Case Mix Adjusted Nursing-home Reimbursement: A Critical Review of the Evidence

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НЕ INTERACTION OF STATE NURSING-HOME payment methods with regulations and market conditions creates incentives and disincentives to provide ready access, high quality, and low cost. Flat rate payment systems, for example, encourage nursing homes to avoid patients who require more than average nursing and aide care because they bring no more revenue than patients who require average or less than average care. Similarly, these payment systems encourage provision of minimal care because the costs of extra care may not be reimbursed. Case mix adjusted reimbursement was developed to mitigate the effects of some of these incentives by tailoring payment amount to patient care needs (Walsh 1979; Weissert et al. 1983; Smits 1984; Fries and Cooney 1985; and Grimaldi and Jazwiecki 1987).

Although the situation is always in flux, at least 11 states have adopted case mix adjustment and several others are in the process of doing so. A major Health Care Financing Administration (HCFA) demonstration project has been mounted to test its efficacy and cost for nursing-home reimbursement. Although details of its reimbursement system and evaluation design have yet to be specified, presumably the

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demonstration will assess the effects of case mix adjusted payments on access for heavy-care patients, quality indicators, costs, and other variables that are important to policy decisions. The demonstration operates in four states and uses data from two more (Rensselaer 1991).

In this article we review the current state of our knowledge about case mix adjusted reimbursement with the aim of providing interim answers to decision makers who may be considering adoption of a case mix adjusted system. It also identifies some of the important questions that designers and evaluators of the HCFA demonstration should consider.

Background

Whereas most authorities regard the market for privately paying nursing-home clients as at least imperfectly competitive, the market for Medicaid clients is widely assumed to be noncompetitive (Scanlon 1980; Nyman 1988a,b,c). Because until recently most states have used certificate-of-need laws to limit the bed supply to fewer Medicaid patients than could be filled by demand, providers face a sellers' market. This shortage of beds adds its own provider incentives, which in turn interact both with payment system incentives and with local private and Medicaid demand for beds.

Access is most restricted when beds are few, would-be clients are many, and the Medicaid payment system pays a flat rate. Facilities can pick and choose Medicaid clients. As a result, it may be more difficult for heavy-care Medicaid clients to find a bed (Nyman, Levey, and Rohrer 1987; Nyman 1989b).

Case mix adjusted reimbursement is intended to make facilities indifferent to patients' care needs when they seek admission. Furthermore, if costs of optimal care are included in the payment rate, the facility *should* be willing to spend adequately to provide appropriate care for the patients it admits. Finally, if the facility knows that it will be paid adequately for its next admission, it may be more willing to encourage an appropriate discharge on a timely basis. Advocates of case mix adjusted reimbursement expect it to improve several aspects of nursinghome care, including both access and quality.

However, imposing a case mix adjusted reimbursement system on a supply-constrained market may create its own set of disincentives. For example, Nyman (1990) suggests that simply covering the costs of each patient would be insufficient to ensure heavy-care access under conditions of excess demand. Because all patients would be equally profitable, it is not clear who would gain access (Nyman 1990). Nyman suggests that case mix adjusted reimbursements would be successful only if the rate were set so that heavier-care patients were more profitable than lighter-care patients. However, Nyman continues, setting more profitable rates for heavier-care patients creates an incentive for homes to let patients deteriorate.

Another concern is the validity of the premise that heavy-care payment adjustment is needed. Weissert and Cready (1988) found, in a one-city study of 1,100 hospital discharges to nursing homes, that Medicaid eligibility processing was a significantly more prevalent cause of delays in nursing-home admissions than patient heavy-care characteristics, despite bed supply shortages.

Quality problems also may not be solved by case mix adjustment. Nyman (1990) suggests that raising the Medicaid reimbursement rate under excess demand conditions leads to lower rather than higher quality care. An increase in quality that attracts an additional private patient results in the displacement of a Medicaid patient who could have been admitted with no quality increase at all. Hence, the closer Medicaid reimbursement is to private rates, the greater the opportunity cost of raising quality to attract private-pay patients, and the less likely a home will try to raise quality (Nyman 1990).

Furthermore, unless the case mix adjusted payment system is effective in requiring it, extra payment may not be spent on heavy-care patients admitted. The facility may just keep the extra money as profit, or to subsidize inefficiency or to offer better care to privately paying patients. Rehabilitation may be avoided in order to keep patients sick enough to qualify for higher payment. Finally, if based on services, case mix adjusted reimbursement creates incentives to give unneeded services or to falsely report services as having been delivered.

These problems are not unique to case mix adjusted reimbursement. For example, facility-specific systems pay facilities based upon staffing and other costs, which may encourage inefficiency and cross-subsidies of private patients. Case mix advocates argue that any system will have its problems.

Some case mix adjustment advocates also argue that because it was never intended as a quality-assurance or cost-containment mechanism, therefore it should not be judged against those criteria. At the same time, however, they point out that internal management can be improved and that case mix adjustment information systems can facilitate better planning. Case mix adjustment also can produce improved equity among providers, paying more money to facilities that admit a clientele that is more costly to care for. Finally, because the law of the land now requires assessment of every nursing-home resident, advocates argue that much of the cost of case mix adjustment is already being borne by the system and should no longer be attributed to case mix adjustment systems.

Hence these questions: (1) Do the advantages of case mix adjusted reimbursement outweigh its disadvantages? (2) Is case mix adjustment likely to result in a net improvement over existing and other alternative approaches?

Before reviewing the evidence on case mix adjustment, the following two sections describe case mix adjusted reimbursement systems and how they are used in several states.

Design Considerations in Case Mix Classification

Classification Measures

The whole idea of case mix classification is to categorize patients into subgroups whose costs of care are homogeneous. Subgroups should also be defined by clinical significance so that providers recognize clinical groupings rather than lumping dissimilar patients together only for similarity in costs of care.

