Creation Of State-Level Medicare Database For Healthcare Evaluation Applications

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The Health Care Quality Improvement Initiative (HCQII) of the Health Care Financing Administration (HCFA) calls for Professional Review Organizations (PROs) to undertake pattern analysis of large administrative datasets for the purposes of quality of care assessment. The limitations of such administrative databases (primarily the MEDPAR file and derivatives thereof) include impoverished information regarding clinical attributes of Medicare enrollees and the process and outcome of their healthcare. This paper describes preliminary efforts to address this problem by the creation of a database, the PRO Concatenated Database (PCD), from the pooled implicit judgment review data of four Peer Review Organizations (PROs). The data elements comprising the PCD were carefully selected to provide important information regarding quality and appropriateness of care. Preliminary inter-state comparative studies employing the PCD are discussed. A method is also described by which the analytical power of state-level databases may be enhanced by linkage to state-level Modeled MEDPAR data which are issued by HCFA and contain patient-level risk-adjusted mortality data. This approach to the acquisition of data whose clinical content is enriched may prove to be particularly useful to the PRO community during the pattern analysis phase of the HCQII. Such analyses will evolve into more detailed studies involving primary data collection followed by dissemination of the results to local healthcare providers. In this manner, the PCD may facilitate rapid feedback regarding the effectiveness of healthcare delivery to the local community.

INTRODUCTION

The Health Care Financing Administration (HCFA) has mandated that Peer Review Organizations (PROs) should implement the Fourth Scope of Work (4SOW) and the Health Care Quality Improvement Initiative (HCQII) [1,2]. As a result, the PROs -- in addition to traditional case-by-case review activities -- are currently developing the capability to analyze large datasets, and to provide feedback to the local medical community, thereby contributing to improvement in the quality of medical care for Medicare enrollees throughout the United States. In this scheme, "pattern analysis" (i.e., identification and monitoring of significance variations in patterns of care and clinical outcomes) is viewed as a vehicle by which PROs can identify areas that merit closer attention (or indeed to become aware of those areas where healthcare delivery standards are already high).

To perform clinically informative pattern analyses, the PRO community requires high quality clinical data [3]. Current plans provide for the PRO analytical staffs to gain access to the National Claims History (NCH) file, and Medicare Provider Analysis and Review (MEDPAR, MEDPRO, and Modeled MEDPAR) data files. Some PROs will have access to Uniform Clinical Data Set (UCDS) files in the early stages of the Fourth Scope of Work and this access will eventually be extended to all PROs. Such data may then be linked to datasets from federal, state, local, or private sources comprising detailed and specific information relevant to quality assurance and utilization of resources [4,5]. Such data linkage may result in the production of large databases suitable for pattern analysis.

Large administrative datasets such as MEDPAR have been employed in quality of care research in the United States for a number of years, but the available methodologic reports advise that these data should be employed for such purposes with considerable caution [6,7]. Problems with the data include a general deficiency in clinical content, lack of ability to estimate the accuracy of diagnostic and procedural information, and little information on the appropriateness and quality of care provided. Thus, PROs are encouraged by HCFA to explore new data sources to expand the scope and scientific significance of their investigations.

Recent work by Thomas et al. [8] suggests that the ability to draw conclusions by the use of risk-adjusted mortality models for specific medical conditions may be enhanced if the results are cross-validated with the results of PRO reviews. This paper describes the creation of the PRO Concatenated Database (PCD) in which both Medicare claims data and PRO review data from four PROs are assembled into a single file. This implicit judgment review data, when linked to other datasets such as Modeled MEDPAR, may be used to provide cross-validation with risk-adjusted mortality studies.

The PCD was conceived following the decision of four Peer Review Organizations (PROs) to pool their Medicare claims data, Medicare beneficiary denominator data, and review audit data into a single aggregated dataset. Colorado Foundation for Medical Care (CFMC), Oregon Medical Peer Review Organization (OMPRO), Connecticut Peer Review Organization (CPRO), and Medical Society of Virginia Review Organization (MSVRO) are working in this effort in collaboration with the Thomas Jefferson Health Policy Institute (TJHPI) and the data processor common to each of the four participating PROs, Commonwealth Clinical Systems, Inc., Charlottesville, Virginia. The PCD (or similar data initiatives) will augment MEDPAR data for the purposes of pattern analysis. Preliminary inter-state comparison analyses are described herein.

