Creating a MEDPAR Analog to the RUG-III Classification System

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As Medicare payments for post-acute institutional care continue to rise sharply, policy interest in the clinical characteristics of beneficiaries admitted to nursing homes and their variation across facilities has stimulated research into case mix. Measures of Medicare skilled nursing facility (SNF) case mix are important in relating payments to the care requirements of residents. The Resource Utilization Groups, Version III (RUG-III) classification system uses a new minimum data set that is not currently available nationally. In preparation for a multi-State demonstration, we needed to simulate at least the first-level splits at the national, State, and facility level. Therefore, we developed proxy measures using comparable data available on the National Claims History files. The analog is an easily programmed measure of the acuity/severity of beneficiaries' conditions across a Medicare Part A SNF stay in 75 percent of the SNF providers. This can be a method for estimating changes in case mix over the years, and differences across provider types and States.

INTRODUCTION

Policy interest in the clinical characteristics of nursing home residents and their variation across facilities has stimulated research resulting in an extensive body of knowledge about this group. Most of this

prior research has focused on Medicaid nursing home residents; some nursing homes have been found to have more severe or complex caseloads, and therefore higher costs, than others. States sought ways to measure this complexity (called case mix) in order to reimburse nursing homes accordingly. In contrast, analysis of Medicare SNF residents has been limited, principally, to specialized studies involving relatively few nursing homes.

As demand for nursing home services increases, so does interest in reforming the payment system for the Medicare SNF benefit. Measures of Medicare SNF case mix are essential to relating payment to the care requirements of the residents, so that Medicare Part A payments to SNFs with different caseloads are distributed equitably. Two recent studies have offered advances in this area. The first is the development of RUG-III, a case-mix classification system designed to adequately capture the resource use of nursing home residents and provide an improved method of tracking the quality of their care (Fries et al., 1994). RUG-III was developed to serve as the basis for the Multistate Medicare/Medicaid Payment Indexes (M³PI) used in the Nursing Home Case Mix and Quality (NHCMQ) demonstration project. The design phase of the demonstration included nursing homes in seven States. Unlike prior nursing home payment demonstrations, however, this study included case mix in the payment calculations for Medicare as well as Medicaid residents.

In the second study, HCFA and the Urban Institute applied the RUG-III classification system to data from the Medicare

provider analysis and review (MEDPAR) data base. MEDPAR is an analytical file created from Medicare hospital and SNF claims and maintained by HCFA. These claims are the basis of the interim payments made by fiscal intermediaries. This file contains information on SNF stays paid for by Part A nationwide. Although Medicare claims information does not include all data necessary to classify SNF residents exactly as they are in RUG-III, it does contain sufficient information to assign Medicare SNF residents to RUG-III categories at the most general level. The value of the MEDPAR analog is that it provides a means to use nationally available data to examine the case mix of Medicare SNF residents.

The MEDPAR analog has come into increasingly wider use since its development. In connection with the NHCMQ demonstration, it has been used to examine the characteristics of nursing home residents, methods of payment, and the quality of resident care. It is also being used as a proxy case-mix measure by the Urban Institute to analyze trends in Medicare SNF use and costs. The purpose of this article is to document the development of the MEDPAR case-mix proxy and discuss its uses and limitations. The following sections describe the relationship between RUG-III and MEDPAR, present case-mix statistics from the 1992 MEDPAR SNF file, and discuss the implications and limitations of the proxy measure.[1]

BACKGROUND

SNF services are a Part A (hospital insurance) benefit under Medicare. The benefit is available only to patients who require continued skilled nursing care and/or skilled rehabilitation services on a daily basis following a hospital stay of at least 3 days. Medicare covers a maximum of 100 days in an SNF per episode of illness, defined by 60-day periods of health (in terms of an absence of Medicare institutional charges) before and after the period of illness. A daily copayment ($81.50 in 1992)[2] takes effect after 20 days of SNF care. For some facilities, this copayment is greater than the daily cost of SNF care, and many residents switch to alternate coverage after the 20th day, ending their Medicare-covered stay and therefore exiting the MEDPAR file. Thus, many stays that last more than 20 days appear truncated in the MEDPAR file, and stays that last more than 100 days are similarly limited in the MEDPAR file.

SNFs are currently reimbursed on the basis of reasonable cost, subject to limits on the per diem routine service costs of the facility. There are no case-mix adjustments to SNF payments. Routine costs include nursing, room and board, administrative costs, and other overhead. Capital-related and ancillary costs (including therapy and drugs) are excluded from the routine limit. Separate limits also apply to rural and urban SNFs. SNFs providing less than 1,500 days of care per year may opt to receive a prospectively set payment instead of cost-based reimbursement.

Different payment conditions apply to the three types of SNFs: hospital-based, freestanding, and swing-bed hospitals. Each type varies in number and in average length of stay (LOS) across States. Hospital-based SNFs are units under hospital governance. This arrangement allows hospitals to keep inpatient acute-care LOSs short by enabling them to use the SNF

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[1]SAS source codes and documentation are available upon request from the authors.

[2]The 1992 copayment is shown because data are from 1992. The copayment in 1994 was $87, and in 1995 it is $90 a day.

benefit for extended care. Freestanding SNFs are independent from hospitals, although they may have cooperative arrangements with local hospitals. They are the most prevalent type of SNF, and tend to be larger, handle more therapy cases, and have longer LOS than the other types of SNFs. A shortage of SNF beds in rural areas and low occupancy in rural hospitals led to the establishment of swing-bed hospitals, which can use the same beds for either SNF care or regular inpatient care. Swing beds tend to be oriented toward short-term recovery. If a patient requires additional care, he or she could be transferred to the hospital or to another nursing home, depending on his or her condition. The Medicare routine limit for freestanding facilities is 112 percent of the national average per diem cost for urban and rural facilities, respectively. The hospital-based limit is the freestanding limit plus one-half the difference between the freestanding rate and 112 percent of the average hospital-based per diem cost (also by urban or rural location). Swing-bed hospitals are paid a prospective per diem rate based on the regional average of freestanding SNFs in the same area. Ancillary and capital costs are paid on a reasonable cost basis for all three types of SNFs.[3]

Among the services nursing home residents may receive are skilled rehabilitation therapy and nursing rehabilitation. To be eligible for Medicare coverage for skilled rehabilitation therapy under 1988 coverage criteria, a resident must receive skilled rehabilitation three times a week and nursing rehabilitation to maintain the benefits of the skilled therapy the other 4 days of the week. Skilled rehabilitation includes physical therapy (PT), occupational

therapy (OT), and speech pathology (SP), alone or in any combination; nursing rehabilitation consists of providing active or passive range of motion, splint/brace assistance, and training in such activities as transferring, dressing/grooming, eating/swallowing, or locomotion/mobility.

PT, OT, and SP provided in the SNF are covered under Part A, unless they are provided by an independent agency, in which case they may be billed under Part B. In addition, not all facilities detail therapy charges in their claims (which comprise MEDPAR). Given these constraints and the coverage limits previously discussed, it should be noted that the MEDPAR proxy is not a complete record of all the therapy a SNF resident may receive during the course of his or her illness.

DESCRIPTION

RUG-III Classification System

As previously noted, RUG-III was developed as part of the multi-State NHCMQ demonstration design, a 5-year effort sponsored in 1989 by HCFA. The purpose of the demonstration is to implement and evaluate Medicare and Medicaid payment procedures and quality monitoring systems for nursing home services using RUG-III across several States. The final RUG-III briefing document was completed in March 1992, after being critiqued by analysts from the demonstration States, five clinical workgroups, and a technical expert panel.[4]

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[3]In this context, ancillary services refers to social work, therapy services, and transportation.

[4]The clinical nursing workgroup found that the RUG-III system did not progress consistently from low to high in terms of staff time as one advanced through the hierarchy. Nursing staff times were adjusted using clinical judgments about level of effort (or nursing resource) for three types of nursing staff to bring the classes into a strictly ascending order. The combined adjustments added less than 1 minute per resident of licensed nursing time and 1.1 minutes of nursing assistant time. These adjustments resulted in the M³PI.

RUG-III is a 44-group model[5] for classifying nursing home residents into homogenous groups according to common health characteristics and the amount and type of resources they use. RUG-III serves as the basis of the M³PI, used to determine nursing home case mix. The purpose of the index is to establish equitable prospective payment levels for residents with different service use. Companion quality indicators are being developed to monitor the quality of the process and the outcomes of care. Case mix in the nursing home context is not based on diagnosis-related groups (DRGs) as it is for acute-care facilities. DRGs are based on LOS and episode cost. Nursing home stays are too variable in duration, and so nursing home case mix is linked instead to daily resource use in terms of staff time and services provided.