Both indirect and direct measures are used to aggregate patients into groups whose costs of care are thought to be homogeneous (Grimaldi and Jazwiecki 1987). Indirect measures include variables such as level of care (e.g., skilled versus intermediate) and facility characteristics such as bed size, ownership, and payer source mix (e.g., Medicare versus non-Medicare). Direct measures include variables such as functional level, medical condition, and services required. The most commonly used measure of functional status in case mix systems is Katz's Activities of Daily Living (ADL) Index (Katz et al. 1963), although various disability scales have been used in patient classification, including the Barthel Index (Mahoney and Barthel 1965), the Rapid Disability Scale (Linn 1967), and the Kenny Self Care Evaluation (Shoening et al. 1965). Quantity and type of services or procedures the patient requires are sometimes used to measure patient severity (Arling et al. 1987). However, use of services rather than patient characteristics introduces perverse incentives to increase these services unnecessarily. If staff assessors declare that a patient needs a service, assignment to a higher reimbursement subgroup becomes automatic. Examples of mistakes include "monitoring of intake/output of fluids," which was included in an early version of the Resource Utilization Group (RUG) system developed by Fries and Cooney (1985). The variable acted as an indicator of heavycare needs (and higher payment categories), but was easy to manipulate because facilities were able to place patients on fluid monitoring and cause no harm to them (Schneider et al. 1988). To avoid such "gaming of the system," independent variables should be objectively and reliably measured and easy to collect (Arling et al. 1987; Schneider et al. 1988).

Reassessment of status is also a concern. A system that is highly responsive in adjusting payment to changing health status may result in poor quality if payment drops as patients recover. Methods to counter this perverse incentive include prolonged or indefinite payment at the higher classification rate despite reclassification of the rehabilitated patient, or segregation of patients who have rehabilitative potential from those who do not (Smits 1984). "Bracket creep," or fictitiously assigning to patients characteristics that would move them to higher payment groups, might be neutralized by using prevalence rates of heavy-care indicators to trigger quality audits. However, whether quality audits can work with case-mix-change triggers sensitive enough to stop "bracket creep" has not been tested empirically and would be difficult to enforce if the sheer number of facilities engaged in this practice hides it from scrutiny because there is no obvious outlier.

Measuring Costs

These direct and indirect measures of resource use can be thought of as predictors of variation in costs. System design must also address the issue of how to define and measure costs. Costs are usually measured per day, but a more global measure would be cost of an episode of care, however defined. All case mix adjusted reimbursement systems now in place use estimated cost per day, rather than any type of predicted episode cost. One concern is that this may cause the opportunity to encourage shorter, more effective stays to be lost. Regardless of the time period covered, all systems define costs to include some combination of nursing and aide time, which has been found to account for a large portion of total nursing-home costs. The Resource Utilization Group-Medicare (RUG-T18) scale includes cost of nursing care, rehabilitative therapy, and social services (Fries et al. 1989). Cameron (1985) developed a system that incorporated nursing care, supplies, dietary services, drugs, linen, and other ancillary services. Weissert and colleagues (1983) included costs for supplies uniquely associated with certain patient classifications (e.g., formula for tube-fed patients), as well as direct patient care costs, and allocated staff costs such as time the nurse spends setting up the medication tray before administering medications.

Measurement of cost, such as nursing and other staff time, can be approached in different ways, including direct observation (Weissert et al. 1983), staff self-report (Arling et al. 1987; Schneider et al. 1988; and Fries et al. 1989), expert estimates (Cameron 1985), and cost function studies (Scanlon and Weissert 1983), in which costs are regressed on case mix measures, facility characteristics, and other predictors to obtain coefficients for case mix variables. Weissert and colleagues (1983) mounted an extensive stop-watch observation of nurses caring for sampled patients as well as nurses' direct-care and other time to measure how costs varied with patient characteristics and the ratio of direct-care time to allocated time.

Methods of Classification

Once costs are reported, they must be used to classify patients. A classification or grouping method uses statistical techniques like analysis of variance to form groups of patients whose individual characteristics make them similar in their resource use (Schneider et al. 1988). An index system (Weissert et al. 1983) and a clustering system (Schneider et al. 1988; and Fries et al. 1989) are the two primary methods of creating classifications. An index or rating system assigns a cost estimate to each of the selected direct or indirect measures, which are then summed to form a total rating. Patients with similar ratings are assigned to payment subgroups. For clustering systems, a statistical technique sometimes used with its associated software is AUTOGRP (AUTOmatic GRouPing system) (Mills et al. 1976). It is an interactive implementation of AID (automatic interactions detection) (Morgan and Sonquist 1963) and was used in the formation of Medicare hospital Diagnosis Related Groups (DRGs). The full set of data points is repeatedly split into subgroups, which are homogeneous in their resource use. They are based on levels of predictors (patient characteristics) and are performed in order to maximize prediction of resource cost (Schneider et al. 1988). Splits are continued until the analyst is satisfied that additional splits will not improve prediction enough to warrant formation of additional groups; too many groups produce cells with samples too small to be statistically stable. It is also desirable to create a system with a minimal number of groups (while explaining a large percentage of variance) to reduce confusion and administrative costs (Arling et al. 1987).

The classification system should be able to distinguish the relative intensity of care needed by heavy-care patients (Fries and Cooney 1985). Distribution of patients among the categories may be uneven. The sample size should be large enough to ensure accuracy of point estimates for group means even in the smallest terminal group (Arling, Zimmerman, and Updike 1989). In the second version of the RUG system (RUG-II), 54 percent of the patients were clustered into the two largest terminal groups, and 22 percent were clustered into the smallest ten terminal groups (Schneider et al. 1988). In the RUG-T18 (Medicare patients only) system of classification, three of the terminal groups had no patients classified into them (Fries et al. 1989).

Homogeneity of the levels of a classification system can be expressed by computing the coefficient of variation (i.e., the standard deviation divided by the mean). It expresses the "tightness" of the values within a level. A coefficient of variation of less than 0.5 indicates that the distribution is acceptably homogeneous, according to some experts.

