Evaluating a benchmarking database and identifying cost reduction opportunities by diagnosis-related group

SCOTT J. KNOER, RICHARD J. COULDRY, AND TANYA FOLKER

Abstract: Pharmacy cost data from the University HealthSystem Consortium (UHC) Clinical Database for specific diagnosis-related groups (DRGs) were reviewed to assess their applicability to a university medical center and to identify opportunities to reduce costs.

UHC headquarters was contacted by telephone to determine UHC's data collection methods. Pharmacy costs for DRG 302 (kidney transplant) at the University of Kansas Medical Center (KUMC) were compared with the costs shown in the UHC Clinical Database. Appropriate drug use for DRGs 302 and 480 (liver transplant) was assessed by contacting transplant pharmacists and pharmacy administrators at the five top-performing hospitals (in terms of cost per DRG) as listed in the UHC database to find opportunities for reducing pharmacy costs.

KUMC's actual pharmacy costs for DRG 302 ($4635) were 46% lower than those listed in the UHC Clinical Database ($8546). There was a disparity between the amount of both intravenous immune globulin (IVIG) and lymphocyte immune globulin used by KUMC and the top-performing hospitals. Guidelines for use of IVIG, acyclovir, and azathioprine in liver transplant patients at KUMC were revised. A potential cost saving of $53,000 was identified in relation to the use of lymphocyte immune globulin in kidney transplant patients.

Data in the UHC Clinical Database were not representative of pharmacy costs at a university medical center for DRG 302 (kidney transplant), overstating pharmacy costs by 46%; benchmarking was found to be a useful tool for identifying opportunities for reducing costs.

Index terms: Acyclovir; Administration; Antivirals; Azathioprine; Benchmarking; Costs; Drug use; Economics; Globulin immune; Immunosuppressive agents; Pharmacy, institutional, hospital; Serums; Transplantation

Available pharmacy benchmarking databases

Several widely used benchmarking databases have been approved by JCAHO as mechanisms for monitoring outcome-related data. HBS International (HBSI) has been accepted by JCAHO, and MECON-PEERnext is being reviewed for acceptance (Anderson-Miles, E, MECON, personal communication, 1999 Apr 27).

There is substantial interest on the part of pharmacy administrators nationwide in having accurate data that can be used for organizational comparisons. Questions as to the validity of the data invariably arise as managers are held accountable for the numbers presented on behalf of their departments in benchmarking products. These questions can lead managers to explore the sources of benchmarking data.
(UHC) Clinical Database are among the benchmarking products available to hospital administrators.

MECON is a consulting firm that specializes in health care productivity improvement and cost reduction. MECON-PEERnext is a Web-based system that evolved from MECON-PEERx. It contains operational and financial data for more than 650 hospitals in the United States. This database attempts to standardize pharmacy workload by assigning weights to various pharmacy tasks. A multiplier assigns a relative weight to various pharmacy workload indicators and results in the pharmaceutical care unit (PCU). Hospital data are then categorized into a standard format, and comparison data are shared with reporting organizations. Data from similar institutions, the upper 25th percentile, and the lower 75th percentile are listed for comparison.

HBSI Action is a health-system benchmarking database similar to MECON-PEERnext. It contains financial and operational information on more than 600 hospitals across the country.

There are several challenges associated with translating benchmarking data into useful information. Although attempts are made to standardize data entry, categories may be ambiguous and subject to different interpretations. Procedural workload variations between institutions add ambiguity to the data collection techniques of MECON. The variety and quantity of data prevent presentation in easily comprehended graphs or tables, and some data indicators (e.g., doses billed per patient day) have limited practical utility. In the context of reimbursement for specific diagnosis-related groups (DRGs), the number of doses billed does not necessarily correlate to revenue collected by the hospital.

Aspen Publishers recently mailed 2000 surveys requesting facility and workload information to pharmacy directors for use in HPDQ. Aspen believes that pharmacy administrators are interested in obtaining pharmacy-specific benchmarking data and that a database produced by a neutral third party rather than a consulting firm will be more appealing to pharmacy managers. The first HPDQ report was generated in July 1998 and contained data derived from 100 hospitals. Future surveys can be mailed in or completed on the Internet.

UHC, a buying group composed of 70 university hospitals, has expanded its efforts into the benchmarking arena. The UHC Clinical Database for fiscal year 1996 (FY96) contains data on 60 member hospitals. Cost information for these 60 hospitals is broken down by cost center and reported for the top 20 DRGs. Expenses for these cost centers are reported for each member hospital, and comparisons with the five top-performing hospitals (in terms of cost per DRG) for each DRG are shown.