METHODS

Creation and Enhancement of the PCD
The PCD was created from a subset of claims and PRO review data received from HCFA by each of the four PROs for the time period 1990 to 1992. Approximately 2 million records in all were incorporated into the initial version of the PCD. Each data element included in the PCD record was selected by agreement between the PRO participants. The database was created and maintained on a VAX/VMS Series 6440 minicomputer using the 'C' programming language. The data were analyzed using SAS on the VAX machine, or downloaded to a Personal Computer (PC) environment where the Stata statistical package was used for data linkage or further analysis.

For each record of the PCD, claims data (UB82) were linked to PRO review data using two alphanumeric identifiers generated by the data processor. Physician data were linked using either the state physician identifier, or the Universal Physician Identification Number (UPIN). Medicare beneficiary data (Health Information Skeletonized Eligibility Write-off file, HISKEW) were linked using Health Insurance Claim (HIC) numbers. In all cases, unlinked data fields were left blank (for alphanumeric fields), or set to a missing value (for numeric fields).

For a single state (CT, FY 1990), the PCD data were enhanced by linkage to the Modeled MEDPAR data (record length = 249) issued to each PRO by HCFA. The latter data are derived from MEDPAR data, and feature elements calculated according to the HCFA Bailey-Makeham Mortality Model (e.g., predicted 30, 90, and 180 day mortality probabilities). The PCD and Modeled MEDPAR were linked employing Stata software and using a concatenation of HIC number-admission date-discharge date as a matching key. In order to increase the degree of linkage, a second link step was performed using social security number-admission date-discharge date-sex as a matching key. Using this methodology, for a given date range, over 93% of the Modeled MEDPAR records were linked to their PCD counterparts.

CABG/PTCA Utilization, In-Hospital Mortality
To illustrate the use of the PCD, the multi-state results of CABG/PTCA utilization and in-hospital mortality analyses are presented below. Utilization rates were calculated using the 1990-1991 HISKEW Medicare beneficiary denominator file following exclusion of those enrollees who were under the age of 65, or who were HMO beneficiaries.

The numerator for each state was the number of beneficiaries receiving their first CABG procedure (defined as procedure codes 36.10 through 36.16 and 36.19), or PTCA procedure (defined as procedure codes 36.01, 36.02, and 36.05). In-hospital percent mortalities were calculated as a percentage of those CABG or PTCA cases identified who died before discharge from the hospital. In each case, the rates were age- and gender-adjusted across the four states.

30-Day Mortality/PRO Review Cross-Validation
Correlation between quality of care and risk-adjusted mortality was measured by separating cases, on the basis of peer review, into those in which a physician reviewer indicated a generic screen failure, and those

in which this was not the case. Using the Connecticut PCD data (FY 1990) enhanced by linkage to Modeled MEDPAR, the 30-day Standardized Mortality Ratio (SMR, the ratio of observed to predicted mortality) was calculated for those dying in both groups of cases. Standardized survival ratios were calculated for those surviving 30 days. The statistical significance of association between mortality and quality of care was then tested by a chi-squared calculated from the difference in standardized mortality between the two groups as described by Thomas et al. [8].

RESULTS

Description of the PCD

The PCD contains records of approximately 2 million hospital discharges over three years for Medicare enrollees in the four states. The PCD record size is 322 bytes. The database contains patient, provider, and physician identifiers, all QC/MEDPAR clinical information plus Medicare Beneficiary (race, date of death, county of residence), calculated fields (case mix indicators), and PRO review data. The latter include details on reasons for selection of the case for review, quality and utilization problem flags, generic screens, adjustment data, and original data (i.e., pre-review data). The enhanced PCD which has been further linked to the Modeled MEDPAR data also contains calculated data including comorbidities, predicted probability of death rates, previous hospitalization indicators, and mortality rate data.