The classification system was designed using resident characteristics (specifically, a survey called the Resident Status Measure [RSM]) and wage-weighted staff time (STM). The RSM evolved into a refined instrument called the Minimum Data Set (MDS), used in nursing homes across the Nation to assess resident functional status and to develop plans of care. From the RSM and the MDS came a third assessment tool, the Minimum Data Set Plus (MDS+), which is used in the demonstration States (Feldman and Boulter, 1991). The STM measured the staff time required to care for groups of residents—over a 24-hour period for nursing staff and over the span of a week for ancillary services.

RSM/STM data were collected for 7,648 residents in 202 nursing homes in Kansas, Maine, Mississippi, South Dakota, Nebraska, Texas, and New York from March to December 1990. Analysis identified three main predictors of a resident's resource utilization: (1) clinical characteristics; (2) self-performance in ADLs;[6] and (3) counts of services received. The RUG-III classification system uses these three variables to describe nursing home residents for the purposes of determining case mix. Table 1 shows the mutually exclusive, layered categories of the RUG-III classification system. The table describes a resident's clinical characteristics, the levels of assistance used in performing ADLs, and the counts of services a resident receives. Clinical characteristics include the residents' diagnoses, conditions, and comorbidities. ADLs include bed mobility, toilet use, transfer from bed to chair, and eating. Residents receive a single RUG-III ADL index score which measures the resident's performance of these activities (scores range from 4-18; higher scores represent greater assistance used). Finally, counts of services include the number of nursing rehabilitation services (previously described), extensive treatments (i.e., suctioning or parenteral feeding), or indications of depression.

The first level of the RUG-III system is a hierarchy of major resident types, representing groups of residents with certain clinical conditions. These include Rehabilitation, Extensive Services, Special Care, Clinically Complex, Impaired Cognition, Behavior Problems, and Reduced Physical Function. For example, the Special Care category includes residents with burns, coma, quadriplegia, multiple sclerosis, pressure ulcers, fever with vomiting, weight loss,

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[5]Although Medicare will use the 44-group RUG-III system exclusively in the demonstration, some States have chosen to continue paying for therapy under Medicaid on a fee-for-service basis. These States were encouraged to collapse the rehabilitation intensity groups into one category with a three-level activity of daily living (ADL) split in order to better allocate funds across the State-specific Medicaid population. Thus, Mississippi and South Dakota use an alternative Medicaid classification system with 35 groups.

[6]Note that there is a difference between the ability to perform an ADL and actual self-performance of the ADL. Residents may have the capability but not the will to perform ADLs on their own.

Table 1
Description of RUG-III Classification Branches

Hierarchy Category	Activities of Daily Living	Problem/Service Split
Rehabilitation		
Very High Intensity	3 Levels	—
High Intensity	4 Levels	—
Medium Intensity	3 Levels	—
Low Intensity	2 Levels	—
Extensive Services	—	Count of Services
Special Care	3 Levels	—
Clinically Complex	4 Levels	Signs of Depression
Impaired Cognition	2 Levels	Nursing Rehabilitation (Activity Count)
Behavior Problems	2 Levels	Nursing Rehabilitation (Activity Count)
Reduced Physical Function	5 Levels	Nursing Rehabilitation (Activity Count)

NOTE: RUG-III is Resource Utilization Groups, Version III.

SOURCE: Fries, B.E.: Multistate Nursing Home Case Mix and Quality Demonstration: Description of the Resource Utilization Group, Version III (RUG-III) System. Unpublished. March 20, 1992.

pneumonia, or dehydration, and residents receiving radiation treatments. The Clinically Complex group consists of residents requiring care for cerebral palsy, hemiplegia, chemotherapy, wounds, kidney failure, urinary tract infections, aphasia, and transfusions. Residents showing behavioral symptoms such as wandering, hallucinations, or physical or verbal abuse of others are classified in the Behavior Problems category, unless the presence of another condition places them in a higher category. In addition to having certain diagnoses, residents in each category must have a minimum ADL score. Extensive and Special Care residents must have a minimum ADL score of 7, whereas Behavior Problem residents cannot have ADL scores above 10.

Rehabilitation, involving the most severe conditions, the most intensive need for services, and thus the greatest expenditure of money and time, appears at the top of the hierarchy. Residents requiring Rehabilitation services are divided into four levels of intensity. Intensity is described in the RUG-III system using total minutes of therapy per week, days of therapy per week, and the number of types of therapy received. The divisions are as follows:

- Very High Intensity Rehabilitation—at least 450 minutes of skilled therapy per week, at least 5 days per week of one type of therapy, and at least two of the three types of therapy provided.
- High Intensity Rehabilitation—at least 300 minutes of skilled therapy per week, and at least 5 days per week of one type of therapy.
- Medium Intensity Rehabilitation—at least 150 minutes of skilled therapy per week, and at least 5 days per week of one type of therapy.
- Low Intensity Rehabilitation—at least 45 minutes of skilled therapy per week, at least 3 days per week of skilled therapy, and at least two types of nursing rehabilitation provided.

The four groups are further split by the ADLs residents accomplish.

Residents whose clinical conditions do not require skilled therapy are classified in lower categories, which descend in order

of severity, number of services used, and the amount of time and expenditure required. These categories are divided into subgroups by the RUG-III ADL index, and then again by the number of services they receive.

Determining Case Mix Using RUG-III

One purpose of dividing residents into these subgroups is to assign weights to them in order to calculate a single number that represents the case mix of a given facility. Care provided directly to or for a resident is represented by a weight based on the staff time associated with that category. The more time and services cases in a category require, the larger weight they receive (Table 2). The nursing weight includes time spent daily by registered nurses (RNs), licensed practical nurses (LPNs), and aides. The time spent by each group is multiplied by a weight that represents their relative salaries (RN—1.34, LPN—1.02, and aide—0.67). The nursing/therapy weights include the above nursing time plus social work (1.83), PT (1.67), OT (2.57), SP/audiology (2.41), and transportation (0.67), on a weekly basis. The nursing and nursing/therapy weights are multiplied by the number of residents in each category to yield nursing case mix and nursing/therapy case mix. In calculating case mix for individual facilities, HCFA uses the RUG-III weights and applies them to the distribution of residents in a given facility. Table 2 shows the RUG-III subgroups and the weights assigned to them.

It should be noted that the case-mix weights represent the sample from the seven States used in the RUG-III classification design. Preliminary evidence shows that the wages used in building the weights vary regionally. In the future it may be possible to allow wages to vary across States, producing case mixes that better represent costs in different areas.[7] Since the weights are constant in the calculation of case mix, however, it is the distribution of residents that drives changes in case mix.

Applying RUG-III

Hypothetical case studies will help explain the RUG-III classification system by comparing residents with similar descriptions but disparate classifications. For example, Ms. A was diagnosed with stroke, cardiac dysrhythmia, hypertension, diabetes mellitus, contractures of the hip and hand, and experienced a urinary tract infection within the past 30 days. In addition, she has lost voluntary movement in her left arm and leg, and has an unsteady gait, pain almost daily, and some localized edema, but is continent. She can see, hear, understand, and make herself understood. She tires easily and carries out ADLs slowly. Her mood is frequently tearful and she expresses sadness about the loss of past life roles. She is concerned about her health and views herself, and is viewed by staff, as having potential for rehabilitation.

Her memory is good, although she does have some difficulty making decisions in new situations. She is involved in the daily life of the nursing home, interacts well with others, and is able to set her own goals. She does spend time in her own room in self-initiated activities.

Ms. A requires the assistance of one person to accomplish her personal hygiene, dressing, toileting (RUG-III ADL index score—4), bed mobility and transferring (ADL scores—4 each), locomotion, and eating (ADL score—2). She uses

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[7] A second staff-time study using the MDS+ began in Fall 1994. The new data will be used to validate the first staff time measurement study and to adjust the RUG-III classification system to the MDS Version 2.0 instrument to be published by HCFA in Spring 1995. Only very minor alterations of RUG-III are anticipated.

RUG-III Category and Intensity[1]	Number in NHCMQ Sample	Nursing Weight	Nursing/ Therapy Weight	MEDPAR Proxy Nursing Weight	MEDPAR Proxy Nursing/ Therapy Weight
Rehabilitation					
Total	552	1.37	2.28	—	—
Very High 14-18	37	1.79	3.68	1.29	3.14
Very High 8-13	77	1.18	3.01		
Very High 4-7	21	0.82	2.65		
High 15-18	23	1.93	2.83	1.43	2.41
High 12-14	51	1.50	2.47		
High 8-11	53	1.31	2.29		
High 4-7	24	1.06	2.14		
Medium 16-18	17	2.09	2.52	1.44	1.99
Medium 8-15	134	1.38	1.95		
Medium 4-7	16	1.25	1.74		
Low 12-18	61	1.36	1.52	1.28	1.44
Low 4-11	38	1.14	1.31		
Extensive Services					
Total	161	2.16	1.97	2.16	1.97
3	13	3.97	3.61		
2	38	2.65	2.44		
1	110	1.78	1.62		
Special Care					
Total	767	1.50	1.36	1.50	1.36
17-18	303	1.61	1.45		
14-16	372	1.47	1.33		
7-13	92	1.28	1.18		
Clinically Complex					
Total	2,398	1.05	0.98	1.05	0.98
17-18 D	55	1.46	1.34		
17-18	282	1.37	1.24		
11-16 D	204	1.19	1.11		
11-16	875	1.16	1.08		
6-10 D	89	1.08	1.02		
6-10	389	0.94	0.89		
4-5 D	72	0.76	0.73		
4-5	432	0.67	0.65		
Impaired Cognition					
Total	769	0.67	0.62	0.67	0.62
6-10 N	127	0.88	0.80		
6-10	278	0.80	0.73		
4-5 N	54	0.60	0.56		
4-5	310	0.49	0.46		

See footnotes at end of table.

pressure-relieving chair and bed pads and receives special attention for her skin. She undergoes PT and OT for 1 hour each, 5 days a week. Ms. A receives daily restorative/rehabilitative followup nursing care and skill training for eating, active and passive range of motion, transferring, dressing, grooming, locomotion, and participates in a bowel and bladder retraining program. Discharge from the nursing home is planned within the next 3 months.