During the research for this project, the University of Kansas Medical Center (KUMC) used MECON-PEERx and the UHC Clinical Database in an effort to reduce costs and improve performance.

Use of the UHC Clinical Database at KUMC

Resource-use information from the UHC Clinical Database was recently circulated to managers and practitioners in the various cost centers at KUMC. Hospital administration initially focused on DRG 302 (kidney transplant) to identify potential cost savings for the medical center. The pharmacy department performed an in-depth validation of the pharmacy costs reported by UHC for this DRG and identified cost-cutting opportunities by contacting the hospitals listed as top-performing hospitals in the UHC database.

The UHC Clinical Database listed the average KUMC pharmacy cost per discharge for DRG 302 as $8546. This cost is substantially above the $2764.60 average of the five top-performing institutions as reported in the UHC Clinical Database for FY96 (Table 1).

Identifying a cost reduction goal required verification that the average accountable costs in the database were valid. It is imperative that administrators use accurate data when making decisions that can affect staffing, new programs, and, ultimately, departmental performance. A project was developed to compare actual pharmacy costs for DRG 302 with the costs shown in the UHC Clinical Database. The project was expanded to include assessment of appropriate drug use for DRG 480 (liver transplant) to find opportunities to reduce pharmacy costs and to ensure appropriate medication use in both DRGs.

Methods

The project involved analyzing the data collection techniques used by UHC, analyzing KUMC pharmacy cost and charge data for DRG 302, analyzing kidney transplant patients for appropriate drug use, seeking existing critical pathways or guidelines for this patient population, contacting the top-performing institutions to compare drug use, working with the hospital team (including physicians, nurses, care coordinators, and others involved with guideline development) to optimally use pharmaceuticals, and presenting the results to hospital administration and relevant physicians.

An understanding of the data collection techniques for the UHC Clinical Database requires a knowledge of the University HealthSystem Consortium (UHC) Clinical Database.

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Average Cost per Discharge DRG 302 ($)</th>
<th>Wage-Adjustment Factor</th>
<th>Cost-to-Charge Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2244</td>
<td>0.8911</td>
<td>0.416</td>
</tr>
<tr>
<td>B</td>
<td>2379</td>
<td>0.9402</td>
<td>0.341</td>
</tr>
<tr>
<td>C</td>
<td>2757</td>
<td>0.9995</td>
<td>0.446</td>
</tr>
<tr>
<td>D</td>
<td>3065</td>
<td>0.9240</td>
<td>0.284</td>
</tr>
<tr>
<td>E</td>
<td>3378</td>
<td>0.9283</td>
<td>0.332</td>
</tr>
<tr>
<td>KUMC</td>
<td>8546</td>
<td>0.9538</td>
<td>0.647</td>
</tr>
</tbody>
</table>

*DRG 302 = diagnosis-related group 302 (kidney transplant).
and formulas used by UHC to arrive at KUMC cost data was necessary to assess the validity of the costs shown in the UHC Clinical Database. UHC headquarters was consulted by telephone to determine UHC’s methods of data collection. UHC provided cost-to-charge ratios (CCRs) and wage-adjustment formulas upon request. The KUMC billing office and the pharmacy information system specialist were consulted to ascertain pharmacy billing procedures. The information specialist also provided a list of pharmacy charge formulas, which were used to compare KUMC’s pharmacy CCRs with those reported by UHC. Lists of patients in DRGs 302 and 480 were obtained through queries of the hospital information system, and charges were queried directly by pharmacy personnel through the pharmacy computer system. The financial office at KUMC provided fiscal data for FY94–96, and critical pathways for kidney and liver transplants were obtained from the respective departmental manuals. The five top-performing hospitals in terms of cost per DRG were selected by UHC and are shown in the UHC Clinical Database for benchmarking comparisons. Transplant pharmacists and pharmacy administrators were contacted by telephone at each of these institutions.

Results

It was determined that the cost information reported in the UHC Clinical Database came from charge data generated by KUMC at the revenue code level. To understand how charges are derived, it is necessary to review how a drug is charged at KUMC. The pharmacy computer system automatically receives updated acquisition costs from the KUMC wholesaler whenever contracts are updated. Unique revenue codes are attached to each product listed in the computer system; these codes are then grouped into classes based on drug category. When orders are entered, a charge formula is applied to the product on the basis of its class and a charge is generated (Table 2). This charge amount is then downloaded to the hospital information system for billing purposes; this is the level of data that UHC receives. This information is then converted back to cost data by applying a CCR (0.647 for FY96 for KUMC after UHC wage adjustment).