Table 1 briefly describes case mix classification systems reported in the published literature as well as the third version of the RUG system (RUG-III) developed for the HCFA case mix demonstration project. Some of these systems were used in one or several states, others were demonstration projects, and the remainder have been proposed in the literature only. The table shows that the systems appear to be relatively successful in explaining resource consumption, ranging from 38.4 to 68.5 percent of the variance. Although the studies take a variety of approaches to measuring resource consumption (Delphi technique versus self-reports versus observation), all have focused on the intensity of nursing resource use over a standard time interval (Fries and Cooney 1985). All include, at a minimum, functional dependency and special

	Summary	of Eight Case Mix Classific	ation Systems	
		Pa	urt A	
Study	Cameron 1985	Arling 1987	Arling 1989	RUG-III (1991 Preliminary)
Sample	1,151 patients, over- representing heavy- care patients	558 patients, represen- tative of VA LTC patients	410 patients, stratified by level of care	6,660 resident assess- ments
Number of facilities	23 LTC facilities in CA, hospital based and free standing	12 VA LTC facilities stratified on facility characteristics; >40% Medicaid	56 facilities in WI; proportionate sam- pling from facilities	Approximately 175 fa- cilities in KS, ME, MS, SD, TX, NE
Sampling period	30 days	52 hours in 8 days	7 days	Not available
Dependent variable	Cost of providing direct-care services to patients	Nursing time weighted for skill mix, standard- ized for facility	Wage-weighted direct staff time	Facilities' direct-care time
Independent variables	Neurological impair- ment, catheter, tube feed, special treat- ment, mobility ADL- walk and feed	Specialized care, catheter/ostomy, ADL scale, cating/feeding variable	Nursing requirements, (special, routine, and intense)–then split special and routine on ADL level; highest ADL split on behav- ioral problems	Patient typology: 1. Rehabilitation 2. Special care 3. Clinically complex 4. Impaired cognitively/ behavior problem 5. Physical functioning; subdivided by ADL index, extra nursing

TABLE 1 1ary of Eight Case Mix Classification

462

Method	AUTOGRP-AID clustering	AID clustering	AID clustering	Not available
Groups	13	6	10	43
Comprehensiveness of measure	High – included nurs- ing, supplies, ancillary care, etc.	Low – only nursing included	Somewhat – nursing care plus other staff time; no indirect costs	High – nursing time plus other staff time, therapies
Variance explained	68.5%	53%	48%	38.4% for Medicare- certified facilities; 56.9% for hospital- based facilities; 51.6% for Medicare hospital- based facilities
Validation	Used expert panel to estimate standard times per service – did not validate	Nurse self-reports, val- idated by concurrent work sampling, cor- related highly	Validated every resi- dent's results	Direct-care minutes per resident day cal- culated based on a percentage of RN, LPN, and aide FTE
Limitations	Validity and meaning of standard time esti- mates	Generalizability and small sample size	Only nursing direct time included – no indirect; small sample	Few states; screening of facilities for "good" ones with high staff- ing levels <i>continued</i>

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		Pa	ur B	
Study	Fries and Cooney 1985	RUG-II	RUG-T18	Weissert et al. 1983
Sample	All 1,469 patients in the selected facilities	All 3,427 residents in selected units	2,272 Medicare pa- tients	3,800 observations
Number of facilities	76 SNFs in two counties in CT	52 LTC facilities in NY – stratified by fa- cility characteristics	38 SNFs in NY, PA IL, FL, CA stratified by facility character- istics	36 proprietary SNFs in San Diego
Sampling períod Dependent variable	3 days Estimate of intensity of facility staff time (1-5 scale) by nurses,	24 hours Wage-weighted facility staff time (RN, LPN, aide, and orderly)	During 3-month period Per diem resource cost (nursing care, PT, OT, ST, social services)	During 3-month period Nursing, aide, and material costs
Independent variable	atdes ADL (dress, ambulate, feed), intake/output of fluids, reason for placement	Patient typology: 1. Heavy rehabilitation 2. Special care 3. Complex clinically 4 Severe behavioral	RUG-11 patient typo- logies with heavy re- habilitation split into PT, OT, and ST cate- pories and further split	Divided by ADL level and further divided by presence of specific conditions (tube feed- ing. decubitus, turning
		 problems S. Reduced functioning; further subdivided by an ADL index 	by ADL index	and positioning, skin care, skilled procedures, maintenance, rehabili- tation, observation)

TABLE 1 continued

464

Method	AUTOGRP-AID	AUTOGRP-AID clustering	AUTOGRP-AID clustering	Observation of staff time allocations
Groups	6	16	20	14
Comprehensiveness of measure	Low—only nursing included	Somewhat – nursing time plus other staff time	Somewhat – nursing time plus other staff time	High nursing, aide, and materials for ADL and special care
Variance explained	37.8%	53%	55.5%	Not available
Validation	Validated estimates with direct observation measures for one-third of patients	Data quality review, training, pretesting, 10% of residents re- assessed, plus other	Used a "variety of measures to ensure accuracy"	All estimates based upon observation and timing of nurses and patients
Limitations	Weak dependent vari- able, some of the IV could be "gamed"	measures Ancillaries and supply costs omitted from the dependent variable	Some categories had no patients classified into them	High-cost categories selected a priori

Abbreviations: ADL, activity of daily living; AID, automatic interactions detection; AUTOGRP, AUTOmatic GRouPing system; FTE, full-time employee; IV, intravenous; LPN, licensed professional nurse; LTC, long-term care; OT, occupational therapy; PT, physical therapy; RN, registered nurse; RUG, resource utilization group; SNF, skilled nursing facility; ST, speech therapy.

care needs as predictors. Cameron's system also employs neurological impairment and medical condition. RUG-II, RUG-T18, and RUG-III include medical conditions and behavioral problems, to which RUG-T18 adds therapies and RUG-III adds depression and nursing rehabilitation.

Although their predictors were similar, the researchers did not use them in the same way to split their patients into groups. Cameron is the only one to choose severe neurological impairment as the first split, claiming that patients with severe neurological impairments may be considered clinically distinct from other long-term-care (LTC) patients. Fries and Cooney (1985) chose to discriminate the first seven of the nine RUG groups solely by functional dependency. This approach was later refined by first dividing patients into clinical categories and then subdividing them by functional status in RUG-II and RUG-T18. Similarly, Arling and colleagues (1987) split patients first by care needs, then by functional status, and later (1989) by a third tier, which was divided depending on the presence or absence of behavioral problems.

