



## *Using Medicare Hospital Cost Reports Cost-to-Charge Ratios in Research*

*The Research Data Assistance Center (ResDAC) is a CMS contractor that provides free assistance to academic and non-profit researchers interested in using Medicare and/or Medicaid data for their research. ResDAC is staffed by a consortium of epidemiologists, public health specialists, health services researchers, biostatisticians, and health informatics specialists from the University of Minnesota.*

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### **Background**

Researchers use a variety of methods in which to calculate 'cost' of hospital services. Researchers have published articles in which they use total submitted charges, total Medicare allowed charges, Medicare payment, while others have applied a Medicare cost-to-charge ratio to the total charges to estimate the provider's 'cost'. All of the methods or definitions mentioned come with limitations. Most researchers tend to use Medicare payments as a simple way in which to estimate 'cost', even though the literature suggests that using the departmental cost-to-charge ratio approach yields values closest to the provider's actual 'cost'. However, using the cost-to-charge ratios from the Medicare hospital cost reports requires a significant amount of time to extract the data and apply to charges.

### **Location of the Cost-to-Charge Ratios in the Medicare Hospital Cost Reports**

Using the cost-to-charge ratio approach when calculating the provider's 'cost' requires the use of the Medicare hospital cost reports in combination with the claims data. The cost-to-charge ratios CCRs are found in two locations. On Worksheet C and D-4 of the Medicare Hospital Cost Reports. The values used to calculate the ratios are found on Worksheet C. Worksheet C contains the total cost and total charge by cost center. Even though Worksheet D reports the cost-to-charge ratios, researchers may want to consider using Worksheet C because this would provide the raw numbers from which the researcher could evaluate possible errors or extreme values. (See Appendix A for additional resources related to the Medicare hospital cost reports.)

## **Issues when using the Cost-to-Charge Ratios**

Some issues that researchers need to keep in mind when using the cost-to-charge ratio approach are:

1. cost centers in the cost reports do not match revenue centers in the utilization files,
2. multiple cost reports may exist per provider per year, and
3. extreme values are found for the cost-to-charge ratios.

Related to the first issue, cost reports contain cost centers and the claims data contain revenue centers. Cost centers and revenue centers do not match exactly and there is not a commonly accepted crosswalk between the cost centers and revenue centers. Hospital providers are required to submit a crosswalk of the revenue centers to cost centers for their cost report (Provider Cost Report Reimbursement Questionnaire Form CMS-339), however, this information is considered private and is not available to researchers. One CMS resource, however, is the cost center to revenue center crosswalk that is used for the Outpatient prospective payment system (OPPS):

[http://www.cms.hhs.gov/HospitalOutpatientPPS/03\\_crosswalk.asp#TopOfPage](http://www.cms.hhs.gov/HospitalOutpatientPPS/03_crosswalk.asp#TopOfPage).

The second issue that researchers need to resolve when using the cost reports is how to handle those providers that have more than one cost report filed per fiscal year. Providers can legitimately have more than one cost report filed per year. This will occur if the provider changes its fiscal year or if the provider has a change of ownership. The researcher will need to evaluate each cost report and determine how to use these data (e.g. use only one, average the two).

Lastly, researchers will find extreme values as well as zero cost-to-charge ratios. Some of the extreme values represent errors while others may be legitimate values that are extreme. The cost reports clearly contain some errors. For example, a researcher may find a provider with a cost center's total cost equal to \$1 while the cost center's total charges equal \$100,000. In addition, the cost reports contain values for cost centers that are extreme relative to other providers, such as cost-to-charge ratios that are less than .05 or are greater than 10. When CMS uses the cost-to-charge ratios to calculate outlier payments, CMS calculates the overall country wide geometric mean of the cost center cost-to-charge ratio and any value that is outside of 3 standard deviations of the geometric mean will be replaced by the statewide average cost center cost-to-charge ratio. An alternative approach may be to consider replacing the provider's extreme cost-to-charge value with the provider's overall average cost-to-charge ratio or previous fiscal year value.

## **Inpatient Standard Analytical File (SAF) versus MedPAR**

Researchers that intend to use hospital cost-to-charge ratios need to use the utilization files in combination with the cost-to-charge ratios in order to determine the 'cost' of providing services. Researchers can use either the Inpatient SAF or the MedPAR hospitalization file.

The Inpatient file is a claim file that contains one record for each claim submitted. This file contains detailed revenue center total charge information for each claim. Providers can submit up to 450 revenue centers per claim. The MedPAR file, on the other hand, is a hospital stay file that contains one record for each hospitalization.

The limitation of using the Inpatient file is that researchers may calculate cost-to-charge ratios by cost center and would like to map it to a specific revenue center. However because the researcher does not know how the provider mapped the cost centers to revenue center, there may exist situation where the researcher has calculated a cost-to-charge ratio, but no charges exist for what the researcher thought should be the appropriate revenue center. Therefore, ResDAC recommends that researchers consider grouping revenue centers together similar to how the MedPAR groups revenue centers or just use the MedPAR file. This should eliminate the chance of having a cost-to-charge ratio mapped to a revenue center with zero charges.

### **Summary**

Using the cost-to-charge ratios from the Hospital cost reports involves considerable time and effort to apply due to the multiple factors to consider when using the cost report data in combination with the Medicare utilization files. Researchers will have to determine which cost reports should be used, how to handle missing data and outliers, how to define the revenue center to cost center crosswalk, and which Medicare utilization file to use. As with any analysis, but especially for analyses involving the cost-to-charge ratios, researchers should be especially diligent about documenting their methods in order for the research to be replicated.

### **Published Articles that have evaluated the use of Cost-to-Charge Ratios**

Below is a list of articles where researchers have evaluated different types of 'costing' methodologies.

Barnett, P. G. "Review of Methods to Determine VA Health Care Costs." *Medical Care* 37.4 Suppl Va (1999): AS9-17.

Burkhardt, J. H., and J. H. Sunshine. "Core-Needle and Surgical Breast Biopsy: Comparison of Three Methods of Assessing Cost." *Radiology* 212.1 (1999): 181-8.

Etzioni, R. D., et al. "On the use of Survival Analysis Techniques to Estimate Medical Care Costs." *Journal of Health Economics* 18.3 (1999): 365-80.

Friedman, Bernard, et al. "Practical Options for Estimating Cost of Hospital Inpatient Stays." *Journal of Health Care Finance* 29.(1) (2002): 1-13.

Hayman, J. A., et al. "A Comparison of Two Methods for Estimating the Technical Costs of External Beam Radiation Therapy." *International Journal of Radiation Oncology, Biology, Physics* 47.2 (2000): 461-7.

Lave, J. R., et al. "Costing Medical Care: Using Medicare Administrative Data." *Medical Care* 32.7 Suppl (1994): JS77-89.

Newhouse, J. P., S. Cretin, and C. J. Witsberger. "Predicting Hospital Accounting Costs." *Health Care Financing Review* 11.1 (1989): 25-33.

Shwartz, M., D. W. Young, and R. Siegrist. "The Ratio of Costs to Charges: How Good a Basis for Estimating Costs?" *Inquiry : a Journal of Medical Care Organization, Provision and Financing* 32.4 (1995): 476-81.

Taira, D. A., et al. "Comparison of Analytic Approaches for the Economic Evaluation of New Technologies Alongside Multicenter Clinical Trials." *American Heart Journal* 145.3 (2003): 452-8.

If you have any questions or comments, ResDAC staff can be contacted at 1-888-ResDAC or [resdac@umn.edu](mailto:resdac@umn.edu)

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