As a stroke patient receiving two therapies five times a week, Ms. A is classified in the Very High Rehabilitation category. Mrs. A has an ADL index score of at least 14 (4+4+4+2). In case-mix calculations, her case receives a nursing weight of 1.79 and a nursing/therapy weight of 3.68.

Table 2—Continued

RUG-III and MEDPAR Proxy Weights for Nursing and Nursing/Therapy

RUG-III Category and Intensity[1]	Number in NHCMQ Sample	Nursing Weight	Nursing/ Therapy Weight	MEDPAR Proxy Nursing Weight	MEDPAR Proxy Nursing/ Therapy Weight
Behavior Problems					
Total	125	0.57	0.54	NOC	NOC
6-10 N	14	0.87	0.79	0.79	0.73
6-10	31	0.78	0.72		
4-5 N	11	0.58	0.53		
4-5	69	0.41	0.41		
Reduced Physical Function					
Total	2,876	0.79	0.73	NOC	NOC
16-18 N	217	1.19	1.07	0.79	0.73
16-18	356	1.13	1.02		
11-15 N	333	1.01	0.92		
11-15	609	1.00	0.91		
9-10 N	53	0.86	0.78		
9-10	124	0.77	0.71		
6-8 N	45	0.68	0.65		
6-8	147	0.66	0.62		
4-5 N	108	0.52	0.52		
4-5	884	0.39	0.39		

[1]Numbers represent ADL levels; D indicates depressed state of mind; N indicates nursing rehabilitation services given.

NOTES: RUG-III is Resource Utilization Group, Version III. MEDPAR is Medicare provider analysis and review file. NHCMQ is Nursing Home Case Mix Quality demonstration. NOC is not otherwise classified.

SOURCE: Fries, B.E.: Multistate Nursing Home Case Mix and Quality Demonstration: Description of the Resource Utilization Group, Version III (RUG-III) System. Unpublished. March 20, 1992.

A non-rehabilitation example, Ms. B, has multiple sclerosis. At the present time she is recovering from a bout of pneumonia. She also had a urinary tract infection within the past 30 days. She has lost voluntary movement in her left arm and leg and cannot balance herself. She is not bedfast, however, and is in a wheelchair during the day. She has a history of pressure sores, but none are present at this time. There are contractures of her left hip, hand, shoulder, and foot. She complains of constipation and is sometimes incontinent of the bladder. She is able to see, hear, fully understand what is said, and is understood.

Her memory is good and she is independent in her decisionmaking. Her mood, however, is tearful and she expresses distress. She grieves for her past life as a professional musician, and she is often withdrawn and has been verbally abusive to her roommate during the past week.

Ms. B uses extensive assistance with transferring (RUG-III ADL index score—4), locomotion, toileting (ADL score—4), and limited assistance with bed mobility (ADL score—3), personal hygiene, and dressing. As she has had a history of pressure sores, she uses bed and chair pressure prevention pads and receives special skin care, positioning, and turning regularly over the day. She is on intake and output, and the nursing staff provides passive range of motion and skill training for transferring with a trapeze while encouraging active range of motion for her unaffected limbs. She also began a bowel and bladder retraining program last week. Any discharge plan for Ms. B is uncertain at this time.

With multiple sclerosis and a high level of ADL dependency, Ms. B is classified in the Special Care category. Her ADL score is at least 12 (4+3+4+1 [since she eats without assistance]). Service counts and

mental state are not used in the Special Care category, so her depressed mood does not factor into her classification per se, but influences her plan of care. In RUG-III case-mix calculations, Ms. B is assigned a nursing weight of 1.28 and a nursing/therapy weight of 1.18. Note that these weights are lower than those assigned to Ms. A, the Rehabilitation patient, despite the many similarities in their descriptions.

The MEDPAR Proxy

Since the MDS+ assessment tool is used in fewer than 12 States, it is not possible to analyze case mix on a national level by applying the RUG-III classification system to MDS+ data. As an alternative, MEDPAR can be used to approximate the RUG-III categories for all Medicare SNF residents nationwide using Medicare claims. Diagnosis and revenue codes on the claims identify clinical conditions and the types of services rendered, making it possible to assign residents to the RUG-III categories. For the Rehabilitation category, the MEDPAR proxy directly reproduces the variety of therapy given, and approximates frequency and duration using Part A charges for skilled therapy thought to be commensurate with certain patterns of service.

One of the outgrowths of the multi-State NHCMQ demonstration design, then, was the MEDPAR analog to the RUG-III classification system. It was built from the charges for rehabilitation services and diagnosis and procedure codes recorded on Part A claims.

METHOD

The development of the MEDPAR proxy involved a logical process of gathering background information, assessing data sources, aggregating cases into homogenous groups, and constructing an overall scheme from the smaller components. Documents provided background information crucial in determining the levels of charges for each category which best approximated the service patterns represented in the RUG-III classification criteria. This section describes the documents and data bases consulted in developing the proxy, then discusses the method used to establish the charge ranges which delineate the Rehabilitation category. The technique used to create the non-rehabilitation categories is then addressed. Finally, the determination of case mix using the proxy is described. Each of these steps is important to understanding what a case-mix measure using the MEDPAR proxy, and the proxy itself, actually represent.

Background Sources

Written sources used in developing the proxy included a study from the Urban Institute on SNF therapy use patterns (Liu, 1993), HCFA's 1988 Medicare SNF coverage guidelines, and 1992 LOS data for SNFs (Helbing and Cornelius, 1993).

In a 1993 study, Liu compared Part A and Part B charges for the same types of therapy, providing a complete overview of all therapy provided under Medicare. The study linked the MEDPAR SNF file with the National Claims History files and the Medicare/Medicaid Automated Certification System. Tables and documentation were used to identify residents of nursing homes with Medicare Part A covered stays who did or did not receive therapy. Only 41.3 percent of covered SNF stays involved no therapy services at all. In addition, Liu's study offered the average Part A charges for each type of skilled therapy. These means helped the authors choose upper and lower limits of charges that best represented the patterns of service used to classify Rehabilitation patients in the RUG-III system.

The 1988 Medicare SNF coverage guidelines described the required levels of nursing and skilled therapy to qualify for Medicare coverage. They were promulgated in response to variation in coverage decisions among fiscal intermediaries, growing numbers of lawsuits challenging coverage decisions, and a threatened petition for court rulemaking (Office of Inspector General, 1991). In general, the guidelines had the effect of extending Medicare coverage to new classes of the frail elderly. The changes led to increased SNF admissions, slightly longer LOSs, and 27-percent-higher Medicare SNF expenditures. The NHCMQ design will use RUG-III to cover the same types of stays as are permitted by the 1988 guidelines, using a payment method that is easier to administer and consistent across States. Hence, the 1988 coverage criteria serve as a basis for the MEDPAR proxy as well.

The MEDPAR analog also relies on average SNF charges and LOS tables derived from the 1990 MEDPAR SNF file, reported by Helbing and Cornelius (1993). LOS tables offered average Part A therapy charges for stays of various lengths, including stays under 8 days, 9-20 days, 21-40 days, 41-60 days, 61-80 days, and 81 days or more. Charges were divided by the average number of days in the stay categories to yield a per day charge. Per day charges were used as indicators of the average frequency and duration of therapy visits.

Data Files

The files used were the MEDPAR and MDS+ data sets. MEDPAR is the complete collection of Part A claims submitted to Medicare for payment. Only the claims for SNF care are relevant to the analog. Constructed by HCFA's Bureau of Data Management and Strategy, the MEDPAR

SNF files contain information on completed Medicare stays of SNF residents. The information includes duration of covered stays, age, gender, and race of the residents, and the geographic locations of the resident and the provider. Central to this study, MEDPAR SNF contains information on charges for PT, OT, and SP services, and revenue codes for other services. The construction of the proxy involved MEDPAR SNF data from 1990, edited to eliminate invalid records.