Arling, Zimmerman, and Updike (1989) asserted that the most troublesome dimension of case mix studies has been the treatment of psychobehavioral conditions. Phillips and Hawes (1992) similarly contend that RUG-II and other case mix systems do not recognize the importance of cognitive functioning in determining resource needs. In fact, these dimensions are largely ignored by many classifications. Those that do focus on psychobehavioral difficulties include the problems that are disruptive or harmful to self or others. Arling, Zimmerman, and Updike (1989) surmised that because the classification studies attempted to measure care provided to nursing-home residents, their results were influenced by current practices in the nursing-home industry. Some argue, however, that many nursing homes give insufficient attention to psychosocial needs and assign higher priority to behavior control, with chemical and/or physical restraints, than to therapeutic interventions. More passive psychobehavioral problems, such as depression or emotional withdrawal and cognitive disorders, are not considered indicative of greater resource use. However, Phillips and Hawes's (1992) study of Texas case mix data found that patients with the greatest cognitive problems received the most care, although it was mostly aide rather than nursing care. They concluded that because resource use was not well predicted for cognitively impaired people, nursing homes would not receive adequate reimbursement under RUG-II and would be reluctant to admit them.

466

In their new version of resource utilization groups, RUG-III, Fries and colleagues evaluate cognitive dysfunctions affecting short-term memory, decision making, and orientation. The new groupings form one of the new main splits on cognitive impairment and behavior problems and a third-tier split on depression. Among the highest-cost categories (i.e., rehabilitation and special care), however, care needs are said to be sufficiently well explained by physical impairments, so that additional subgroups based upon mental impairments are not needed.

Despite design differences, an important reality documented by Fries (1990) is that the various systems tend to be similar in their *relative* resource use classifications because most of the variance is explained by the measures of ADLs included in all systems. Some argue that this allows system designers considerable flexibility. Others say that, when choosing among systems, it gives more weight to the subtle differences in subgroups *after* functional dependency splits. Still others claim that such similarity makes the amount of effort that has gone into case mix classification seem like overkill.

The San Diego Nursing Home Incentive Reimbursement Experiment funded by the National Center for Health Services Research (now the Agency for Health Care Policy and Research) (Weissert et al. 1983) was unique in several respects. A controlled experimental design was implemented in 1980-83 in 36 proprietary nursing homes in San Diego county to assess effects of paying treatment group homes case mix adjustments based upon 14 categories of ADL and special care needs. Facilities were also paid bonuses if they achieved one or more of eight specific outcome goals, and a bonus for a discharge that lasted 90 days. Payment rates reflected wage-adjusted costs of nursing and aide time plus ancillaries such as tube-feeding formula.

One of the objectives of the HCFA demonstration using RUG-III is to develop quality outcomes to link with the payment systems. All four states participating in the demonstration (Kansas, Maine, Mississippi, and South Dakota) will implement a common core quality assurance system consisting of norms for acceptable treatment of resident outcomes. The details have yet to be worked out, and states may add additional mechanisms. Payment systems are also expected to vary from state to state and possibly will be adjusted to reflect variation in market conditions. Because the evaluation design has not yet been drafted, the nature of comparison states and systems, if any are to be used, has not been specified.

Another HCFA initiative, the national Minimum Data Set (MDS), while not a case mix classification system, is nonetheless of special relevance because it provides an important building block for case mix classification and payment adjustment. Mandated by Congress in the Omnibus Reconciliation Act of 1987, and recommended by the Institute of Medicine (1986), it is a tool that must be used to assess all nursing-home patients upon admission, annually and at the time of "significant change" in the resident's status (Morris et al. 1990). Such a tool would greatly reduce the administrative costs of implementing a case mix adjusted system. By design, the tool includes many or all of the items used by the leading case mix adjustment systems. One of its drawbacks is its reliance on nursing-home staff to collect the material; such staff tends to experience high turnover and to vary in reliability. Another drawback is that, to date, the HCFA has not chosen either to require the data to be converted from its hard copy form or to insist on its availability for research and evaluative purposes except at the discretion of the data-gathering facility. Nonetheless, the potential of the MDS to facilitate implementation of case mix adjustment is profound.

State Case Mix Adjusted Reimbursement Systems

Tables 2 and 3 compare the case mix adjusted reimbursement systems of 11 states (Illinois, Maryland, Massachusetts, Minnesota, New York, North Dakota, Ohio, Pennsylvania, Texas, Virginia, and West Virginia). Comparisons are made on a number of aspects, including patient classification, data collection, quality assurance, and the reimbursement basis for nursing and nonnursing care and administrative and routine costs. Material for Massachusetts, North Dakota, Pennsylvania, Texas, and Virginia is based upon telephone interviews and follow-up correspondence with knowledgeable state representatives. Material for Illinois, Maryland, Minnesota, New York, Ohio, and West Virginia was drawn largely from the report by P. A. Butler and R. E. Schlenker, Administering Nursing Home Case Mix Systems (1988), which was based primarily on site visits and qualitative information. Although a number of other states (Arkansas, California, Connecticut, Delaware, Georgia, Iowa, Kentucky, Louisiana, Nebraska, Vermont, and Washington) were in the process of developing or considering a case mix reimbursement system at the time of our data collection activities, the details of their Text continues on p. 476

	CO	itate Case Mix Classification Systems	
State	Categories	Data collection	Quality assurance
XT	11 categories plus 1 default category; determined by TILE calculations based on functional ability and medical conditions.	Facilities conduct case mix resident assessments every 180 days.	State conducts targeted reviews of resident assessments.
QN	16; similar to RUG-II categories.	Facilities conduct resident assessments at admission and every 6 months; facilitywide reviews are conducted semiannually.	State audits facility assessments.
MA	10 categories, defined by the number of minutes of care.	Facilities conduct assessments using 1-page Management Minutes Ques- tionnaire, which gathers data on ADLs, nursing interventions, etc.	State Division of Health Care Quality reviews assessments.
٨٧	4 classes based on composite ADL score (6 ADLs) ranging from 0–12; class $A = 0-6$, $B = 7-12$, $C = >9$ plus certain service needs; and D for exceptionally heavy care.	Facilities conduct assessments at ad- mission, twice per year, and after a lengthy hospital stay.	State agency employees visit different homes monthly and sample to mea- sure accuracy.
			continued