UHC derives its CCRs from information provided to the Health Care Financing Administration (HCFA) on the HCFA Cost Report Worksheet C, Part I, columns 1–9. Potential for error in UHC data was identified because UHC used CCRs from FY94 to analyze data for FY96. Investigation of CCRs revealed that pharmacy costs were not strictly based on variables controlled by the pharmacy but also on hospital overhead.

Overhead is allocated to the various hospital cost centers (e.g., pharmacy) and is factored into the CCRs reported to HCFA for KUMC (20% of actual costs for FY96). Capital, benefits, number of telephones, purchasing, plant operation, administration and general, housekeeping, and cafeteria are the major categories of overhead that the hospital allocates to each cost center.

Total pharmaceutical costs for FY94, the year for which UHC determined pharmacy CCRs for its FY96 UHC Clinical Database, were $22,428,614. Adding overhead increased costs to $27,764,594, and reported charges were $39,771,338 for this period. This gave KUMC a CCR of 0.6981 as filed with HCFA. The audited HCFA CCR used in the UHC Clinical Database was 0.6744, while the actual CCR for KUMC before overhead was added was 0.5639. UHC then applied a wage-adjustment factor to the cost data associated with each hospital (Table 1). KUMC had the second highest wage-adjustment factor (0.9538) among the hospitals with which it was compared. Determining a CCR from HCFA data is a complex process involving multiple steps of data manipulation. Each time this number is manipulated, potential error is introduced into the data.

The final CCRs used by UHC in analyzing pharmacy data among peer institutions are shown in Table 1. A high CCR inflates the reported costs of the institution. The CCR for KUMC is considerably higher than that of any of the hospitals with which it was compared.

To verify the validity of the CCR used by UHC, the actual CCR was calculated for all patients in DRG 302. A list of all kidney transplant patients from FY96 was generated from the hospital information system, and two separate reports were compiled from the pharmacy computer system. The reports listed all pharmacy costs and charges generated for each patient. The actual and UHC-reported CCRs for DRG 302 for FY96 at KUMC are 0.461 and 0.647, respectively. This translates into a 28.74% difference between the CCR estimated by UHC and the CCR that was calculated from actual patient profiles.

The next step in the process was to identify medications that could significantly affect the costs of providing pharmaceutical services to patients in DRG 302. Twenty-four kidney transplants were performed at KUMC in FY97. The medication profiles for these 24 patients were obtained for review. FY97 patients were chosen so that the most recent therapy trends could be identified. Several factors affecting reported pharmacy costs were discovered, including high use of lymphocyte immune globulin (Atgam, Pharmacia & Upjohn),

<table>
<thead>
<tr>
<th>Product</th>
<th>Multiplier</th>
<th>Fee ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit-dose prescription drug</td>
<td>1.33</td>
<td>4</td>
</tr>
<tr>
<td>Multiple-dose prescription drug</td>
<td>1.25</td>
<td>15</td>
</tr>
<tr>
<td>Controlled substance</td>
<td>1.33</td>
<td>15</td>
</tr>
<tr>
<td>I.V. admixture or solution</td>
<td>1.33</td>
<td>28</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>1.80</td>
<td>200</td>
</tr>
<tr>
<td>Total parenteral nutrition</td>
<td>1.33</td>
<td>350</td>
</tr>
<tr>
<td>Outpatient prescription drug</td>
<td>1.25</td>
<td>15</td>
</tr>
</tbody>
</table>

*Pharmacy charge formula = (Cost × Multiplier) + Fee.*
problems with billing discharge medications, and differences in the classification of anesthesia agents by various hospitals.

Pharmacy is only one of 35 cost categories reported in the UHC Clinical Database. No anesthesia costs were reported to UHC by KUMC, although all other hospitals reported costs averaging $564 for this category. A review of charges for kidney transplant patients revealed that anesthesia drugs accounted for $178 worth of charges at KUMC. Multiplying this number by UHC's CCR of 0.647 yields a cost of $115. For an accurate comparison with other institutions, anesthesia costs should have appeared in a separate section of the UHC report rather than under pharmacy costs.