Usage of CABG/PTCA in the Elderly by State

Comparisons across states may be cross-tabulated by most frequent DRGs, mortality, readmission, and complication rates. The participating PROs use such comparisons to reveal areas where significant variation is noted. These are then subjected to hypothesis testing and are used ultimately to assist in the selection of guided projects for pattern analysis studies. Examples of this process and the manner in which the PCD is useful to the PROs may be provided by reference to examination of coronary artery bypass graft (CABG) and percutaneous transluminal coronary angioplasty (PTCA). CABG and PTCA are attractive as candidates for population-based pattern analyses since they are both expensive surgical procedures. Also, these procedures are associated with relatively high mortality rates.

Figure 1 shows a comparison of utilization rates for CABG and PTCA for 1991 discharges, across the four PCD participant states. The usage rates for PTCA are rather consistent at around 375 per 100,000 person-years (p-y) for beneficiaries aged 65 and above, but there is somewhat more variability in the utilization rates for CABG. For the latter procedure, while the overall mean among the four PROs is 451 per 100,000p-y, Oregon exhibits a maximum of 523 per 100,000p-y, and Colorado the minimum of 336 per 100,000p-y.

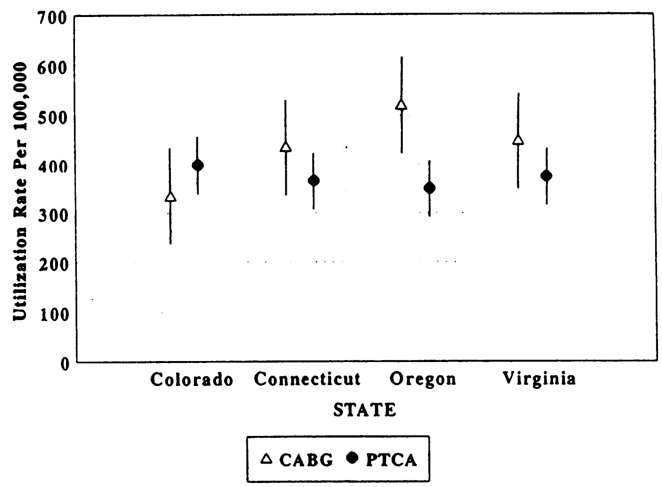

Figure 1 - PTCA/CABG utilization rates per 100,000 beneficiaries with 95% confidence intervals shown. Results based on 1991 discharges for patients aged 65 and above only, age- and gender-adjusted across the four states.

In-Hospital Mortality Following CABG/PTCA in the Elderly by State

Figure 2 displays in-hospital mortality data which corresponds to the utilization data of Figure 1 above. The data in Figure 2 indicate similarity of CABG/PTCA in-hospital mortality experience across the four states. The overall averages are 5.8% death rate following CABG (maximum 6.6% for CT, minimum 5.4% for OR) and 2.1% following the PTCA surgical procedure (maximum 2.9% CO, minimum 1.8% VA).

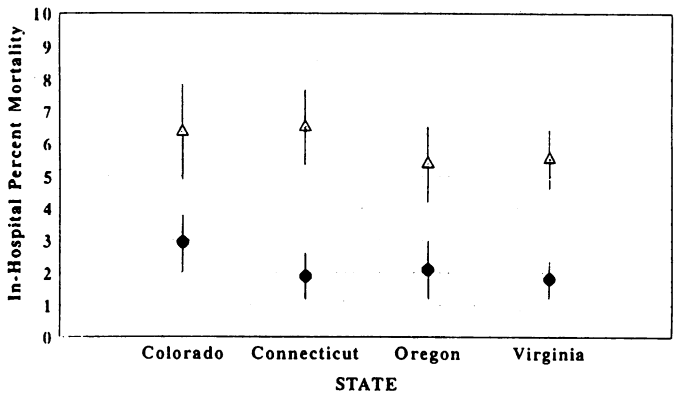

Figure 2 - PTCA/CABG In-hospital percent mortality with 95% confidence intervals shown. Results based on 1991 discharges for patients aged 65 and above only, age- and gender-adjusted across the four states.

Selected Quality of Care Applications
Preliminary investigation of the correlation of quality of care in risk-adjusted mortality was performed by grouping conditions according to the display categories used by HCFA for published comparison of providers. We tested all categories for which more than 100 deaths were recorded. Some of the results are shown in Table 1. In this table, "N" is the number of cases, "Poor Qual" indicates those cases with a generic screen failure, and "Good Qual" indicates all other cases within a given diagnostic category. SMR is a standardized 30-day mortality rate among those who died.