TABLE 2

		TABLE 2 continued	
State	Categories	Data collection	Quality assurance
ΡA	16 categories; based on RUG-II.	Data will be drawn from the MDS.	The state will conduct targeted reviews.
П	Patients grouped by 6 resident func- tioning categories, 4 kinds of training in ADL independence, and 17 types	Department of Public Aid nurses assess patients semiannually with the state inspection of care, using data	Increased checks by the state as to whether charted services were needed and received.
	of services. Itme values are assigned to each category and multiplied by wage rates.	from patient records, observation, and staff interviews.	
WV	Based on dependence in 5 ADLs and need for 10 specific services.	Facilities provide patient assessment data as often as monthly.	Audits are conducted semianually in conjunction with IOC (includes checks on charted services).
НО	Based on 5 dependency characteristics and need for 9 services. Six more therapy services can be reimbursed on a "habilitation plan" Frequency	State conducts assessments 3 times per year in conjunction with IOC.	Assessments are based on charts; dis- crepancies between chart data and res- ident observation can be referred to the licensing agency. Medicaid fraud
	and time required for each service are multiplied by each other and then wages to determine costs.	-	prosecutors, or peer review.
MD	4 categories based on ADLs and need for decubitus care, tube feeding, or turning and positioning. Added pay- ment if any of 10 special services are	Facilities conduct assessments using the Maryland Appraisal of Patient Progress. Reports are submitted to the state monthly.	The state PRO audits records quarterly as part of IOC. Audits are based on chart reviews and observation.

470

	for the services. Facilities receive in- centive payments for residents who fall into the 3 highest case-mix groups.		
NУ	16 RUG categories.	Facilities assess all patients twice a year and assess new admissions quarterly. Staff nurses with state-approved train- ing can conduct assessments.	The state PRO performs audits 1 or 2 times a year. Facilities found to conduct inadequate assessments have their assessments done by outside agencies.
MN	11 groups based on ADLs and be- havioral, special nursing, and neuro- muscular problems.	Facilities conduct assessments once per year.	Department of Health assesses all residents once per year in conjunction with IOC.
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needed. Prices based on time values

Abbreviations: ADL, activity of daily living; IOC, inspection of care; MDS, minimum data set; PRO, professional review organization; RUG, resource utilization group; TILE, Texas Index for Level of Effort.

		Features of the States' Reir	nbursement Systems	
State	Reimbursement basis for nursing care	Basis for rate increase	Nonnursing care, routine, administrative costs	Capital
XT	Prospective, resident-level system. Medicaid reimburses for 3 cost centers: patient- care costs that are case-mix adjusted, fixed capital- asset use fee, and general administration and dietary.	Annual cost reports; wage and price inflation; changes in regulations and standards; modifications of rate meth- odology.	General administration and dictary payments are the same for all facilities.	Capital reimbursement is the same for all homes.
Q	Prospective, resident-level system. Each resident brings a 4-part payment: property, indirect services, direct services other than nursing care, and nursing care. Nursing-care costs are case mix adjusted.	Last year's costs adjusted for inflation.	Indirect services and direct services other than nursing care are reimbursed at the same rate for all facilities.	Property is reimbursed at the same rate for all homes.
МА	Prospective system; patient care costs are case mix adjusted.	Cost-of-living adjustment.	Operating costs have a sep- arate ceiling: 84% ceiling on incentive-based costs such as phone, clerical; 90% ceiling on nonincentive costs, such as quality of	An allowable basis for cost of land, building, and im- provements; straight-line de- preciation for fixed costs; return on equity: nonprofits are reimbursed depending

TABLE 3 of the States' Reimbursemer

472

on percent of public pa- tients; for-profits are reim- bursed in full.	Retrospective facility-level system subject to limitations on construction costs and interest rate.	Facility-specific rate based on fair rental value.	Flat fate median cost for homes grouped by age of home and geographic area.	Fair rental approach.	continued
care, and costs out of con- trol of home (e.g., salary tax).	Prospective, facility-level system based upon allowable costs subject to indirect pa- tient care operating peer group ceilings.	Administrative costs reim- bursed at a median level.	Projected median costs for facilities grouped by geo- graphic area. Efficiency in- centives are possible.	Prospective reimbursement based on the lower of the previous year's actual costs or ceilings determined for 7 categories of facilities. Efficiency incentives are	
	Facilities' annual cost re- ports.	Most current cost report available indexed for inflation.	Consumer price index and historical cost trends for state nursing homes.	Average nursing times for the case mix groups are multiplied by nursing wages adjusted by 3 bed size categories. The lower of the case mix ceiling or)
	Prospective, facility-level system. Case mix adjust- ment is measured by "pa- tient intensity" system.	Prospective; patient care costs and other patient costs are case mix adjusted.	Prospective, facility-level system. Previous reporting period costs are adjusted by a facility-level case mix index.	Prospective, facility-level system. Case mix informa- tion is used to determine rate ceilings for nursing care in specific facilities.	

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Case Mix Adjusted Nursing-home Reimbursement

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State	Reimbursement basis for nursing care	Basis for rate increase	Nonnursing care, routine, administrative costs	Capital
		actual costs is used to de- termine the home's nursing- care rate component for the next year (adjusted for in- flation).	available. Medical records, taxes, fringe, and insurance are paid up to the 90th percentile of costs.	
НО	Retrospective, facility specific. Actual costs are paid up to a ceiling, based on facilities' case mix and state average wages.	Interim payments based on last year's costs trended for- ward for inflation, then checked against actual costs, and paid up to a ceiling.	Costs are paid up to a ceil- ing (67th percentile in 1987) with efficiency incentives possible. Taxes and utility costs are fully reimbursed.	Retrospective, paid up to a ceiling based on age of facility. A return on equity is paid to for-profit homes.
MD	Prospective, resident-level per diem prices are paid independent of costs. Prices are determined by 4 ADL categories and the need for 10 special services. Service prices are set prospectively each year and adjusted for 3 geographic areas.	Based on previous year's costs.	Paid up to a ceiling based on regional groupings, with efficiency incentives paid to homes with costs below ceiling.	Net capital value rental approach, plus actual costs of interest, insurance and tax. Return on equity based on ownership type for profit and nonprofit.

