in the clinic 4 full days a week and spends the fifth weekday on clinic

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business, although not necessarily seeing patients. Using this definition, a physician who sees patients 4 days a week and spends 1 day in clinical research is one FTE. If the fifth day was spent performing administrative duties, then the physician is considered a 4/5 (or 0.8) FTE physician.

**Benchmark 2: Revenue per FTE physician** Revenue is total cash collected from all sources. It is the top line from the practice's profit-and-loss (P&L) statement and its cash-basis tax statement. It will not necessarily be the same as the total of all revenue posted in the PMS, as revenue may come into the practice outside of the PMS. For example, clinical trials, expert witness payments, data sales, and directorships are common sources of income that don't always appear in the PMS but that are reported on cash-based tax forms and in the P&L statement. An FTE physician is defined in the same way as above.

**Benchmark 3: Chemotherapy administrations per FTE staff member** The numerator here is the sum of all initial chemotherapy units billed in the PMS. FTE staff is based on a 40-hour week, or 2,080 hours per year. FTE chemotherapy administration staff includes people involved in drug purchasing, mixing, delivery to patients, and management.

**Benchmark 4: Drug revenue per FTE hematology/oncology physician** Drug revenue is all charges associated with any drug-related J-codes that were collected during the accounting period. This source is a component of the total revenue reported in benchmark 2, above. The date of service for the charge need not be in the accounting period, but the date of posting will be. In this benchmark, not all physicians in the business unit are counted; only the hematology/oncology physicians are counted, as they are the drivers of this cost and revenue center.

**Benchmark 5: Cost of drugs paid for per FTE hematology/oncology physician** Cost of drugs paid for is

the sum of all payments made for drugs less any drug rebates actually received during the accounting period. It is critical that rebates and discounts are applied to reduce the total drug expenditure, or this benchmark will be meaningless. As with the metric for drug revenue, the denominator of this metric includes only hematology/oncology physicians.

**Benchmark 6: Market basket margin on drugs at average sales price (ASP)** This useful tracking metric is calculated for all drugs and all payers in the accounting period. It is measured by taking the total units of each drug billed and calculating what the amount of drug necessary to produce that number of units would have cost at the published ASP. (We use the average ASP for the year for this purpose.) This calculated amount is then divided by the total collected for the drugs. The resulting decimal is the percentage of drug revenue that hypothetically was spent to produce that revenue. This percentage is then subtracted from one to provide the market basket margin on drugs at ASP. Although there are several objections to this methodology from the perspective of any individual practice, it remains a useful benchmark.

**Benchmark 7: Cost of drugs at ASP per FTE hematology/oncology physician** This metric is calculated using the methodology for ASP cost as described for benchmark 6 and the definition of an FTE physician used for benchmark 1, above.

**Benchmark 8: Drug margin at ASP as a percentage of total revenue** This metric uses the methodology of benchmark 6, above, to reduce drug revenue to drug revenue after cost of drugs paid for at ASP. This marginal revenue is then expressed as a percentage of the top-line revenue, less the cost of drugs at ASP. This methodology appropriately reduces the revenue impact from the pharmacy operations so that it can be better compared with other P&L centers in the practice.

**Benchmark 9: Drug cost as percentage of total cost** This benchmark is calculated from the cost of drugs paid for rather than from the computed cost at ASP. Since it relates to the actual experience of the practice, it measures the trend over time of the relative importance of this cost component as compared with all others.

**Benchmark 10: Revenue distribution by revenue center** This important metric is calculated by aggregating the procedure codes into cost centers and creating a pie-chart distribution of all revenue. Typically, we have used pharmacy, evaluation and management (E&M), laboratory, chemotherapy administration, diagnostic imaging, and radiation therapy as the revenue centers. More recently, closed-door pharmacy and clinical trials have begun to emerge as separate revenue centers.

**Benchmark 11: Total FTE staff per FTE physician** This is a measure of the relative staff support provided to each physician in the business unit. As the physicians are the source of clinical production, this is a useful comparison of resource deployment.