MDS+ is part of the Resident Assessment Instrument used to gather data in the NHCMQ demonstration States.[8] The second part is the Resident Assessment Protocols, which signal potential problem or risk areas and offer guidelines for residents' plans of care. The MDS+ expands the original assessment tool, the MDS, by adding items and increasing the number of response categories to provide greater detail regarding resident conditions and services received. For example, MDS+ reports the number of minutes of therapy given and the rehabilitative/restorative nursing care provided. MDS+ collects resident background information, such as the date of assessment, marital status, lifetime occupation, and the payment source. It also reports current resident health status in terms of resident diagnosis, complicating conditions, and use of medication. Certain conditions included in the MDS+ (for example, pressure ulcers) serve as indicators of the quality of care residents receive.

The computerized MDS+ system of records features over 400,000 assessments from Kansas, Maine, Mississippi, and South Dakota. The earliest assessments in the data base were made on May 1, 1992,

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[8]Results from a pilot study suggest that MDS+ data can be used to enhance consistency in determining Medicare SNF coverage (Heine, 1994).

and approximately two-thirds of the individuals in the file have assessments over at least three points in time. New York added some 500,000 assessments to the HCFA data base beginning in November 1992.

Responses to the MDS+ assessment instrument serve as the basis for classification of residents into the RUG-III system. In the creation of the MEDPAR proxy, MDS+ item definitions thus formed the key against which MEDPAR diagnosis and revenue service codes were matched.

The Rehabilitation Category

The most complex RUG-III category to approximate using the MEDPAR data base was Rehabilitation. Since service patterns had to be approximated using ranges of therapy charges, great attention was paid to developing decision rules that would yield the most accurate description possible using Medicare claims. In addition, there are four levels of intensity within the Rehabilitation category. The Rehabilitation category thus requires the most detailed explanation and is addressed by each of its subdivisions in turn. HCFA researchers set upper and lower charge limits for the Rehabilitation category first, and then created the intermediary splits.

Construction

As previously mentioned, nursing home case mix is not a direct function of diagnosis, as it is with hospital inpatient services. Diagnosis obviously has a role in determining what services a resident receives, but it is the services themselves, with the staff time required to provide them, that determine case mix in nursing homes. Thus, for the Rehabilitation categories, the RUG-III system uses measures of staff time and service frequency, variety, and duration to classify residents. The criteria are in the

form of minimum numbers of minutes of therapy a day and/or week, minimum frequencies of therapy sessions over a week, and minimum numbers of therapy disciplines used per resident. While the MEDPAR proxy can directly reproduce the variety of therapy given, frequency and duration can only be approximated using Part A charges for skilled therapy thought to be commensurate with certain patterns of service. It should be kept in mind, then, that the ranges of charges used in the MEDPAR analog to represent certain therapy patterns are based on educated guesses about therapy and its cost. Since the authors used their own judgment, their choices may seem somewhat arbitrary.

Liu (1993) revealed the following therapy service patterns:

- PT was provided in 56.3 percent of total SNF stays.
- OT was provided in 26.1 percent of stays.
- SP services were given in 9 percent of stays.

This information offered insight into the distribution of services and guided the formation of the categories. In addition:

- 32.1 percent of stays included a single therapy.
- 20.8 percent of stays included two therapies.
- 5.9 percent of stays included all three therapies.
- 41.3 percent of stays did not involve any therapy.

The four Rehabilitation groups for the MEDPAR proxy were determined using ranges of charges to approximate the RUG-III criteria. The Low Intensity group ranges from $250 to $1,000 in any combination of types of skilled therapy. The Medium Intensity group ranges from $1,001 to $2,000 in any combination of therapies. The High Intensity group ranges from $2,001 to

$3,500, with one or more therapies represented. Finally, the Very High Intensity group includes any charge greater than $3,500, with at least two therapies represented, one of which has charges greater than $1,500 (note that if only one therapy is used, the case is classified in the High group, regardless of the charge amount).

Low Rehabilitation Group Determination

The lower boundary of the Rehabilitation category for the MEDPAR proxy was set at $250. Any resident with total therapy charges under $250 was assumed to have received a primary evaluation to determine the need for therapy which did not result in more than two treatments. The Rehabilitation—Low Intensity group requires skilled therapy at least 3 days a week for no less than 10 minutes a day, with a required minimum of 45 minutes per week. This second criterion would be consistent with a 15-minute unit of service 3 days a week, a typical pattern. In addition, at least two forms of nursing rehabilitation must be provided 5 days a week.

Using the MEDPAR file, there was no way to approximate the nursing rehabilitation component of the RUG-III Rehabilitation—Low group. It was possible, however, to model under 5 days a week of skilled therapy using therapy charges that parallel such a pattern of treatment.

Liu (1993) revealed a comparatively large proportion of SNF stays with therapy service charges in the $1 to $250 range. These included 19.5 percent of stays involving PT, 25.9 percent of stays with OT, and 27.7 percent of stays with SP. The 1990 LOS tables previously mentioned provided information on the average covered therapy charge per stay (Helbing and Cornelius, 1993). For this group of stays, LOS was divided into two levels, those that lasted 1-8 days (with a 5-day average), and those that lasted 9-20 days (with a 14-day average).[9] Only 44 percent of the shorter stays had any covered therapy charges. For these, the average covered therapy charge per stay was $401, or $133 per day, if 2 days are assumed to fall on the weekend, since therapy is generally not provided on the weekend. For the longer stays, 65 percent had some covered therapy charges. The average covered therapy charge per stay for this group was $1,046, or $105 a day, excluding weekends.

Obviously, the floor of the Rehabilitation category should be sufficiently lower than the average charge per stay to encompass legitimate therapy charges that comprise the low side of the mean. At $250, a 5-day stay would cost $50 a day and a 14-day stay would cost about $18. Each of these charges is too low to represent actual therapy treatments, which typically cost $65 or more per visit, depending on their duration. Based on these analyses, charges under $250 per stay were assumed to be evaluations, with possible therapist consultation, which did not result in more than two treatments.

Very High Rehabilitation Group Determination

The Rehabilitation—Very High Intensity group was intended to apply only to the most complex cases requiring therapy well above the average amount of service time. This translates into higher charges for therapy services, both because treatment is more frequent and complex, and because LOS is longer than for other skilled rehabilitation groups. In line with the intended complexity of this classification group, the lowest charge for the Rehabilitation—Very

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[9]Average LOS ranges (1-8, 9-20, etc.) represent covered days of care per admission, rounded to the nearest whole number. See Table 5.10 in Helbing and Cornelius (1993).

High group was set at $3,500, with at least one discipline having a minimum of $1,500 in covered charges.

The RUG-III criteria for Rehabilitation—Very High are:

- Two of the three therapy disciplines represented.
- 450 minutes of treatment a week across the three services.
- One discipline providing services at least 5 days a week.

By definition, the highest Rehabilitation group must involve at least two of the three disciplines. Liu (1993) showed that 26.7 percent of SNF stays met this criterion. The mean covered charges for stays involving two or three types of therapy were:

- PT and OT—35,500 stays with mean total charges of $2,481.
- PT and SP—3,586 stays with mean total charges of $2,219.
- OT and SP—568 stays with mean total charges of $2,745.
- PT, OT, and SP—11,295 stays with mean total charges of $5,611 (median $3,669).

The longer stays in the 1990 LOS tables were divided into three levels, 41-60 days (a 49-day average), 61-80 days (a 70-day average), and 81-100 days (an average of 97 days) (Helbing and Cornelius, 1993). The 49-day group had average total covered therapy charges of $3,312 per stay, or $94 per service day (assuming 35 weekdays). The middle group had average therapy charges of $4,117, or spread over 50 service days, $82 a day. The 97-day group had average charges of $4,610, or $65 per day (over 71 service days). The shortest stays appear to involve the more intense service use, rather than the longer stays, which arrive at higher average charges by virtue of their duration rather than their intensity.

To differentiate between Rehabilitation—Very High and Rehabilitation—High, the Very High floor was set at $3,500, which is above all the means for combinations of therapy listed earlier, except cases using all three disciplines. Note that the figure is slightly below the three-discipline median, and therefore includes the majority of three-discipline charges per stay. The two longest LOS periods fall into the Very High category, while the 49-day group average falls into the High category, except for very expensive stays on the high side of the mean.

The final criterion for classification in the Rehabilitation—Very High group is a minimum of $1,500 in charges in one discipline. Liu (1993) found that among those stays with therapy service, single discipline covered charges of at least $2,000 occurred in 17.3 percent of stays involving PT, 17.1 percent of stays with OT, and 23.1 percent of stays with SP. Assuming at least 30 minutes of service a day, a minimum of $1,500 in charges would be incurred during a 5-day-a-week pattern of service in a given therapy. To approximate the required intensity over 5 days a week of service, then, the model requires charges of at least $1,500 in one discipline. This is more than one-half of the mean charge for two disciplines, but only one-quarter of the mean charge for stays involving all three disciplines.