TABLE 3 continued

УY	Prospective, facility-based	Based on historical costs ad-	A ceiling of 102.5% of	Payments include deprecia-
	system. Patient care pay-	justed for inflation.	mean costs and a floor of	tion and interest expenses
	ments are case mix adjusted		97.5% of mean costs are	plus a return on equity for
	by the facility's average case		set on indirect care costs.	proprietary homes.
	mix index. A ceiling is set		Other operating costs are	
	at 105% of the state's mean		reimbursed on a cost basis.	
	costs and a floor of 95% of			
	state mean costs.			
MN	Prospective, resident level	Based on previous year's	Nonnursing patient care	Fair rental value.
	system. The facility's aver-	expenditures adjusted for	costs are combined with	
	age per diem cost is used	inflation.	nursing costs and paid to	
	as a base that is adjusted		a ceiling based on area-	
	by each resident's case mix		adjusted wage levels. Op-	
	category weight. A ceiling		erating costs unrelated to	
	is set for patient care per		patient care are paid in the	
	diem payments based on		same way, but with effi-	
	costs in 3 regions of the		ciency incentives.	
	state. Homes are paid			
	actual costs up to the			
	ceilings.			

systems were too sketchy to merit description. Similarly, the four states participating in the HCFA demonstration are not discussed because the details of their case mix systems have not been worked out yet.

The tables suggest some general observations:

- ADLs and medical conditions and/or the need for specific services are used as the predictors for classification in most of the systems (Illinois, Maryland, Minnesota, New York, North Dakota, Ohio, Pennsylvania, Texas, Virginia, and West Virginia).
- The dependent variable, resource use, is often determined by multiplying nursing times by wages. In some states, such as Illinois and Maryland, wages are adjusted by substate geographic region.
- The number of patient groupings ranges among the states' systems from 4 (Virginia) to 16 (New York, North Dakota, and Pennsylvania).
- Resident assessments, which can be financially prohibitive, are conducted in eight of the states (Maryland, Massachusetts, Minnesota, New York, North Dakota, Texas, Virginia, and West Virginia) primarily by the facilities.
- In those states in which facilities conduct assessments, the state or a contractor performs audits of facility assessments to ensure the integrity of the data.

Five of the 11 states (Illinois, New York, Ohio, Virginia, and West Virginia) employ a "facility-based" case mix adjusted reimbursement system. In such a system, the case mix indices of the assessed residents are averaged to arrive at one case mix index for the facility. Each resident brings the same case mix adjusted level of payment to the facility. This contrasts with the "resident-level" case mix adjusted reimbursement system used by the other six states. In a resident-level system, assessment of each resident is used to determine the payment that the facility receives for providing services to that resident, up to a ceiling.

"Facility-based" case mix adjusted reimbursement is administratively easier to implement because it is tied to an initial assessment of all residents (and periodic reassessments) rather than ongoing individual resident assessments. However facility-based case mix systems may create disincentives to admit patients requiring resources above what is reimbursed according to the facility's case mix index. Yet, Willemain (1980) has argued that facility-based classification is superior because assessment errors resulting from unreliable measurement and intervening passage of time offset each other from patient to patient and assure accuracy on average.

Nonnursing care costs, administrative costs, and routine costs are most often paid to nursing-home facilities irrespective of case mix adjusted reimbursement, although some states pay for case mix adjusted nonnursing costs such as activities, social services, and therapies.

Evaluation of Specific Systems

Studies of the effects and costs of case mix adjusted reimbursement have been scant and vary widely in their rigor. Those published to date, covering the systems in Illinois, Maryland, Minnesota, New York, Ohio, and West Virginia, are summarized in table 4. Unevenness in extent and detail of findings is unavoidable given the variation in completeness of evaluative studies available on the various states' systems.

Some salient points from the studies include:

Illinois. Holahan (1984) reported that average patient impairment scores in Illinois increased by 7.5 percent between 1978 and 1980, suggesting that heavy-care access increased with the case mix reimbursement system. In addition, Butler and Schlenker (1988) reported that six months after the introduction of payment for decubitus prevention, the incidence of decubitus fell 38 percent following several years of stability. Unfortunately, the researchers did not state the number of cases either before or after the incidence drop. One may surmise that the number was small. Butler and Schlenker (1988) also reported that state agency officials observed that financial incentives seemed to gradually encourage facilities to provide more restorative care to patients. Of course, state agency officials had a vested interest in the success of the case mix system. However, other evidence in support of their claim, or contrary to it, is lacking.

Maryland. Feder and Scanlon (1989) found evidence of increased case mix complexity after the Maryland system – a modified version of the San Diego system – was installed. An ADL index increased 6 percent between July 1982, before the system was implemented, and July 1984. A special service index increased 10 percent between January 1983 and July 1984. However, the data may have been influenced by the fact that they came from the same patient records that payment levels were based on during the time the new system was in effect. Because records did not affect payment during the baseline, increased reporting may or may not have merely reflected incentives for more record keeping rather than

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Evaluators	System	Dates	Research design and analyses	Data
Weissert, Scanlon, Wan, & Skinner (1983)	San Diego Experiment	11/80-4/83	Controlled experiment. Random assignment of 36 proprietary nursing homes (who agreed to participate) in San Diego to treatment and control groups. Only the treatment groups re-	Patient assessment data, gathered each 90 days by a team of research nurses. Assessment began with 6- month baseline.
Meiners, Thorburn, Roddy, & Jones (1985)	San Diego Experiment	11/80-4/83	ceived bonuses. Pre- and posttest compari- sons between control and treatment groups (χ^2 and <i>i</i> -tests), using data from the Weissert et al. experiment. Studied change in heavy- care admissions resulting from incentive payments.	Case mix of admissions at baseline and 2 subsequent periods (mos. 7–12 and 13–18).