**Benchmark 12: Revenue and revenue distribution per new patient** This measure is calculated using the distribution from benchmark 10 (revenue distribution by revenue center) and dividing it by the number of new patients from new patients per FTE physician (benchmark 1). The result provides a comparison of the dollar amounts that flow from new work demanded as new patients enter the practice. Although it makes no attempt to sort practice revenue into that generated from the provision of services to new or established patients, it is a good measure of the revenue impact of new patients on the economic viability of the practice over time. As service lines are added to the business unit, revenue increases in a stepwise fashion rather than gradually increasing over a protracted period.

**Benchmark 13: E&M frequency score ratio to overall group** This is

a new way of looking at E&M coding distributions within and among practices. Using the E&M codes levels 2, 3, 4, and 5, a weighted average code score is calculated for each provider in the practice and for each practice in the comparison cohort.

**Data collection**

In the past, Oncology Circle members provided data for the benchmarks by running reports from their respective billing and collection systems and submitting these reports to Oncology Metrics for compilation. As the number of members, complexity of the benchmarks, and diversity of the member practices has grown, it became necessary to automate the data-extraction process. About half of the present members now automatically feed data from their PMS into the benchmarking database, and the rest are scheduled to join them by September 2008. This automation will allow the production of more consistent benchmarks among the member practices. Improved cost and profit center specificity is also supported through this new process.

Although the billing and collection systems provide much of the rate-of-production information for benchmarking, production-capacity information usually comes directly from the member practice. These data, including FTE counts, accounting information, and subjective qualitative information, are gathered through a twice-yearly online survey completed by each member.

*Reviewing benchmarks*

Twice a year, members of the Oncology Circle meet to review the peer-to-peer benchmarks that have been developed. A portion of this meeting is open to industry sponsors, but the actual review of the individual benchmarks is open only to members.

In the members-only meeting, printed booklets containing blinded benchmarks are distributed. Each practice also receives a private note that reveals the identity of their practice to them

and an individualized “Oncology Practice Barrometer<sup>®</sup>” with several of their benchmarks presented in a single graph (Figure 1). The booklet is divided into three sections (clinical, operational, and financial), and each benchmark in each section is systematically reviewed and discussed by the group.

In 2006, we surveyed 22 oncology practices having a combined drug expenditure of \$375 million. These practices employed 1,750 people, including 167 FTE medical oncology physicians; had 750 infusion chairs; and treated over 62,700 new patients. We have discussed standards for measurement within and among disparate practices for sound business management in the operational and financial domains of oncology practice. But what about the clinical domain?

**Clinical measures of quality care**

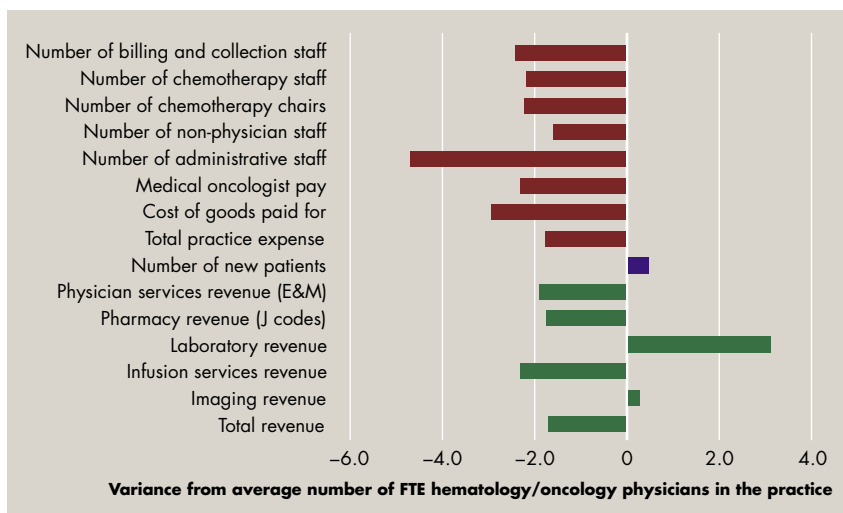
While the debate on quality clinical measures in oncology has been ongoing for many years, recent focus in the popular press on the use of erythropoietin<sup>2-4</sup> has sparked many clinicians and practice administrators to speculate about usage patterns for this drug and the extent to which commercial promotions, unrelated to clinical quality and scientific advances,<sup>5</sup> may have caused changes in the