A review of patient profiles showed that KUMC reported costs for discharge medications averaging $1839 on the inpatient bill. Conversations with representatives of the five top-performing hospitals revealed that KUMC was the only hospital that charged discharge medications to the inpatient bill. This accounted for a 21.5% inflation of inpatient pharmacy costs as reported by UHC.

KUMC also charged patients $135 for self-medication teaching. Conversations with representatives of the top-performing hospitals revealed that other hospitals did not charge for this service. Applying UHC's CCR of 0.647 to this charge yields a calculated cost of $87. This cost did not appear on the charge summaries of comparison hospitals in the database.

Factoring out anesthesia, discharge medications, self-medication teaching, and an inappropriate CCR gives a more accurate picture of pharmacy costs at KUMC. Table 3 shows that the actual cost of medications for DRG 302 was 46% lower than the cost reported by UHC.

Because of the practice overlap of transplant pharmacists among kidney, liver, and bone marrow transplant patients, we made several observations about pharmaceutical use in populations other than DRG 302. Conversations with pharmacists at the top-performing institutions confirmed that there was a disparity between the amount of both intravenous immune globulin (IVIG) and lymphocyte immune globulin used by KUMC and the top-performing hospitals. Protocols involving IVIG for liver transplant patients were reviewed, and guidelines for use of lymphocyte immune globulin in kidney transplant patients at KUMC were analyzed on the basis of clinical practice information gathered.

This analysis revealed that the KUMC liver transplant protocol included treating all patients with cytomegalovirus infection with IVIG 500 mg/kg every other day for two weeks (245 g for a 70-kg patient). At a cost of $15 per gram, a total of $3675 is incurred per patient. Conversations with practitioners at the top-performing hospitals revealed that IVIG use for these patients was not a standard practice. KUMC guidelines were therefore rewritten to exclude IVIG dosing in the liver transplant protocol.

An investigation of lymphocyte immune globulin protocols revealed a similar disparity between the usage patterns of KUMC and the top-performing hospitals. Two of the top-performing hospitals for DRG 302 (hospital A and hospital B) followed noninduction protocol guidelines for their kidney transplant patients. Lymphocyte immune globulin was used only if three days of high-dose steroid therapy had failed. The KUMC kidney transplant protocol calls for lymphocyte immune globulin to be given if a patient is anuric or if no drop in serum creatinine (SCr) concentration is seen within 48 hours of the transplant, and cyclosporine is held until a drop in SCr concentration is seen. Once cyclosporine is restarted, daily trough concentrations are drawn for the entire patient stay. Lymphocyte immune globulin costs and cyclosporine laboratory costs were much higher at KUMC than at hospital A or hospital B. Intravenous medication costs for kidney transplant patients at KUMC with or without lymphocyte immune globulin were $73,028 and $19,662, respectively. Communications with best-practice hospitals resulted in KUMC identifying a potential $53,000 cost saving related to use of one drug product (Atgam).

It was also discovered during the guideline review that patients in DRG 480 were receiving cyclosporine immediately postoperatively by the nasogastric route; however, these patients were also receiving i.v. acyclovir and azathioprine. When this was brought to the attention of the liver transplant team, guidelines were rewritten so that azathioprine would be given nasogastrically immediately postoperatively to patients who can tolerate oral or nasogastric medications, and acyclovir was taken out of the guidelines altogether.

Discussion

Calculated pharmacy costs for DRG 302 at KUMC ($4635) were 46% lower than those quoted by UHC.

Table 3.

Costs of Medications for Diagnosis-Related Group 302 (Kidney Transplant)*

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total UHC reported pharmacy costs</td>
<td>8546</td>
</tr>
<tr>
<td>Anesthesia costs</td>
<td>115</td>
</tr>
<tr>
<td>Self-medication teaching costs</td>
<td>87</td>
</tr>
<tr>
<td>Discharge medication costs</td>
<td>1839</td>
</tr>
<tr>
<td>Adjusted total costs</td>
<td>6505</td>
</tr>
<tr>
<td>Difference (28.74%) between calculated and UHC-reported CCRs</td>
<td>1870</td>
</tr>
<tr>
<td>Actual KUMC pharmacy costs</td>
<td>4635</td>
</tr>
</tbody>
</table>

*UHC = University HealthSystem Consortium, CCR = cost-to-charge ratio, KUMC = University of Kansas Medical Center.