Medium and High Rehabilitation Group Determination

The boundaries for the Medium and High groups, obviously, lie between those for the Low and Very High groups. The Medium group has covered charges in the $1,001 to $2,000 range, in any combination of therapies, and the High group ranges from $2,001 to $3,500, in any combination. The $3,500 cap on the High group can be exceeded if only one therapy is provided.

In the RUG-III classification system, these two intermediate groups are not

driven by a specific number of disciplines represented. Both require at least 5 days a week of skilled therapy, but they are split according to weekly treatment time: the High category requires at least 300 minutes of therapy a week (typically five 60-minute sessions), and the Medium category requires only 150 minutes a week (or five 30-minute sessions).

In the MEDPAR crosswalk, the Rehabilitation—High category may include one therapy at any level of charges above $2,001, or two or three therapies if the total charges are less than $3,500. The lower boundary was set at $2,001 based on the same information used in setting the floor for the Very High group. The LOS tables (Helbing and Cornelius, 1993) confirm this choice, showing stays of 21-40 days to have average total therapy charges of $2,078.

The Rehabilitation—Medium group can also consist of one, two, or three therapies. Liu (1993) found the mean charges for a single discipline to be $916 for PT, $724 for OT, and $933 for SP. As previously mentioned, the average total covered therapy charges for stays from 9-20 days (keeping in mind that stays of 8 days or fewer would probably not get in 5 treatment days) was $1,046. Based on these data, the lower boundary for the Rehabilitation—Medium group was set at $1,000 to avoid including residents with less than 5 days of therapy service. Although this may seem inconsistent with the Very High Intensity requirement of $1,500 to represent a 5-day-a-week pattern of service, the Very High requirement is intended to be more stringent. In the Medium Intensity group, residents may receive less than 30 minutes of service a day, and different combinations of therapy could be used to meet the 5-day-a-week requirement. If this involved 3 days of OT and 2 days of PT, for example, a 5-day service pattern could easily cost less

than $1,500, since OT is less expensive than PT ($724 versus $916).

Non-Rehabilitation Categories

MEDPAR contains variables describing diagnoses and procedures which are based on the *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM). The ICD-9-CM system uses five-digit codes, the first three digits representing broad classes of diagnoses and the last two representing more detailed subclassifications. The proxies for the non-rehabilitation categories in the RUG-III classification were created by matching the numerical diagnosis or procedure codes in MEDPAR with the specific clinical criteria used to classify residents in the Extensive Services, Special Care, or Clinically Complex categories, with the assumption that the same range of services are represented by the diagnosis code.

One of the authors, a gerontological nurse clinician and researcher (who had assisted in the development of the RSM field test), searched ICD-9-CM Volumes 1, 2, and 3 for identical or comparable words or descriptors of diagnoses, treatments, and procedures that would meet the intent of the RSM items used in the development of the RUG-III classification. She used the tables of contents and the indexes to find identical wording, descriptors, or appropriate commonly associated treatments and procedures. For example, the RSM item "burns" is matched to ICD-9-CM codes 940-949.5, "burns." Similarly, ICD-9-CM codes 038-038.9 (septicemia), 998.5 (postoperative septicemia), and 999.3 (septicemia following infusion, injection, or transfusion) approximate the RSM item "septicemia." Often, there were more than one ICD-9-CM code which might match the RSM item. In such cases, all applicable ICD-9-CM codes were used. Categorical

exclusions in the ICD-9-CM codebooks were noted. Table 3 presents in detail the MDS+ variables and qualifying criteria used for RUG-III and shows the proxy ICD-9-CM codes, descriptors, and qualifying criteria used to represent the MDS+ items.

Certain RUG-III criteria could not be satisfactorily matched to any ICD-9-CM code. In the Special Care category, for example, intravenous medication had no corresponding code. In the Clinically Complex category, terminal illness and physician visits cannot be modeled. Roughly 20 percent of residents classified as Clinically Complex are so categorized due to their number of physician visits. This means that in the MEDPAR proxy, these residents are probably falling into the not otherwise classified group. Finally, parenteral feeding, under the Extensive Services classification, is approximated by "unspecified machine dependent," which refers to the commonly used feeding pump. Unfortunately, the ICD-9-CM code does not distinguish between parenteral feeding pumps and intravenous pumps; this detracts from the precision of the match.

Similarly, the proxy for Impaired Cognition was modeled using only the diagnosis code for Alzheimer's disease (ICD-9-CM code 290). It does not include residents with Alzheimer's who fit into a higher category due to other problems, neurological Alzheimer's (331.0), or any of the other codings for dementia. While the structure of RUG-III purposely excluded residents with other problems from this lower group, future revisions of the MEDPAR proxy should expand this category to include other codings for dementia.

There is insufficient information in the MEDPAR data base to approximate the criteria for the RUG-III categories Behavior Problems and Reduced Physical Function, so the criteria for these categories were not

used in the proxy. Residents who cannot be classified in the top eight groups are combined in a final category, not otherwise classified. These include residents who would be classified in the Behavior Problems or Reduced Physical Function categories of the RUG scale, as well as some Impaired Cognition residents without more complicated physical problems.

Case Mix Using the Proxy

Recall that in the RUG-III system, the case-mix index is a function of the distribution of residents in each of the categories, further detailed across the ADL index, and then by service counts, depression, or nursing rehabilitation services (Table 2). ADLs, nursing rehabilitation, depression, and service counts could not be modelled using MEDPAR. For the MEDPAR proxy, then, the nursing and nursing/therapy weights are not detailed to the second and third levels of the RUG-III system. In the Rehabilitation category, weights for the four intensity levels were collapsed from the subdivisions (Table 2). In addition, the Behavior Problems and Reduced Physical Function categories were combined as not otherwise classified for the MEDPAR proxy, as previously discussed. Residents in this category are included in case-mix calculations using the nursing and nursing/therapy weights assigned to Reduced Physical Function in the RUG-III system (0.79 and 0.73). In the RUG-III system, the Behavior Problems and Impaired Cognition categories have weights of 0.57 and 0.54, and 0.67 and 0.62, respectively. Thus, in case-mix calculations using the proxy, these residents receive a higher weight than they would using the MDS+ data base. This tends to bias case mix upward, but probably only slightly, since these groups

Table 3

MDS+/MEDPAR Crosswalk

RUG-III Group	MDS+		MEDPAR	
	Items Used	Criteria	ICD-9-CM or MEDPAR Source Code	Descriptor
Rehabilitation				
Very High Intensity, Multidisciplinary	N, 1, b, (a, b, c) Box A and B a. Speech b. Occupational Therapy c. Physical Therapy	Box A - Two of the 3 = 1+ and one of the 3 = 5+ Box B - Sum of a + b + c = 450	OT, PT, Speech V57.0 to V57.9	Covered Charge $250+ Covered Charge $3,501 + 2 of 3 Therapies and 1 Therapy > $1,500
High Intensity	N, 1, b, (a, b, c) Box A and B a. Speech b. Occupational Therapy c. Physical Therapy	Box A - Combination of a + b + c = 5+ and Box B - Sum of a + b + c = 300	V57.0 to V57.9	Covered Charge $2,001 - $3,500 and 2 Therapies or $2,001 + and Only 1 Therapy
Medium Intensity	N, 1, b, (a, b, c) Box A and B a. Speech b. Occupational Therapy c. Physical Therapy	Box A - Combination of a + b + c = 5+ and Box B - Sum of a + b + c = 150	V57.0 to V57.9	Covered Charge $1,001 - $2,000 and Any Combination of Therapies
Low Intensity	N, 1, b, (a, b, c) Box A and B a. Speech b. Occupational Therapy c. Physical Therapy N, 2, (a, b, c, f, g, h, i, j) a. Range of Motion (Passive) c. Splint/brace Assistance f. Locomotion/Mobility g. Dressing/Grooming h. Eating/Swallowing i. Transfer j. Amputation Care	Box A - Combination of a + b + c = 3+ and Box B - Sum of a + b + c = 45 and N, 2 - Any two = 5 + (a, b, c, f, g, h, i, j)	V57.0 to V57.9	Covered Charge $250 - $1,000 and Any Combination of Therapies
Extensive Services				
Parenteral Feeding	L, 4, a (Parenteral/IV) N, 1, a,(d, e, j)	At Least One Checked	V46.9	Unspecified Machine Dependence (IV Pump)
Suctioning	d. Suctioning		V46.0 V55	Aspirator Attention Artificial Opening
Tracheostomy	e. Trach Care		V44.0	Tracheostomy
Ventilator/Respirator	j. Ventilator/Respirator		V46.1	Respirator

See notes at end of table.