use of erythropoiesis-stimulating agents (ESAs) by oncologists. Indeed, a survey sponsored by US Oncology and conducted by the KJT Group reported that “the average number of patients requiring potentially avoidable transfusions accounted for approximately 17% of their Medicare patients in the 12-week period preceding the research study.”<sup>6</sup>

Similarly, the advent of high-cost treatment options and diagnostic testing in cancer care will likely bring scrutiny to these patterns of use as well. Though there is little data-driven insight into these trends available to the authors of these lay press articles, they are still powerful in their ability to shape public opinion. As treatment and diagnostic options continue to expand, the trend toward high-impact, high-cost interventions will likely continue. This will certainly lead to increased attention to the patterns of use associated with these interventions, the expenditures associated with them, and the outcomes that they produce.

*EMRs and clinical indexing*

As treatment options have expanded, so, too, has the use of electronic medical records (EMRs).<sup>7</sup> Oncology practices with EMRs can utilize these systems to create clinical benchmarks in the same way that PMS data are used to create



**FIGURE 1** Example of an Oncology Practice Barrometer<sup>®</sup> for a single practice in 2006. Green bars indicate revenue and red bars, expenses.

operational and financial benchmarks.

For the first time in history, a significant repository of accessible clinical information has accumulated in EMRs, creating the opportunity to deploy analytic tools to objectively process the clinical data available in an aggregated data warehouse. Using these data to develop and publish indices of practice patterns and to track changes occurring in the patterns of care can be helpful in tracking the presence, or absence, of quality indicators.

The advantages of EMR utilization in oncology care have been well documented,<sup>8,9</sup> and the process of oncology EMR selection and implementation is under rapid development.<sup>10</sup>

Many individual oncologists and oncology business groups instinctually recognize that there is real value in the data gathered by these systems,<sup>11,12</sup> but there is not yet much evidence of the practical use afforded by the opportunity to measure and manage the clinical processes locked in these electronic files. The problems of getting clinical users acclimated to using EMRs in a way that provides good, searchable data are well known, and the difficulty in developing software that is intuitive to the clinicians who treat cancer patients causes both slow adoption of the systems and data anomalies that make subsequent analysis difficult.<sup>13,14</sup> Even so, sufficient data are now available, both in volume and geographic distribution, to support national indices.

It is important to understand the distinction between an index and a benchmark. An index is something that serves to guide, direct, or otherwise reference, in a single number, the change in a measurable quantity in comparison with a reference number from an earlier period. A benchmark, on the other hand, is a standard by which something can be measured or judged with the design of achieving a standard. Although the indices presented here—ESA utilization, cancer staging, and human epidermal growth factor receptor 2 (HER2) testing—can be used to track changes

against a benchmark or standard, they are not standards per se. It is tempting to ask, "What should the index for ESA use be?" But the index is silent on this point, describing the trend over time but not the goal or destination.

No control of variation in the number of practices is made. The indices are all made relative to the number of ESA administrations in the database within the reporting period. Further, no statistical analysis of these data is performed; our intention is to simply report the index. And no effort is made to correlate cause and effect in an index, although it is fairly easy to speculate.

#### *Indexing ESA use*

The Oncology Metrics National Index (OMNI) ESA is based on a retrospective analysis of more than 260,000 ESA administrations recorded in the target database between January 1, 2004, and December 31, 2007. All ESA administrations documented were analyzed with respect to the most recent hemoglobin (Hgb) level determined on the day of ESA administration. If no Hgb value was recorded on that day, the most recent Hgb value was used by looking back a maximum of 6 days prior to administration. Using this methodology, more than 137,800 ESA administrations (52.8%) were not associated with Hgb values. That left a total of 120,000 ESA administrations having relevant Hgb values available for the index.