TABLE 4 Research Design of Evaluative Studies of Case Mix Adjusted Systems

Thorburn & Meiners (1986)	San Diego Experiment	11/80-4/83	Bivariate comparisons of changes in 8 specific out- comes, between treatment and control facilities, using Weissert et al. demonstra- tion data.	Patient assessments from treatment and control groups. Facility nominees for outcome bonuses.
Jones & Meiners (1986)	San Diego Experiment	11/80-4/83	Bivariate comparison of dis- charge rates between experi- mental and control facilities and study of the recidivism rate of treatment discharges.	Patient data from treatment and control groups; follow- up of discharged treatment patients.
Holahan & Cohen (1987)	CA, CT, GA, IL, MA, MN, NY, WVª	1978-80	Nonrandomized, retrospec- tive study to determine how reimbursement methods re- late to quality of care as measured by resource allo- cation and how access is af- fected by reimbursement.	Cost reports submitted by 3,300 nursing homes in 8 states for 3 years and re- ports from 1,500 homes in 10 states in same period.
Holahan (1984)	IL, MD, WV, OH	1978-81	Multiple regression tech- nique to estimate standard economic cost functions de- signed to yield relationships between nursing cost and case mix. Cross-sectional estimates were made for 2 time periods each year.	Cost reports from 37 homes in WV (1979 & 1981) and 374 homes in IL (1978 & 1980). Used facility indices of patient impairment. <i>continued</i>

Evaluators	System	Dates	Research design and analyses	Data
Feder & Scanlon (1989)	Maryland	7/82-7/84	Compared characteristics of nursing-home patients be- fore and after case mix ad- justed reimbursement was implemented. Measured rate of change in nursing re- sources relative to inflation and to other changes in	Data on nursing-home pa- tients, costs, staffing, and interviews with nursing- home administrators, state officials, assessors, and hospital discharge planners plus hospital discharge data.
Butler & Schlenker (1988)	IL, WV, OH, MD, MN, NY	1983-88	ber of case mix systems.	Site visits with reps. of Medicaid, PROs, nursing homes, consumer advocates, legislative staff. Literature review of nursing-home te- imbursement and quality assurance.

TABLE 4 continued

amples of 135 nursing omes and 25-30 patients com each home. Patient- evel data collected using andard protocols. Follow-up ample to obtain changes ver a 1-year period. ARF or area characteristics.	ost data came from facility ost reports; case mix came rom the state's resident ssessment files.	lth resources developed by the
Comparative statistical S analysis. Bivariate compari- sons of case mix, facility ff specific, and class rate pay- ment systems on a number st of variables: case mix, rate st of catheterization, prevalence o of skin ulcers, use of drugs, ff and use of restraints. Quali- tative case studies.	Multivariate, 1985–86 im- plementation comparisons of co a 194-facility panel selected fit randomly with stratification at to reflect statewide patterns of ownership, size, location, and costs in relation to re- imbursement cost ceilings.	e U.S. health work force and other hea
1983-88	1985-86	ounty description of th
MD, OH, WV	λ	inia are case mix states. source File (a county-by-c DRO professional review
Schlenker et al. (1988)	Thorpe et al. (1991)	^a Only Illinois and West Virg Abbreviations: ARF, Area Res Bureau of Health Manomed

actual case mix changes. (Because Maryland had a state hospital rate payment system in place prior to implementation of Medicare's prospective payment system for hospitals, results were probably not confounded by the hospital payment system.)

Researchers found that the more Medicaid patients a home served, the more it altered its case mix in response to the new system. The majority (80.7 percent) of homes with more than 80 percent of Medicaid patients increased their case mix, compared with about half the homes that had fewer Medicaid patients (Feder and Scanlon 1989). This finding, however, may be an effect of small sample size and the data-driven choice of the 80 percent cut-point.

A number of providers perceived that access to nursing homes declined for light-care patients and that community care was not necessarily provided in its place. Yet, lack of data precluded researchers from empirically testing this claim (Feder and Scanlon 1989). This anecdotal evidence suggests that heavy-care access increased, perhaps to the detriment of some light-care access.

Hospital discharge planners responding to a telephone survey reported that the new system made it easier to place heavy-care patients. State officials claimed, but did not substantiate, reduced hospital discharge delays worth \$2.5 million in savings in the first year of implementation (Butler and Schlenker 1988). These savings would not be calculated in the same way during the post-DRG period, however, even if validated.

Consequences for quality were mixed. Feder and Scanlon (1989) found no evidence that extra payments were used for additional staff. Yet, Schlenker and colleagues (1988) found that higher payments for turning and positioning and nonpayment for preventable decubitus ulcers were associated with a lower ulcer prevalence in Maryland, at least compared with the other case mix states in their study (Ohio and West Virginia).

Maryland was successful in initiating patient assessment at relatively low cost. The low cost reflected integration with preexisting administrative practices and investment in education and training by both the state and the nursing-home industry. Professional review organizations (PROs) were contracted to do assessments, incorporating them into ongoing patient review activities (Feder and Scanlon 1989). Implementation was further facilitated by recently enacted licensing requirements for uniform patient records. *Minnesota.* Few studies address Minnesota's case mix system. Butler and Schlenker (1988) report that light-care patients sometimes faced difficulty getting admitted to nursing homes. To encourage heavy-care access and discourage light-care access, Minnesota's rates for the lightestcare category pay for fewer nursing hours than the minimum required under licensing standards. On quality, Butler and Schlenker (1988) report that the bonus for increased resident functioning apparently has not encouraged more restorative care.

The costs of implementing the system were high. The Department of Health increased its budget from one to two million dollars over a oneyear period to accommodate new assessment and audit functions, despite long experience with assessing its nursing-home population (Butler and Schlenker 1988).

New York. A document issued by New York State's Department of Health reported that, in the first six months, overall nursing-home case mix increased 11 percent because of admissions of residents with greater care needs. In addition, light-care admissions reportedly decreased (Butler and Schlenker 1988).

With regard to quality, the Department of Health reported that the per facility average number of licensing and certification deficiencies declined from 1985 to 1986, perhaps because the RUG system required documentation to be more detailed than it had been (Butler and Schlenker 1988). Because they came from the state's Department of Health, reports of the results of New York State's case mix initiative may be biased.

On the negative side, New York nursing homes did not increase staff commensurate with their increase in case mix. In addition, researchers found no evidence that the bonus for increased resident functioning encouraged more restorative care (Butler and Schlenker 1988).

An objective of New York's implementation of a case mix adjusted reimbursement system was that it be budget neutral. To limit the impact of case mix reimbursement on the state's Medicaid budget, the facilities conducted patient assessments and paid the cost of training nurse assessors. PROs were contracted to conduct audits.

Butler and Schlenker (1988) reported that the case mix system led to the equalization of payments across New York state nursing homes commensurate with resident needs and services.