Table 3—Continued
MDS+/MEDPAR Crosswalk

RUG-III Group	MDS +		MEDPAR	
	Items Used	Criteria	ICD-9-CM or MEDPAR Source Code	Descriptor
Special Care		At Least One Checked or Answered as Specified		
Burns	J, 4, c (Burns)		940 to 949.5	All Types and Locations
Coma	B, 1, 1 (Coma)		780	Coma Excludes 780.3 Eclampsia Excludes 779.2 Newborn
			586	Grand Mal, Status, Epileptic
Fever With: Vomiting Weight Loss	K, 3, e and K, 3, m or L, 3, b or K, 1 or L, 2, c = 1		008.8 783.2 783.3 260-263.0	Abnormal Weight Loss, Feeding Difficulties, and Nutritional Deficiencies
Pneumonia			480-487	See ICD-9-CM Volume 1 for Exclusions
Dehydration			276.5 276.0 276.1	Volume Depletion Hypertonic Hypotonic
Multiple Sclerosis	K, 1, 1 (Multiple Sclerosis)		340	Multiple Sclerosis
Pressure Ulcers	J, 2, c or d = 1+ (Stage 3 or 4 Pressure Ulcer)		707.0 to 707.9	Pressure Ulcers
Quadriplegia	H, 4, d (Quadriplegia)		344.0	Quadriplegia
Septicemia			038-038.9 998.5 999.3	Postoperative Following Infusion, Injection, Transfusion
IV Medication	N, 1, a, f (IV Medications)		No List	N, 1, a, f (IV Medications)
Radiation Treatments	N, 1, a, b (Radiation Treatments)		V15.3 V58.0 V66.1	Irradiation (Aftercare) Radiotherapy Following Radiotherapy
Tube Feeding	L, 4, b (Feeding Tube)		V44.1	Tube Feeding

See notes at end of table.

Table 3—Continued
MDS+/MEDPAR Crosswalk

RUG-III Group	MDS+		MEDPAR	
	Items Used	Criteria	ICD-9-CM or MEDPAR Source Code	Descriptor
Clinically Complex				
Aphasia	K, 1, j (Aphasia)	At Least One Checked or Answered as Specified	784.3	
Aspiration	K, 3, j (Lung Aspirations)		507.0	
Cerebral Palsy	I, 12, b (Cerebral Palsy)		343.0 to 343.9	
Dehydration	L, 3, b (Dehydration)		276.5 / 276.0 / 276.1	Volume Depletion / Hypertonic / Hypotonic
Hemiplegia	H, 4, c (Hemiplegia)		342.0 to 342.9	Excludes Congenital and Infantile
Internal Bleeding	K, 3, g (Internal Bleeding)		578 to 578.9	Excludes Newborn
Pneumonia	K, 1, o (Pneumonia)		480 to 487	See ICD-9-CM Volume 1 for Exclusions
Stasis Ulcer	J, 1 = 1 (Stasis Ulcer)		434.0 to 454.9	
Terminal Illness	K, 1, z (Experiencing Terminal Illness)		No List	Death Within 60 Days
Urinary Tract Infection	K, 1, e e (Urinary Tract Infection)		599.0	
Chemotherapy	N, 1, a a (Chemotherapy)		V58.1 / V66.2	Maintenance Chemotherapy Following Chemotherapy
Dialysis	N, 1, a c (Dialysis)		V45.1 / V56 to V56.8 / V58.8 / V58.9	Renal Dialysis Status / Excludes Billysis Status / Other Specified Aftercare / Unspecified Aftercare
Respiratory Therapy	N, 1, b e Box A = 1+ (Respiratory Therapy)			Only Part Time Breathing Exercises
Transfusions	N, a g (Transfusions)		V58.2	Blood Transfusion Without Reported Diagnosis
Wound Care Other Than Pressure Ulcer	J, 4, (d, e, or f) and J, 5, (d, or e) or J, 7, c (Foot Dressings)		V58.3	Attention to Dressing/Sutures, Dressing Changes
Physician Visits	N, 6 = 4+ (Physician Visits)		No List	Does Not Apply at Admission

See notes at end of table.

Table 3—Continued
MDS+/MEDPAR Crosswalk

RUG-III Group	MDS+		MEDPAR	
	Items Used	Criteria	ICD-9-CM or MEDPAR Source Code	Descriptor
Impaired Cognition Impairment in All: Decisionmaking Recall Short-Term Memory	B, 2, a = 1 (Short-Term Memory) and B, 3, a, b, c, or d Not Checked and B, 4 = 1 or More	All Three Answered as Specified	290.0	
Behavior Problems	E, 3, a or b or c or d = 2 or K, 3, f (Hallucinations/Delusions) E, 3, a (Wandering) E, 3, b (Verbally Abusive) E, 3, c (Physically Abusive) E, 3, d (Socially Inappropriate)	Any One of "E" Variables = 2 or K, 3, f Checked	Not Used	
Reduced Physical Function	H, 1, a (Bed Mobility) H, 1, b (Transfer) H, 1, f (Toilet use) H, 2, a b f (Support)	Self-Performed Score 0 or 1 = 1 (0 - Independent) (1 - Supervision) Self-Performed Score 2 = 3 (2 - Limited Assistance) Self-Performed Score 3 or 4 and Support Score 2 = 3 (3 - Extensive Assistance) (4 - Total Dependence) Support (2 - One Person) Self-Performed Score 3 or 4 and Support Score 3 = 4 (3 - Extensive Assistance) (4 - Total Dependence) Support (2 - Two Persons)	Not Used	
	H, 1, e (Eating)	Self-Performed Score 0 or 1 = 1 (0 - Independent) (1 - Supervision) Self-Performed Score 2 = 2 (2 - Limited Assistance) Self-Performed Score 3 or 4 = 3 (3 - Extensive Assistance) (4 - Total Dependence) (8 - Not Feed and L4 a or b Checked - IV or Tube Feeding)		

NOTES: MDS+ is Minimum Data Set Plus. MEDPAR is Medicare provider analysis and review. ICD-9-CM is *International Classification of Diseases, 9th Revision, Clinical Modification*. OT is occupational therapy. PT is physical therapy. IV is intravenous.

SOURCE: Cornelius, E., Health Care Financing Administration, Feldman, J., Allied Technology Group, Inc., Marsteller, J.A., and Liu, K., Urban Institute, 1994.

are not a very large proportion of the not otherwise classified RUG-III category.

On the other hand, the MDS+ includes residents who are not being paid for by Medicare, possibly due to the expiration of their coverage. Thus some MDS+ stays are longer term than those represented in the MEDPAR file. This may indicate higher severity/acuity of illness among the long-term residents, shifting MDS+ case mix upward compared with case mix using the MEDPAR analog. Long stays do not coincide in every case with higher classifications using RUG-III or the MEDPAR analog, however. In addition, since the most intensive service provision likely occurs at the beginning of the stay, MEDPAR files would record the most intensive and expensive part of a resident's total stay, biasing case mix using the analog upward. Given these opposing possibilities, the effect of the longer stay population on case mix is unclear.

APPLICATIONS

The proxy makes it possible to characterize typical Medicare residents in SNFs across the Nation. Using the 1992 MEDPAR SNF file, simple frequencies were run to describe the distribution of 917,526 SNF residents across the RUG-III proxy categories (Table 4). Clearly, the largest part of

Table 4
RUG-III Groups in the 1992 MEDPAR SNF File

RUG-III Group	Percentage of the Sample
Rehabilitation—Very High	14.14
Rehabilitation—High	12.52
Rehabilitation—Medium	14.18
Rehabilitation—Low	19.43
Extensive Services	0.75
Special Care	11.27
Clinically Complex	9.13
Impaired Cognition	1.15
Not Otherwise Classified	17.43

NOTE: RUG-III is Resource Utilization Groups, Version III. MEDPAR is Medicare provider analysis and review file. SNF is skilled nursing facility.

SOURCE: Urban Institute 1992 MEDPAR SNF data base.

SNF residents, 60.27 percent, are classified in the Rehabilitation groups. Typical diagnoses in these groups include fractures, sprains, and cerebrovascular disease. Among the non-rehabilitation categories, the Special Care category constitutes the largest group, representing 11.27 percent of residents. The Clinically Complex category is not much smaller, with 9.13 percent of SNF residents.

Facility administrators can compare the distribution of their own residents to the national distribution to get an idea of the severity of their resident case mix compared with the national mix. If, for example, 8 percent of a facility's residents are Clinically Complex, then that facility can be said to have fewer Clinically Complex residents than the national average. This information could be helpful in assessing claims of extraordinary case mix.

Another useful result of the creation of the MEDPAR proxy for the RUG-III system is the ability to estimate SNF case mix on a national basis. Tables 5 and 6 show nursing and nursing/therapy case mix from 1987 to 1992 for three types of SNFs: swing beds, hospital-based, and freestanding facilities. These case mix numbers were calculated using the MEDPAR proxy weights shown in Table 2. The MEDPAR SNF files were sorted by type of facility, then the overall distribution of residents within each type was multiplied by the nursing and nursing/therapy weights for the categories, and divided by the total number of residents in that type of facility.