Table 1 - Distribution of risk-adjusted mortality for selected conditions by peer review measures of quality of care for Medicare enrollees in Connecticut, 1990

Cond.	N	"Poor Qual"	SMR if "Poor Qual"	SMR if "Good Qual"	Chi Sq.	P Value
AMI	1249	95	4.17	3.17	1.74	.19
CHF	1808	139	6.03	5.28	0.39	.53
P & I	1145	90	3.71	4.34	0.39	.53
Stroke	693	116	4.39	3.34	1.83	.18

SMR = Standardized Mortality Ratio; CHF = Congestive Heart Failure; P & I = Pneumonia and Influenza

Table 1 shows that, though SMRs are higher for cases with indicators of quality problems as measured by implicit review in three of four cases, these relations did not pass a chi-squared test of significance. This is consistent with the results described by Thomas et al.[8] for a sample from Third Scope of Work data of similar size. When all observations were pooled, the variation of the quality indicator was found to be associated with standardized mortality with chi-squared equal to 22.05 ($p < .001$). This suggests that with a larger sample, condition-specific associations may be detectable.

DISCUSSION

The pooling of PRO data across states and creation of the PRO Concatenated Database (PCD) described in this paper may provide PROs with a powerful tool for the performance of pattern analysis. The chief enhancement of the PCD over the MEDPAR-derived data from HCFA is the addition of implicit judgment peer review data.

In addition to multi-state analyses, this work shows that risk-adjusted mortality data may be used to validate PRO review data and vice versa. It is clear that neither risk-adjusted mortality nor peer review data alone provide a "gold standard" indication of quality of hospital care [9]. However, by extending the methodology of Thomas et al. [8], the combination of both may enable PROs to identify those conditions and procedures which may be the most appropriate subjects for cooperative quality assurance (QA) projects. The follow-up QA projects may then combine modeled MEDPAR data with other, project-specific data to study differential risk-adjusted outcomes or risk-adjusted utilization rates.

The PTCA and CABG utilization data of Figure 1 indicate interesting variations in the management of coronary artery disease in the elderly across the four participating states. Also, the CABG utilization rates of Figure 1 are similar to those of Anderson et al. [10] who recently reported 478 per 100,000p-y for CA and 362 per 100,000p-y for NY. Three of the four states included in Figure 1 demonstrate a preference for CABG as the preferred method of revascularization. This preference is most clearly shown in the case of Oregon. Figure 1 also suggests that PTCA may be favored over CABG in Colorado. Such results provide a rapid method to compare practice patterns among the four states, and may indicate areas where more studies could usefully be performed.
Table 1 demonstrates a possible use for the review

data contained in the PCD. Further refinements in the methodology and additional data are necessary before undertaking rigorous condition-specific comparisons between the two sets of results. Once the optimum methodology has been established, the PCD will enable PROs to identify more readily those variations most likely to be a result of quality of care differences.

A further advantage of the PCD is that it can be used as a sampling frame to select samples of patients meeting certain criteria. In addition, multi-year datasets promise the ability to index patients in the early stages of medical intervention and track care provided over the course of several years. This capability holds potential for gaining insights into variations in outcomes.

As the mandate of the PROs changes from disciplinary monitoring of providers to the analysis of patterns of care, one way in which the expertise and data resources of the PROs can prove valuable is in determining which variations in practice and outcome are most likely to reflect variations in the quality of care provided. The integration of outcomes data and peer review data may play an important role in the efforts of PROs to become positive agents of change over the next three years in the Fourth Scope of Work of HCFA's HCQII.

CONCLUSIONS

This work demonstrates ways in which outcomes-based measurements of provider performance can be enhanced by review data available in the PCD. The American Medical Peer Review Association (AMPRA) has called on PROs to become "Quality Improvement Organizations" (QIOs) to disseminate quality information to consumers in a managed healthcare regime [11]. For PROs or any other bodies to take on such responsibilities requires both a broad range of quality measures and the ability to employ widely recognized measures such as risk-adjusted mortality rates in an effective manner. Improving the performance of both mortality models and of peer review assessment of quality of care will be important for successful implementation of the HCQII, and crucial to the QIOs of the future.

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