The primary outcome measures were the proportion of ESA administrations performed at a Hgb level  $\geq 12$  g/dL and  $< 12$  g/dL and those initiated by a Hgb level  $\geq 10$  g/dL and  $< 10$  g/dL. The ESA index was further segmented into two age cohorts (age  $\geq 65$  years and age  $< 65$  years) to provide insight into the degree to which Medicare reimbursement changes may be reflected in these populations. The threshold of 12 g/dL was selected based on the American Society of Clinical Oncology and the American Society of Hematology practice guidelines to best direct the management of cancer patients with

anemia.<sup>15</sup> The threshold of 10 g/dL was selected because of recent Medicare reimbursement initiatives.

Three clinical databases derived from oncology-specific EMR software were available for use in the creation of the OMNI ESA, but only one was used in the final data analysis. One set of clinical records was complete only for 2004, the initial year of the study period, and another was relatively meager in terms of the number of records available. We selected the third source of data as most applicable to the study because of the relatively large size and continuity of data over the study period. The number of practice types (hospital or free-standing clinic) and practice locations varied throughout the period of the study, and no effort was made to correlate study results with the composition of the database.

Results also were not filtered by diagnosis or by trade name, dose, or administration frequency of the ESA for individual patients. Using only one database eliminated inherent differences stemming from variations in the front-end user interface and/or underlying database structure rather than from actual differences in clinical practice patterns. We did discover that many ESA administrations recorded in the selected clinical database were scheduled but never actually given. These lapses were consistent with the EMR software application used to create the database, as it allowed the scheduling of anticipated administrations that were part of a structured regimen of care. It was necessary to carefully purge these uncompleted ESA administrations from the calculation schema.

Our methodology allows for the comparison of sorted cohorts to assure accurate counting of all the selected administrations at each step of the query process. It also removes all ESA administrations that do not have a recorded dose amount and counts all administrations that are actually given but which do not have a recorded Hgb value.

To create the OMNI ESA 12 g/dL-

threshold index, the total number of ESA administrations in each age cohort associated with Hgb values < 12 g/dL was divided by the total of all ESA administrations associated with a recorded Hgb value within the 6-day look-back period plus the day of administration. The result was multiplied by 1,000 to create an index range from 0 to 1,000. If all of the ESA administrations having a recorded Hgb value during a given time interval were associated with Hgb values < 12 g/dL, then the numerator and denominator would be the same, and the resulting index would be 1,000.

The OMNI ESA 10 g/dL-threshold index was calculated in the same way, but the threshold Hgb value of 10 g/dL was used as the cut-off in both age cohorts. Both the OMNI ESA 12 g/dL and ESA 10 g/dL indices are shown in Figures 2 and 3, respectively, along with third-order polynomial lines fitted to the data points and the corresponding correlation coefficient ( $r^2$ ) values, which measure the fit of the line to the observed data.

