

Statistical Critique of Acumen's SNF Payment System Reform Proposal

Preliminary Overview

Prepared for AHCA By: The Moran Company April, 2017

Introduction

There are three key elements involved in a peer review of the materials distributed by Acumen as part of its Technical Expert Panel meeting series. These are:

- Adequacy of documentation and methodology for a robust peer review.
- Evaluation of quality of data used, and its fit to the statistical methods selected.
- Adequacy of the statistical methods to the purposes of the research.

The Moran Company has undertaken a peer review process of the Acumen materials to illuminate how such research can and should be strengthened if it is to serve as the basis for payment policy. We conclude and will provide documentation to show:

- Explanation and documentation are not adequate for a robust peer review, or for replication of the research.
- Data quality are highly variable, with some having potential to be trimmed and improved, while others are completely of unacceptable quality or fit to the methods. It is possible to use existing data to develop a reformed payment system, but not using the methods and assumptions provided by Acumen. It is also possible to collect the data needed over a relatively short period of time to validate or improve rate setting, but no such plan is considered.
- Statistical methods appear to have been chosen for convenience and to fit the scope, time and budget for the research, and are not a good fit for available data, nor adequate to produce the improved payment accuracy that was the purpose for the research. Statistical methods also rely upon assumptions that can be shown to be invalid.

Adequacy of Documentation and Methodology

- All statistical methods rely upon assumptions of the quality, reliability, and consistency of the data used. Acumen relies upon manipulation of cost report and claims data to produce cost per day metrics. Acumen was provided information documenting the variability and sources of error in these data. It never responded to either questions or other research suggesting the data may not be acceptable to the statistical methods or purpose. It provided no documentation of testing the data, nor did it explain trimming or other methods to exclude unbelievable values.
- Acumen indicated it was told to use available data by CMS, and explained some minimal checking to argue the data are of acceptable quality. Those unfamiliar with the structure and sources for SNF cost report data and the use of cost-to-charge ratios originating in

hospital payment systems (never before used in SNF payment) may not be familiar with the extent of error, inconsistency, and difficulty interpreting these data. The assertion that these data are used correctly in the Acumen research can be refuted.

- The regression analytics performed are only partially explained. Regression analysis relies upon statistical independence of variables. No information is provided regarding testing of statistical independence of any variables, nor is evidence provided regarding the correlations of any variables. R-squared statistics are published at the variable level, and for the most part, are close to zero, showing negligible explanatory power. If such testing was done and it can be explained, it would be possible to evaluate the regression results. Without greater detail, it is impossible to determine the validity of these results.

Evaluation of Quality of Data Used & Fit to Statistical Methods

- The Moran Company performed analysis of cost report data and the derivation of cost-to-charge ratios using SNF cost report and claims data. In its review, it found some consistency in data on therapy cost and charges, though a high degree of variability. This variability would need to be addressed by systematic trimming to remove extreme and unbelievable data. With increased parsing of the units of cost through the application of statistical methods to the various patient characteristic defined cells, concentrations of error in these data can skew or distort results.
- The Moran Company performed an analysis of cost and charge data at the revenue code level for non-therapy ancillaries (NTAs), such as drugs. These data were found to be highly questionable with little consistency, and a great deal of unbelievable data. There are many reasons for this finding, which have been detailed, and cannot be corrected. The Moran Company further collected data on NTA actual costs from long term care pharmacies for a significant number of SNFs, though not a representative sample. These data illustrate powerfully how the method Acumen selected for statistical manipulation of the therapy data (which might be cleaned and improved) would be inappropriate for the NTA data. NTA data show very low frequency of high cost experience. The use of data with all its flaws in the Acumen method would produce overpayment consistently for most providers and vast underpayment for the low volume high cost cases, where payment most needs to reflect cost. At the volume of most SNF facilities, such underpayment could be disastrous if only one or two patients experienced these high NTA costs. The resulting incentive would be for SNFs to avoid such predictably high cost patients. Actual data bears no resemblance in its distribution to the data Acumen is using for this component of its proposed payment system. The actual structure of the NTA data lends itself to an “outlier payment” type mechanism not presently included in the SNF PPS, and therefore excluded from Acumen’s scope of work. It would be possible to collect actual data in the existing SNF PPS and adapt a payment policy with a better fit to the data, but no evidence has been provided that any alternative methods were considered.
- The data Acumen is using to split the nursing component between nursing and NTAs is 10 years old, based on a relatively small sample that was criticized as inadequate at the time it was used for the purposes it was used. It is proposed to be used for an entirely unrelated purpose, and it is likely highly inaccurate. The Moran Company provides data