Tables 5 and 6 show an across-the-board increase in case mix over time. One is also struck by the more rapid increase in freestanding SNF nursing/therapy case mix, which has now surpassed hospital-based SNF nursing/therapy case mix. Freestanding SNF nursing case mix is still the lowest, however, suggesting that some freestanding facilities

Table 5

Nationwide Nursing Case Mix: 1987-92

Facility Type	1987	1988	1989	1990	1991	1992
Total	1.13	1.14	1.14	1.17	1.19	1.20
Unknown	1.15	1.06	1.13	1.29	0.81	1.11
Swing Beds	1.16	1.17	1.17	1.19	1.20	1.21
Hospital-Based	1.16	1.17	1.19	1.20	1.23	1.23
Freestanding	1.12	1.13	1.13	1.17	1.18	1.20

SOURCE: Urban Institute Medicare provider analysis and review skilled nursing facility data base, 1987-92.

Table 6

Nationwide Nursing/Therapy Case Mix: 1987-92

Facility Type	1987	1988	1989	1990	1991	1992
Total	1.19	1.22	1.24	1.34	1.44	1.54
Unknown	1.16	1.11	1.13	1.41	0.77	1.35
Swing Beds	1.18	1.19	1.21	1.24	1.26	1.29
Hospital-Based	1.24	1.29	1.33	1.38	1.47	1.52
Freestanding	1.18	1.22	1.23	1.35	1.47	1.58

SOURCE: Urban Institute Medicare provider analysis and review skilled nursing facility data base, 1987-92.

are specializing in therapy services. Swing-bed hospitals lack the patient volume to support therapy staffs and as a result often serve as short-term recovery beds. Residents requiring longer term and rehabilitative care are likely referred elsewhere, hence swing beds' much lower nursing/therapy case mix.

For more detailed comparison, Table 7 presents case mix by State and facility type. Although aggregate national statistics show that freestanding SNF nursing/therapy case mix has outstripped hospital-based SNFs, this is not true in 18 States and one territory. Also contrary to the national trends, swing-bed hospitals have higher case mix numbers than both hospital-based and freestanding facilities, for both nursing and nursing/therapy, in New York and North Dakota. Similarly, in Alabama and Mississippi, swing-bed hospitals have higher nursing and nursing/therapy case mix than hospital-based SNFs. Vermont and Maryland also diverge from national trends in that their swing-bed nursing case mix is highest among the provider-types, and their swing-bed nursing/therapy case mix is higher than the freestanding SNF nursing/therapy case

mix but lower than hospital-based SNF nursing/therapy case mix.

California and Nevada have high overall case mixes for both nursing and nursing/therapy. States with high nursing case mix across provider types include Tennessee, Alaska, and Utah, while Florida, Colorado, Arizona, Oregon, Washington, and Wisconsin have high overall nursing/therapy case mixes. Hospital-based SNFs in Delaware, New Hampshire, and Alaska have particularly high nursing/therapy case mix, at 2.21, 2.05, and 1.96, respectively. States with low overall case mix numbers for both nursing and nursing/therapy include South Carolina, New York (further discussed later), North Dakota, and Montana. Puerto Rico, Nebraska, and South Dakota have low overall nursing/therapy case mixes, and the District of Columbia, Maine, Michigan, and North Carolina have low nursing case mixes.

DISCUSSION

The MEDPAR analog offers a great deal of case mix information that could not be determined before on a national basis.

Table 7

State Nursing Case Mix (NCM) and Nursing/Therapy Case Mix (NTCM), by Type of Facility: 1992

State	Total		Unknown		Swing Bed		Hospital-Based		Freestanding	
	NCM	NTCM	NCM	NTCM	NCM	NTCM	NCM	NTCM	NCM	NTCM
Total	1.20	1.54	1.11	1.35	1.21	1.29	1.23	1.52	1.20	1.58
Alabama	1.20	1.45	0.79	0.73	1.24	1.26	1.17	1.17	1.20	1.51
Alaska	1.27	1.68	NA	NA	1.29	1.49	1.33	1.96	1.17	1.74
Arizona	1.23	1.75	1.17	1.47	1.19	1.27	1.23	1.55	1.23	1.83
Arkansas	1.21	1.47	1.08	1.42	1.20	1.33	1.29	1.63	1.20	1.53
California	1.26	1.79	1.21	1.61	1.19	1.27	1.28	1.75	1.26	1.80
Colorado	1.24	1.76	1.38	1.90	1.19	1.27	1.28	1.68	1.25	1.88
Connecticut	1.16	1.47	0.87	0.89	NA	NA	1.21	1.61	1.16	1.48
Delaware	1.23	1.62	0.79	0.73	NA	NA	1.30	2.21	1.24	1.61
District of Columbia	1.13	1.39	0.97	1.12	NA	NA	1.15	1.06	1.17	1.50
Florida	1.23	1.87	1.21	1.78	1.18	1.22	1.29	1.82	1.23	1.89
Georgia	1.19	1.62	1.00	1.12	1.13	1.19	1.16	1.43	1.20	1.74
Guam	1.24	1.38	NA	NA	NA	NA	1.24	1.38	NA	NA
Hawaii	1.18	1.31	0.79	0.73	1.07	0.99	1.17	1.26	1.26	1.53
Idaho	1.20	1.45	1.36	1.87	1.17	1.20	1.17	1.33	1.22	1.57
Illinois	1.22	1.53	1.17	1.49	1.19	1.25	1.27	1.59	1.21	1.54
Indiana	1.21	1.67	1.16	1.31	1.23	1.31	1.24	1.54	1.21	1.72
Iowa	1.24	1.48	1.12	1.47	1.23	1.36	1.26	1.61	1.26	1.63
Kansas	1.22	1.45	1.02	1.11	1.21	1.28	1.27	1.55	1.24	1.63
Kentucky	1.20	1.41	1.20	1.55	1.21	1.28	1.23	1.37	1.20	1.43
Louisiana	1.26	1.46	1.12	1.21	1.24	1.26	1.29	1.55	1.26	1.61
Maine	1.13	1.37	0.79	0.73	1.21	1.40	1.25	1.67	1.09	1.26
Maryland	1.16	1.40	0.95	0.88	1.27	1.44	1.19	1.45	1.16	1.41
Massachusetts	1.18	1.53	1.17	1.58	NA	NA	1.26	1.70	1.18	1.53
Michigan	1.14	1.41	1.10	1.42	1.14	1.14	1.18	1.48	1.13	1.42
Minnesota	1.17	1.41	1.02	1.11	1.15	1.17	1.18	1.31	1.18	1.48
Mississippi	1.24	1.49	1.22	1.41	1.26	1.42	1.10	1.21	1.24	1.69
Missouri	1.25	1.62	1.22	1.58	1.26	1.41	1.29	1.61	1.24	1.66
Montana	1.14	1.25	0.94	0.92	1.14	1.18	1.16	1.23	1.13	1.32
Nebraska	1.16	1.25	0.92	0.89	1.19	1.22	1.24	1.50	1.12	1.25
Nevada	1.27	1.71	NA	NA	1.00	0.92	1.22	1.27	1.32	1.89
New Hampshire	1.25	1.68	0.79	0.73	1.27	1.50	1.35	2.05	1.24	1.81
New Jersey	1.20	1.52	0.99	1.19	NA	NA	1.18	1.53	1.20	1.53
New Mexico	1.23	1.58	0.95	0.88	1.17	1.18	1.29	1.68	1.26	1.74
New York[1]	1.06	1.13	0.92	0.88	1.19	1.38	1.11	1.32	1.05	1.11
North Carolina	1.13	1.36	1.02	1.31	1.20	1.27	1.20	1.47	1.11	1.35
North Dakota	1.10	1.12	0.79	0.73	1.16	1.22	1.12	1.13	1.05	1.06
Ohio	1.22	1.53	1.16	1.46	1.20	1.29	1.25	1.55	1.22	1.54
Oklahoma	1.25	1.47	1.16	1.31	1.24	1.34	1.30	1.54	1.26	1.65
Oregon	1.24	1.73	0.95	1.09	1.24	1.28	1.30	1.59	1.25	1.84
Pennsylvania	1.19	1.58	1.00	1.03	1.21	1.36	1.22	1.56	1.19	1.59
Puerto Rico	1.08	1.08	0.79	0.73	NA	NA	1.22	1.33	1.09	1.05
Rhode Island	1.15	1.35	0.79	0.73	NA	NA	NA	NA	1.15	1.36
South Carolina	1.12	1.27	0.91	0.84	1.19	1.19	1.13	1.30	1.12	1.28
South Dakota	1.17	1.25	NA	NA	1.20	1.21	1.28	1.48	1.13	1.28
Tennessee	1.27	1.63	1.16	1.49	1.28	1.44	1.29	1.50	1.27	1.70
Texas[1]	1.22	1.53	1.18	1.56	1.23	1.30	1.29	1.59	1.20	1.56
Utah	1.25	1.67	1.06	1.30	1.15	1.18	1.27	1.59	1.29	1.84
Vermont	1.18	1.41	NA	NA	1.24	1.44	1.11	1.46	1.17	1.39
Virginia	1.17	1.50	1.22	1.86	1.24	1.27	1.25	1.53	1.15	1.51
Washington	1.24	1.71	0.90	0.83	1.14	1.20	1.21	1.54	1.26	1.77
West Virginia	1.23	1.44	1.28	1.59	1.23	1.26	1.20	1.32	1.25	1.55
Wisconsin	1.23	1.71	1.14	1.55	1.25	1.47	1.23	1.65	1.22	1.79
Wyoming	1.19	1.40	0.79	0.73	1.21	1.25	1.20	1.41	1.20	1.57

[1]New York and Texas nursing/therapy case mix numbers here are likely to be lower than in actuality, due to billing practices in some SNFs which impede classification using the Medicare provider analysis and review file analog.

