Adjusted Clinical Groups: A New Measure of Illness

THE MANITOBA CENTRE FOR HEALTH POLICY AND EVALUATION

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This study was a joint project between the *Manitoba Centre for Health Policy and Evaluation,* University of Manitoba, and the *Centre for Health Services and Policy Research,* University of British Columbia.

A recent study has found "much promise" in a new case-mix tool—the Johns Hopkins Adjusted Clinical Group (ACG) system—for measuring the burden of illness in individuals and populations. The study was conducted by the Manitoba Centre for Health Policy and Evaluation (MCHPE) in collaboration with the Centre for Health Services and Policy Research at the University of British Columbia.

Valid methods to measure illness in populations have a variety of important applications in health care research, policy and management. They can help us to:

- understand better the patterns of health care service delivery to populations with differing needs;
- match health care resources more closely with health care needs;
- adequately compensate health care organizations and providers for treating their patients; and
- develop ways to account for differences in illness experienced by users of health care services.

The Johns Hopkins ACG system is one of a new class of tools that measure the overall illness experienced by individuals over the course of a year. Developed by researchers at The Johns Hopkins University School of Hygiene and Public Health in Baltimore, the ACG system has been extensively validated in the United States and more recently in Europe, but experience with the system in Canada has been limited. This study examined the performance of the system using demographic, diagnostic and expenditure data from Manitoba Health for the fiscal year 1995/96.

The specific aims of the study were to: assess the performance of the ACG system in how well it explains differences in the amount and cost of health care provided to individual Manitobans; and evaluate the extent to which the ACG system can provide a valid measure of a population's need for health services through comparison with other generally accepted measures of population health.

Overview of the System

Differences in the use of the health care system are in part predictable, based on differences in how sick or healthy people are. The underlying assumption of the Johns Hopkins ACG case-mix adjustment system is that a measure of illness can help explain the need for and the use of medical care resources.

With the assistance of expert clinicians, the Johns Hopkins researchers categorized more than 14,000 diagnoses into 32 groups, based on their expected clinical outcomes and use of health care resources. Each of these categories is called an Ambulatory Diagnostic Group—or ADG. To apply the system to a population, each individual is assigned as few as zero and as many as 32 ADGs, based on diagnoses contained in physician and hospital records. Individuals are also assigned a single ACG which represents common combinations of the diagnostic groups and patient demographics, such as age and gender.

Other systems use the most important or common diagnosis in a *single* episode of illness. In contrast, ACGs describe the constellation of illnesses over a period of time that contribute to the overall level of health services that the individual would be expected to use. In other words, the ACGs attempt to capture the "clinical complexity" or "burden of illness" experienced by the individual. The individual data are aggregated to produce information on the illness burden of the population as a whole.

Explaining Variations in Health Care

The first objective of the study was to assess the performance of the ACG system in explaining variation in the health care provided to individual Manitobans. To make this assessment, the study evaluated:

- the degree to which diagnoses coded on Manitoba records are supported by the ACG system;
- the distributional properties of several ACG illness groups;
- the variability in health care expenditures incurred by people in the same ACGs;
- the relative differences in costs of care with those from other populations; and
- the explanatory power of ACGs for same-year health care expenditures.

The overall findings are set out briefly below:

1. Manitoba medical codes worked with the ACG software.

The performance of the ACG system depends on the degree to which a patient's diagnoses are captured by administrative records and the accuracy of those diagnoses. The information from the codes on physician claims and hospital forms must be specific enough to permit assignment to one of the diagnostic groups (ADGs). Fewer than 1% of the codes from the Manitoba administrative data were rejected, which is well within acceptable limits (less than 5%) set by the system developers.

2. Distribution of ACG illness groups was generally compatible with prior research.

Approximately 82% of Manitobans were assigned at least one of the ADGs for the year of the study. That means they went at least once to see a physician, and/or went to hospital as an inpatient or for an ambulatory surgical procedure. The other 18% of Manitobans had no contact with physicians or hospitals in that period. These rates are similar to those found in prior MCHPE research.

About 65% of Manitobans were relatively healthy (i.e. assigned 1-3 ADGs) and less than 1% had very high illness burdens (i.e. 10 or more different ADGs). We do not have a general population with which to compare these Manitoba findings. The system has been applied mainly to specific groups of patients in the US, such as recipients of Medicaid (government-funded health care for the poor).

As one way to assess whether the software worked with Manitoba data, we examined the system's distribution in areas where there is available research. For example, we estimated the Manitoba birth rate at 13.5 births per 1,000 population using the system's infant-specific ACGs for fiscal year 1995/96. Statistics Canada reports 13.8 births/1,000 for 1995. For mental health disorders, we found treatment of 12.8 cases per 100 adults compared to 10.6 cases (21% lower) from an MCHPE study conducted several years earlier. In these test areas, the ACG distribution was compatible with available research.

3. Groups with the highest illness burdens cost more than the lowest, but there was considerable variation in costs within groups.

The system is designed to measure whether people with higher measured illness incur higher costs of medical care. For this part of our analysis, we examined how well the ACG system was able to explain the variation in expenditures for both physician and total—physician plus hospital—costs.* Comparing the lowest- to highest-cost ACGs, we found

*The expenditure estimates were calculated directly for physician services from their claims. Hospital costs were estimated using the Refined Diagnosis Related Group and Day Procedure Group estimates. Because of limitations of the data, there were some exclusions, for example, provincial cancer treatment centre expenditures, and hospital outpatient pharmaceutical and emergency department expenditures.

about a 50-fold variation in physician costs and a 400-fold variation in total costs. In general, the ACG relative costs had substantial face validity. Groups with the greatest burden of illness (those with 10 or more ADGs) were the most expensive, and those with the lowest illness burden cost the least.