*Indexing staging*

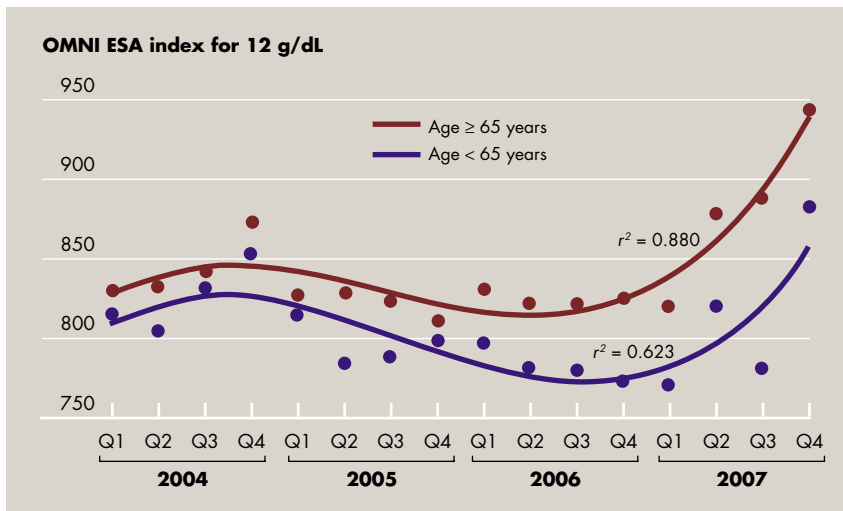
The OMNI staging index measures the prevalence of cancer staging documented within the structured data fields of the EMR, an important Quality Oncology Practice Initiative (QOPI) quality indicator.<sup>16</sup> Paper-chart audits have shown that cancer staging data are recorded in a high proportion of oncology patient charts, albeit in rudimentary or incomplete form (QOPI data; personal communication, Spring 2007). If a similar frequency of staging data were present in the detailed and precisely structured fields of the EMR record, the resulting OMNI would likely be very high (perhaps over 900 out of a possible 1,000). In preliminary work, however, we found a much lower overall presence of staging information in the structured EMR data fields, and, consequently, the OMNI would likely be much lower.

This discrepancy is caused by the fact that staging information in the EMR is still frequently recorded in text notes

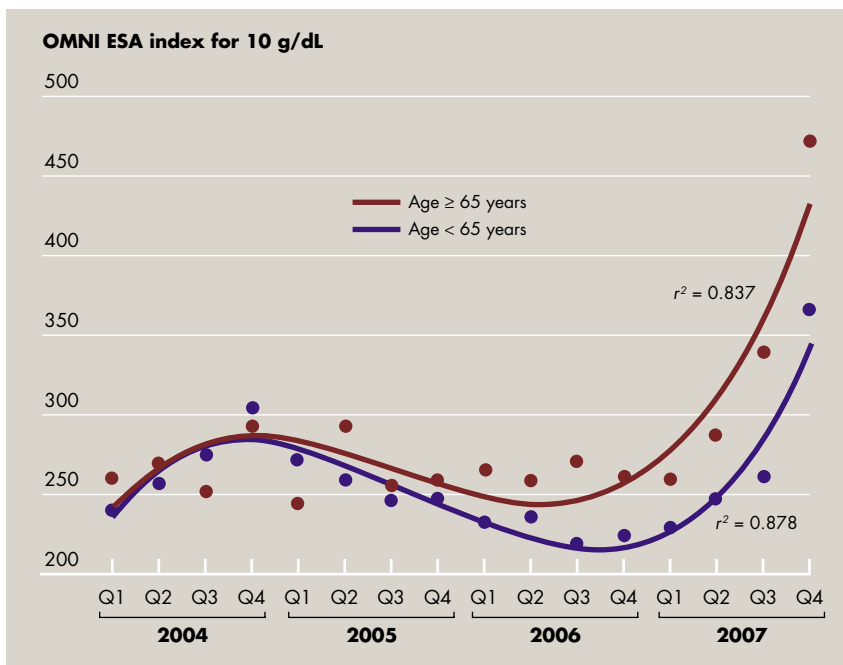
rather than in the structured data fields. Certainly, staging information recorded in text fields rather than structured data fields is sufficient for responsible individual patient management, but to take full advantage of the opportunities for system-wide learning, it is necessary to get the staging information into the searchable data fields.