NOTE: NA is not available.

SOURCE: Urban Institute 1992 Medical provider analysis and review skilled nursing facility data base.

While the MEDPAR proxy for the RUG-III classification system is very useful, however, it does have limitations. Although the NHCMQ demonstration clinical therapist workgroup[10] generally agreed with the grouping decisions, the MEDPAR proxy data and the MDS+ data for the same resident may not be exactly analogous. Research continues on the comparability of the classifications of residents in the two data bases.

Some unavoidable constraints in the construction of the MEDPAR proxy are evident. First, the proxy represents only Part A therapy services, and since many residents drop out of the MEDPAR file after 20 days (or in any case, after 100 days, when Medicare coverage ends), the proxy does not give a full picture of the therapy services SNF residents receive. Nor does the proxy include all the categories of the RUG-III system, as previously explained. In addition, it cannot reproduce nursing rehabilitation patterns, the ADL index, service counts, the Impaired Cognition items, or some of the other criteria used in the RUG-III classification. Therefore, the proxy represents the RUG-III in a general way, at the highest level of aggregation.

Accepting these constraints, preliminary analyses of comparability looked for matches between the two data bases within particular variables.[11] For example, do the two data bases report the same admission and discharge dates for SNF stays? In actuality, there is about a 1-month discrepancy in these

dates between the two data sets. Do the diagnoses match? If MDS+ reports a stroke, does MEDPAR report a stroke for the same resident? Is a resident classified in the same category using the MEDPAR analog as she would be using the RUG-III system?

The Urban Institute is working in conjunction with Allied Technology Group, Inc. to link the MDS+ and MEDPAR files using patient identification numbers. At this time, no data concerning the success of the matching is available. The Medicare portion of the NHCMQ demonstration becomes operational in early 1995, however, which will create a data set that matches the MDS+ with MEDPAR by definition. This will offer the opportunity for detailed analysis of the comparability of the MEDPAR and RUG-III classifications.

Preliminary tests for resident-level matches between MEDPAR and MDS+ revealed some structural differences in the nature of the data and the data collection. MEDPAR represents claims collapsed to the stay level, and data is reported at the end of the stay. MDS+ data is presently gathered on the 7th day of the resident's stay (at the latest, although amendments can be made up to the 14th day). The next MDS+ assessment is on the 90th day, when Medicare coverage has ended and residents have dropped out of the MEDPAR file. Often, a resident's classification will change over the duration of his or her stay. Thus, a resident may appear as Clinically Complex in MDS+ (in the early part of her stay), as Rehabilitation in MEDPAR (at the end of her Medicare stay, but not necessarily of her total stay), and as Reduced Physical Function in MDS+ at her second assessment. In the future, MDS+ data will be gathered on a more frequent basis, which will improve their comparability to MEDPAR. Greater similarity between the two files will offer more information about

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[10] The workgroup consisted of approximately 20 occupational therapists, physical therapists, and speech pathologists. Members of the group were nominated by their respective professional associations and selected by the technical design contractor with the approval of the HCFA project officer.

[11] We considered making a simple comparison of the MEDPAR-generated distribution of 1992 SNF residents with a RUG-III distribution for the same States and year. Since MEDPAR only includes Medicare patients, and MDS+ assessments include all residents of nursing homes (reflecting longer term stays, and possibly lower case mix), it was decided that this comparison would not yield very useful information.

the course of an illness and its treatment over the full duration of the episode.

In addition, residents in a sizeable subset of facilities are not adequately classified using the MEDPAR analog. SNFs across States bill ancillary services differently. In the early runs using the Rehabilitation proxies, over 20 percent of the stays fell into the lowest Rehabilitation category. David Wilcox, in his study of New York data, found that well over one-third of New York facilities do not break out ancillaries on the SNF claim. They charge an all-inclusive per diem rate which brings the entire therapy amount under the "routine limit." As a result, nursing/therapy case mix for New York is skewed away from the higher Rehabilitation categories; that is, the case-mix number will be lower than it really is because high-cost therapy patients are effectively omitted from case-mix calculations using MEDPAR.

Similarly, an examination of Texas data showed that about one-third of facilities there bill some ancillary services, such as medications and medical supplies, separately, but they do not include therapy charges on the SNF claim. In such cases, therapy services are provided by independent rehabilitation agencies, which usually bill Medicare separately under Part B. As a result, beneficiaries' Part A SNF claims do not report some therapy charges, although therapy may well have been provided in the SNF during the stay.

In some cases, then, MEDPAR offers less information than MDS+ data. In other cases, the reverse is true. For example, the multi-State NHCMQ demonstration did not gather data on swing-bed hospitals. By definition, swing-beds only appear in rural areas. Several of the demonstration States are largely rural and have high proportions of swing-bed facilities (Table 8). This population, missing from the MDS+ data base, is included in the MEDPAR set.

Since the non-rehabilitation categories of the proxy were delineated in a fairly informal fashion by a single investigator, questions may arise regarding the reliability of the pairing of the ICD-9-CM codes with the RUG-III clinical criteria. The comparability of the proxy to RUG-III has not been validated. Potentially, a medical records administrator could examine the crosswalk and offer suggestions. The fact that the same single investigator handled all the matches, however, offers a consistency that committee-style selection would not. In addition, that individual is intimately acquainted with the intent of the RSM items on which the RUG-III system is based, because she helped develop them.

It should be noted, however, that the usefulness of the MEDPAR proxy does not depend on its ability to duplicate verbatim the MDS+ classifications. The intent of the proxy was to apply Medicare data to the RUG-III classification system in order to typify residents, examine gross patterns, and develop case-mix payments. In addition, one would expect the proxy to be more and more accurate (in terms of comparability to RUG-III) as one moves from the level of the individual to the facility, the State, and then the national level. Finally, the proxy is in development stages and will likely improve with time and suggestions.

Table 8

Proportion of Swing Beds in NHCMQ Demonstration States

State	1989	1990	1991	1992
		Percent		
Kansas	54.22	53.80	49.73	44.79
Maine	8.33	11.54	9.38	10.00
Mississippi	62.11	63.16	60.61	55.77
South Dakota	74.07	71.19	55.56	53.25
Nebraska	62.39	57.89	52.42	48.89
Texas	17.79	17.13	15.86	13.57
New York	0.00	0.00	1.29	1.44

NOTE: NHCMQ is the Nursing Home Case Mix Quality demonstration.

SOURCE: Urban Institute Medicare provider analysis and review skilled nursing facility data base, 1987-92.

CONCLUSION

Using average charge-ranges and diagnosis and procedure codes, the RUG-III resident classification system for SNFs was simulated for a national sample using Medicare SNF claims data from the MEDPAR data base. This article describes the RUG-III classification system and explains the methods used to create the MEDPAR proxy. The analog can be used to characterize SNF residents across the Nation and to examine the cost and quality of the care they receive. It can also be used to calculate case mix over time nationally, by State, and by type of facility.

The MEDPAR analog can be used to address specific policy questions currently under debate. For example, do types of patients and service patterns vary across the country, and if so, how? This question is central to the discussion of differential payments across regions, facilities, and types of patients. As another example, since changes in case mix can be tracked over a period of years, the analog facilitates statements about whether patients are getting sicker over time. The increase in nursing case mix supports a more severe case load in 1992 than in 1987. Differential changes between nursing case mix and nursing/therapy case mix over time may suggest that changes in treatment patterns (i.e., therapy) also drive increases in case mix. These changes in treatment patterns translate into increased costs to Medicare for ancillary services, which are of obvious concern in times of fiscal conservatism.

Limitations in MEDPAR data make it impossible to exactly reproduce the RUG-III categories, however, and so it must be kept in mind that the analog provides a general overview and not minute detail. As the analog comes into increasingly wider use, it is important that researchers and officials understand precisely what the proxy and proxy case mix represent, so that they are not misused or misinterpreted.

In addition to its usefulness for HCFA, the MEDPAR proxy to the RUG-III classification system opens new research doors in post-acute care. Immediate uses include improving the case-mix weighting system and learning more about the Medicare SNF population. For example, research is being conducted by the Urban Institute and Allied Technology Group, Inc. to link the MDS+ file to the MEDPAR file to track residents between Medicare-covered stays. From this, the full course of an illness can be better understood, and common patterns across diagnoses may be identified.

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