However, we found considerable variation in costs within each ACG, with a small number of high users of health services in each category of ACGs. Some ACGs had more variability than others. The costs of the categories with acute major, chronic unstable medical, and psychosocial diagnoses were the most variable. On the whole, the least resource-intensive ACGs showed more variability than the high intensity ones. Some of the variation within categories was unexpected and unexplained. For example, the preventive and administrative category was highly variable for both physician and total expenditures.

4. We found a similar cost structure across ACGs for a variety of Canadian and US populations.

We compared the costs of Manitoba patients with similar cost estimates for three other populations: a random sample of the British Columbia population; non-disabled recipients of Minnesota's Medicaid health insurance program; and members of one large US Health Maintenance Organization (HMO) plan.

For the majority of ACGs, there were few differences in the relative costs for physician services between Manitoba and BC. Notable exceptions were the psychosocial ACGs. These large differences can be partially explained by the methods that the provinces use to pay physicians for psychiatric services. There was also substantial similarity with US relative costs, especially the HMO. That is, categories of patients that incurred high health care costs in Manitoba were also among the most costly in BC and the US. These findings of a similar cost structure indicated substantial validity of the system as a measure of illness.

5. The system helped explain the variation in same-year expenditures for a general population, but was not as useful for certain sub-groups.

Knowing the age and gender of patients explained only 9% of the difference in physician expenditures and less than 5% of total expenditures (see Table). Adding the ADG categories improved the explanatory ability to about 51% of physician and 28% of total expenditures. The ACG categories on their own, without age and gender, explained 48% of the variation in physician and 32% of total expenditures. These results are comparable to findings in the US. However, the Manitoba study found that the ACG-only models did not explain as much variation for child, adolescent and senior sub-populations as was true for other age groups.

Proportion of Health Expenditures Explained by Various Characteristics

	EXPLANATORY FACTORS		
	Age & Gender	Age, Gender & ADGs	ACGs Only
Spending on Physicians			
Winnipeg	8.9%	52.4%	49.6%
All Manitoba	8.3%	50.6%	48.0%
Total Spending on Physicians & Hospital Care			
Winnipeg	3.9%	27.4%	32.8%
All Manitoba	4.5%	27.7%	32.4%

Using ACGs to Measure Population Health Status

Factors other than illness are known to influence use and cost of health services, including patient factors (e.g. social supports and location of residence), provider factors (e.g. physician specialty and practice style), and system factors (e.g. availability of resources). Another set of validity checks was done on the ACG system in relation to its utility as a measure of population health.

There is no "gold standard" to measure the need for health services in populations. Researchers and policy-makers have relied on a variety of population health indicators as proxies, such as mortality (death) rates, or incidence and prevalence rates of specific diseases (e.g. cancer and diabetes). Little information was available as to how case-mix measured by the ACG system compared with such other measures. Therefore, the study used the system to construct indicators of population health and then compared them to several generally accepted indicators.

We grouped Manitobans into 60 small geographic areas called Physician Service Areas (PSAs). We created an ACG Morbidity Index for each area by:

- determining each resident's ACG category;
- using the average provincial costs per ACG as a morbidity weight;
- assigning these weights to every Manitoban;
- calculating the average ACG cost for each area (the sum of the weights divided by the number of residents); and
- dividing the result by the overall provincial average.

We then compared PSA performance on this index with performance on other population health status measures, including premature mortality (death prior to age 75), which is generally considered to be the best single indicator of a population's need for health care.

We found a strong association between the area scores on the ACG Morbidity Index and the area's premature mortality rates. This association remained statistically significant after adjusting for a variety of other influential factors. The parallel scores on these two measures provided substantial evidence of validity of the ACG system as a population health indicator for geographically-defined populations, and as a general case-mix measure for medical practices.

The ACG index offers significant advantages over premature mortality as a measure of population health because it can be specified over shorter time periods and for smaller populations. Moreover, it is more logically related to the need for health services than an index based on deaths.

The major limitation of the index appeared to be that it is systematically related to physician visit rates: the more often people visit physicians, the more likely that conditions which increase their illness score will be recorded. Winnipeg has more physicians and higher visit rates than rural areas, so the index tended to overestimate illness for Winnipeg residents and underestimate it for rural areas. Also, the ACG system tended to overestimate illness in people who live in high income neighbourhoods, since people of high socioeconomic status tend to visit physicians more relative to their health status than do individuals of low socioeconomic status.

Future Study

This study was a first step in the comprehensive assessment of the validity and usefulness of the ACG system in Canada. We found it holds much promise as a tool for describing case mix and illness levels in individuals, physicians' practices and populations. Further study of the usefulness of this system is planned, including analysis of its potential to predict next-year expenditures.

Summary by Cheryl Hamilton, based on the report: Measuring Morbidity in Populations: Performance of the Johns Hopkins Adjusted Clinical Group (ACG) Case-Mix Adjustment System in Manitoba *by Robert Reid, Leonard MacWilliam, Noralou Roos, Bogdan Bogdanovic and Charlyn Black.*

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