elsewhere demonstrating that there has been gradual and significant change in patient characteristics and clinical practice in SNFs, following changes brought about by widespread proliferation of delivery system reforms and increased Medicare Advantage penetration. Acumen has no basis for checking the accuracy of its data, except to argue that nothing has changed in SNF practice that would invalidate these data. The potential for using nursing data with no factual basis in a payment system could reduce funds for nursing which is the core service in the SNF. Given evidence that the demands upon nursing of changing clinical practice are increasing due to more cognitively impaired patients and higher tech care needs, inappropriate reductions in funding for nursing would be disastrous. Assumptions about average nursing time related to patient needs may be supported by evidence, but the amount of nursing cost to be split off to cover payment for NTAs is at present highly speculative.

Adequacy of Statistical Methods to Purpose of Research

- Acumen developed a single basic regression method to fit different kinds of data with varying reliability and a number of problems that would normally exclude the use of the method without evidence that the data fits the method.
 - In regression, the research team has an obligation to verify that the data and their distribution make sense, and that trimming and other methods to correct for error are evaluated and implemented. This was not explained, and therefore, if the data are not accurate, which we would argue, the results are not valid.
 - The variables in a regression must be tested for independence/lack of correlations. There must be some evaluation as to whether all relevant variables are being measured. Nothing is explained with regard to these issues. Without much more detailed explanation and evidence that the necessary testing has been performed, we would have to conclude the regression results are not valid.
 - Acumen chose MDS variables (from the MDS 3.0, not the current version) that explain more variation than others (>0) though explanatory R-squared values are very close to zero. The possibility that none of the MDS variables are sufficient to explain cost is not considered. No lower bound for an R-squared is considered, leaving the possibility that 95% or more of the variation in cost is not explained.
 - Acumen actually indicates that six out of ten self performance variables and 12 of 14 cognitive measures are unrelated to the cost of treatment. The extent of relationship between any variable and cost is the entire basis for building a payment system based on these data, and such a relationship is entirely unexplained in the research.
 - When the explanatory power (R-squared) is shown at the variable level, and it is close to zero for almost all variables, it is unclear what the researchers think it means. It is not appropriate to add R-squared values together over a range of variables. Any correlations (which are most certainly present given the variables

chosen) would amplify a summation of R-squared overstating explanatory power by an unknown amount.

- Acumen then applied a data mining technique (Classification and Regression Tree—CART) to identify combinations of the variables in the regression to create homogeneous payment categories.
 - To the extent that the cost per day data underlying all the statistical analysis is not valid and introduces random variation and other errors, the reliability of both regression and CART results are threatened. Either random error or systematic error, each of which is highly likely given analysis of data sources, will threaten the meaning of results.
 - CART results will construct different classification schemes depending on the nature of error in the underlying data. It cannot reduce variation in payment categories below what exists in the data it uses (output from the regression). Since it appears that the regression cannot explain 95% of the variation in cost, CART will limit any improvement in constructing broader payment categories over the results at the variable level.
 - The CART method does include a cross-validation method which was used. However, it is highly sensitive to underlying variation and error in the data.

Conclusions

The Acumen research represents standardized statistical manipulation of data that have not been adequately evaluated for quality. Nor have the statistical methods been fit to the character of the data. Any data can be run through statistical methods, and will produce results that appear on their face to mean something. However, when the data are not of adequate quality and the statistical methods have not been selected for both fit to the data and the purpose for which the research is performed, the results may yield something that is random, or highly inaccurate.

The Acumen research can be repeated mechanically on more recent data with minor improvements in method, but will yield a very large number of payment categories that are asserted to be related to patient characteristics that are related to cost, when such conclusions are not true. There is no way using existing data to determine how inaccurate the Acumen results are. The risk is that what appear to be competently performed statistical analyses, are performed on data that is inappropriate to use with these methods for these purposes. Providers will have no way to estimate what their payment rates will be, as the methodology is far too complicated and relies on statistical algorithms not available to the public. We conclude that the distribution of payment under the proposed system will be virtually random, and will randomly overpay some providers and underpay others in ways that are somewhat predictable, in that providers can avoid predictably high cost patients. This will provide access to care problems for predictably high cost patients.