Why “necessary” and not just sim-

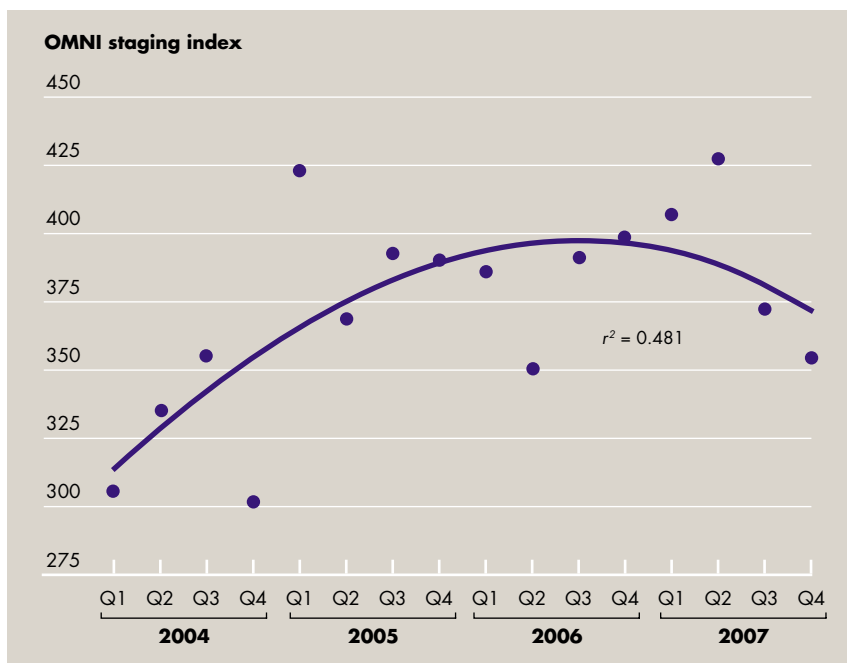
ply more convenient for the people extracting the information? This goes to the heart of the issue of using electronic health records. To achieve quality patient care, it is certainly not necessary to enter information into the EMR in a retrievable fashion. Care is delivered one-on-one, and the clinician can clearly see each case. But to look at system issues, and to see all the cases clearly, it is nec-



**FIGURE 2** Trends from 2004 to 2007 in OMNI (Oncology Metrics National Index) ESA index for a threshold hemoglobin level of 12 g/dL.



**FIGURE 3** Trends from 2004 to 2007 in OMNI (Oncology Metrics National Index) ESA index for a threshold hemoglobin level of 10 g/dL.



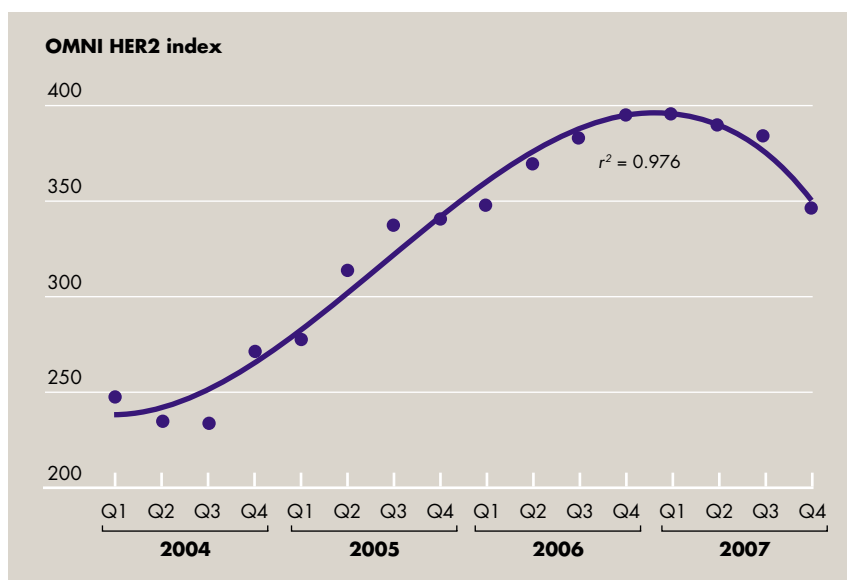
**FIGURE 4** Trends from 2004 to 2007 in OMNI (Oncology Metrics National Index) staging index.

essary to look across many patients, and that can only be accomplished with good access to electronically retrievable data.

Although there are promising technologies that may be able to extract staging and other essential information from free text, it is preferable to encourage clinicians to take

the time to stage the patient using the structured data fields and “drop-down” lists built into the EMR data-entry forms. Only in this way can the software properly inform regimen selection and track outcomes.