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More recently, Thorpe, Gertler, and Goldman (1991) found that New York's RUG-II system produced a significant redistribution of patients across RUG-II categories from 1985 to 1986. The number of light-care patients decreased, and the number of heavy-care patients increased. Change was greatest in skilled facilities where lightest-care patients dropped by nearly half, and overall case mix increased by 8.5 percent in facilities near the reimbursement ceiling, and 6 percent in facilities not so near the ceiling. Health-related facilities' case mix complexity also increased, although less dramatically, by about 3 percent. Changes did not differ by ownership, size, or proportion of patients subsidized by Medicaid. Costs grew by 10.2 percent, varying by several facility characteristics. Costs of facilities with more Medicaid patients grew less than average, whereas costs of facilities that were well below the ceilings grew more than average. Outcome effects were not addressed, leading the authors to conclude that the relative superiority of case mix adjustment versus facility-specific payment remains an open question for further research.

Ohio. Officials estimated that administering case mix reimbursement tripled the administrative costs from Ohio's former nursing-home rate system (Butler and Schlenker 1988). Whereas Ohio had planned to increase expenditures, officials wanted to ensure that such increases were channeled into patient care. Yet the success of the program seems to be mixed. Researchers report that secondary sources support the general impression that access for heavy-care patients in Ohio improved with the implementation of a case mix system. However, Butler and Schlenker (1988) found that payment incentives designed to encourage therapy did not appear to lead to greater provision of services.

West Virginia. The system does not appear to have improved heavy-care access. Butler and Schlenker (1988) reported that state agency staff asserted that residents needing skilled nursing continued to face access barriers. Holahan (1984) corroborated this assertion in his study that found impairment scores among nursing-home residents unchanged between 1978 and 1980.

Findings in terms of quality were mixed. On the negative side, Schlenker et al. (1988) reported a connection between the additional payment for catheterization and its higher frequency in West Virginia, relative to the other case mix states (Maryland and Ohio). False charting and overreporting were found as well.

More positively, researchers found that an increase in nursing resources accompanied increases in patient needs between 1979 and 1981: a 1 percent increase in patient impairment scores resulted in a 1.1 percent increase in nursing costs (Holahan 1984; Holahan and Cohen 1987).

The San Diego Experiment. Results were evaluated by Meiners et al. (1985), Thorburn and Meiners (1986), and Jones and Meiners (1986), and later reassessed by Norton (1990). Meiners and colleagues found limited positive effects on access only for certain types of heavy-care patients and no effects on quality. There was a substantially positive impact on discharge in only two nursing homes of the 18 in the treatment group. Norton (1990) subsequently used a more sophisticated Markov approach to reanalyze the data and found that length of stay was shortened considerably and mortality was greatly reduced when the effects of all three types of incentive bonus payments (admission, outcome, discharge) were treated as one variable.

Disturbingly, however, Meiners and colleagues found no evidence that extra payments received by the treatment group were spent on extra staff.

Table 5 shows, in summary, based upon findings from the statewide systems evaluated (the San Diego Experiment is excluded), that, whereas case mix probably improves access for heavy-care patients, it usually has produced little or no net positive effects on quality, and tends to raise costs, sometimes substantially.

				States			
Variable	IL	MD	MN	NY	ОН	WV	
Heavy-care access	+ ^{a,b}	+ ^{a,c}	+ ^a	+ ^{a,e}	+ ^a	_ a,b	
Quality	+ ^{a,b}	~ ^{a,c}	_ a	~ ^a	_ d	$\sim^{a,d}$	
Costs	NA	+ ^c	^a	+ ^{a,e}	^a	NA	

TABLE 5 Summary of Six States' Case Mix Reimbursement Systems' Impact on Access, Quality, and Cost

^a Butler and Schlenker 1988.

^b Holahan 1984.

Feder and Scanlon 1989.

^d Schlenker et al. 1988.

^e Thorpe et al. 1991.

Abbreviations: +, positive impact; -, negative impact; \sim , mixed impact; NA, findings not available.

Discussion: Questions for the HCFA Demonstration

Tables 4 and 5 suggest priority research questions for a case mix demonstration:

- What does case mix adjustment cost?
- How do costs and benefits compare with facility-specific prospective payment systems that have high patient-care cost ceilings and other payment systems?
- Does case mix adjustment produce more access per dollar than supply expansions or elimination of Medicaid eligibility processing delays?
- Does case mix adjusted payment actually discourage rehabilitation?
- Can quality audits be made sensitive enough to identify and stop "bracket creep"?
- What reforms work best as local market conditions vary?

Although the HCFA demonstration project is timely and likely to be important in improving the state of the art of case mix adjustment, research design problems and the small, predominantly rural states and nonrandom choice of facilities within the states for system design data may limit both conclusiveness and generalizability of results.

Cost increases can be measured in pre- to postcomparisons, but outcome differences will be difficult to judge without a controlled experiment, and marginal benefits will be difficult to compute even with very careful selection of comparison states.

A potentially insurmountable challenge will be to disentangle case mix reimbursement effects from simple spending increases and the elaborate quality assurance system being implemented as part of the same demonstration.

Conclusion

Where does all this leave the state policy maker who is trying to choose among various nursing-home reform options including case mix adjusted reimbursement? Probably perplexed. Results of studies done before the HCFA demonstration point to access improvement for heavy-care patients, little quality improvement, and higher costs. Local supply and differences between Medicaid and private payment rates may be critical factors in determining whether case mix adjustment achieves its goals, but how these factors are precisely related is unknown. Alternative sources of access problems are likely to remain. Nor has its cost-effectiveness been compared with other access solutions. Case mix system design flaws threaten adverse consequences and perverse incentives. Quality assurance mechanisms may require strengthening to prevent new case mix related abuses.

Yet system advocates point out that every alternative reform will produce its own problems, and they argue that judged against what some view as its principal purpose—access improvement—case mix adjustment is an unequivocal success, proffering also the added benefit of better planning and management information that implementation of the MDS system has made less expensive. Equity among providers is enhanced.

How much the HCFA demonstration will advance the state of the art remains unknown. State-by-state evaluations of the newer case mix systems could add additional insights. One conclusion, however, is clear: those who choose case mix adjustment should carefully decide which goals it is intended to achieve as it is unlikely to achieve much more than better access. Quality is not likely to improve while costs are likely to rise.

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