1 Adjusted total costs = total costs less anesthesia costs, self-medication teaching costs, and discharge medication costs.
2 Actual costs = adjusted total costs less difference between calculated and UHC-reported CCRs.
department if they are included in pharmacy inventory. Expensive products that can add considerable cost to a pharmacy department costs include responsibility for radiopharmaceuticals and contrast media. These are very pumping costs and that this cost is not passed on directly through an increase of pharmacy charges.

A major source of error potential in the UHC database is the inability of the system to directly report cost data. At KUMC, the pharmacy department is the only source of actual cost data for the products it provides to patients. UHC does not have access to this information; therefore, the data it uses must undergo a complex process of being transformed from cost data to charge data and then back to cost data. Error is introduced at each step of this transformation.

Another source of potential error with UHC CCRs is that the most current data are not being used; CCRs are based on HCFA data that are two years old. The integrity of cost data calculated from charge data is questionable at best. As managed care continues to expand, hospitals are increasingly reimbursed a fixed amount per DRG or receive a flat rate per member per month. Under this system, the amount a hospital charges its patients has little bearing on actual revenues; therefore, CCRs become less relevant.

Another source of concern with the CCRs reported to HCFA is that they incorporate hospital overhead. Although the actual cost of providing pharmaceutical services in a hospital includes hospital overhead, this information is not presented in the reports circulated to the various departments. If hospital administrators do not know how the costs in benchmarking databases such as MECON-PEERnext, HBSI Action, and the UHC Clinical Database are derived, they could make uninformed decisions or set unreasonable goals for departments.

The fact that each hospital has its own unique charge formulas adds even more confusion to the data. Many noncontrollable variables are introduced during attempts to standardize data for different institutions. For example, not all pharmacies bill for i.v. tubing. KUMC does not pay for its i.v. pumps; the hospital instead pays a premium on i.v. sets when it purchases them and recoups these costs by charging a higher fee for all i.v. medications it dispenses. Upon surveying other hospitals, we discovered that some institutions buy their pumps and that this cost is not passed on directly through an increase of pharmacy charges.

Other potential variables that reflect differences in pharmacy department costs include responsibility for radiopharmaceuticals and contrast media. These are very expensive products that can add considerable cost to a department if they are included in pharmacy inventory as they are at KUMC.

There are also ambiguities in the way various products are classified. KUMC was the only hospital that did not report anesthesia agents separately. These products need to be uniformly reported in order to limit error in the database.

Although the UHC Clinical Database did not accurately reflect pharmacy costs at KUMC, it is not without merit. Undertaking an in-depth review of costs associated with various procedures can provide useful data. By reviewing KUMC guidelines, contacting peer institutions, and questioning current drug therapy practice, substantial cost reduction opportunities were identified. Discontinuing IVIG use in liver transplant patients could potentially save the hospital $121,275 a year. Changing lymphocyte immune globulin guidelines for kidney transplants is associated with a potential cost saving of $53,000 a year.

This project provided objective data to the hospital that lymphocyte immune globulin use at KUMC is far greater than that at peer institutions. It also identified opportunities for pharmacists to affect drug costs by suggesting that azathioprine be given orally or nasogastrically rather than intravenously on postoperative day 1 to liver transplant patients.

Although potential cost savings of $53,000 were identified through better protocols for lymphocyte immune globulin use, it is unclear what effect current KUMC lymphocyte immune globulin guidelines have on the total cost of care to the patient for DRG 302. It is possible that KUMC has a lower readmission rate for acute rejection episodes, which could potentially lead to an overall lower cost for these patients. Readmission data were not tracked; complex formulas for determining overall patient outcomes were beyond the scope of this study.

Although the pharmacy department often makes suggestions about drug therapy, the thorough analysis of specific populations by the entire hospital, as well as the support of hospital administration, led to many pharmacy recommendations being incorporated into protocols.

Benchmarking databases can provide an opportunity to re-evaluate procedures at an institution and can help identify opportunities for cost reduction and improvement in patient care. They can also facilitate networking by providing a list of peers at other institutions who can serve as invaluable sources of information.

Identifying top-performing organizations and attempting to learn from them in an effort to improve organizational performance is a mandatory part of continued success in health care. As data collection techniques improve and outcome models are established, benchmarking has the potential to substantially improve the quality of care provided by health care institutions.

Conclusion

Data in the UHC Clinical Database were not representative of pharmacy costs at the University of Kansas.
Medical Center for DRG 302 (kidney transplant), overstating pharmacy costs by 46%. However, benchmarking was found to be a useful tool for identifying opportunities for reducing costs.

References