We used EMR data to monitor the staging of patients over time with



**FIGURE 5** Trends from 2004 to 2007 in OMNI (Oncology Metrics National Index) HER2 testing index.

the following schema:

1. Select all patients with diagnoses where staging is customary who were recorded in the database from January 2004 through December 2007.

2. Sort these patients into two groups: those with staging information and those without staging information.

3. For each of these two groups, sort the counts of the number of patients into calendar quarters.

To create the OMNI staging index (Figure 4), the total number of patients with staging information was divided by the total number of all patients for whom staging was expected during each quarter. The result was then multiplied by 1,000 to create an index ranging from 0 to 1,000. If all of the patients for whom staging was expected in a given interval were actually staged, then the numerator and denominator would be the same, and the resulting index would be 1,000.

As with any index, there are many possible interpretations of the fluctuations seen in the data. The authors believe that, as has been observed in other data—that is, QOPI—most patients are staged. The fact that the staging is not also in retrievable fields is a reflection of EMR usage and not of a lack of staging. As the necessity to report and measure clinical transparency grows, the OMNI will increase.

#### Indexing HER2 screening

The clinical efficacy of trastuzumab (Herceptin) correlates highly with overexpression of the *HER2* gene.<sup>17</sup> Some commercial payers already require that a positive immunohistochemical or fluorescence in situ hybridization (FISH) test result for *HER2* be reported in order to reimburse practices for use of the drug. The OMNI HER2 index tracks the charting of the HER2 test for patients who receive trastuzumab.

The schema for the OMNI HER2 index is as follows:

1. Select all of the valid administrations of trastuzumab recorded in the da-

tabase from January 2004 through December 2007.

2. Sort these administrations into two groups: those with recorded HER2 testing information and those without recorded HER2 testing information.

3. For each of these two groups, sort the counts of the number of patients into calendar quarters.

To create the OMNI HER2 index (Figure 5), the total number of patients receiving trastuzumab who had a recorded HER2 test result was divided by the total number of all patients who received trastuzumab in the same time interval. The result was then multiplied by 1,000 to create an index ranging from 0 to 1,000. If all of the trastuzumab administrations have HER2 testing associated with them, then the numerator and denominator would be the same, and the resulting index would be 1,000.

All administrations of trastuzumab were counted, and the presence of the HER2 test was counted for all administrations for every patient. The high correlation coefficient for this index indicated that a stable, predictable process is in place and was reflected in the data. Although they were few in number, HER2-negative patients receiving trastuzumab were included in the dataset and were counted. The index made no differentiation as to the HER2 result; it only measured the presence or absence of the test in the searchable EMR record.

## Conclusion

Oncology Metrics will continue to extract and publish additional indices. These indices will promote accelerated efforts to ensure that accurate information is systematically entered into the EMR in a way that produces searchable data for users both inside and beyond the clinic. As this type of data input becomes routine in clinical cancer care, we can expect that the rate of change expressed in the indices will initially increase and then reach stability as both treatment and data entry consistency is optimized within the EMR. Continued new product devel-

opment, scientific advancement, and payment-policy changes will also likely affect both the rate and direction of change in these and other indices.

Current data resources allow for the production of meaningful operational and financial benchmarks and clinical indices that provide useful insights into past business management and clinical treatment patterns. These benchmarks and indices offer a unique way to measure changes in both patterns over time. Practice management systems are universally deployed and can be readily accessed through today's technology to yield management information that can be used to produce valuable management benchmarks. The Oncology Circle is an example of collaboration among diverse practices to enhance knowledge and share best practices. Because EMR systems have improved and become more widely adopted in oncology, OMNIs offer data-driven indices with which to facilitate and enhance quality cancer care.

*Acknowledgments:* This article is dedicated to the memory of Dr. Christopher Desch and recognizes his early work to create the intellectual foundations for performance indexing. Chris was participating in the development of these indices at the time of his death. The authors acknowledge the assistance provided by Surveillance Data Incorporated (SDI) and by Chris Webb of Ronald Walker Associates in the formulation and testing of the query methodology used in the production of these OMNIs.

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