

# Patient classification and resource allocation in Veterans Administration nursing homes

Patient classification for Veterans Administration and non-Veterans Administration long-term care patients is discussed. Results are reported from 290 patients in two VA nursing homes by using both resource utilization groups and an independently generated classification system. Patient classes were generated by using the Automatic Interaction Detection Program, which was the methodology used to create the diagnosis related groups. The use of diagnoses in long-term care patient classification is also reviewed. The effect of disaggregated nursing times by type of provider and by type of nursing activity on patient classes is examined.

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CURRENT NURSING home payment systems used by public health insurance programs are believed to discourage efficient resource utilization and appropriate placement of patients.<sup>1</sup> The Medicaid program mandates that reimbursement for patient care be "reasonably cost-related." However, most nursing homes are licensed for one or more levels of care, including skilled care and various classes of intermediate care. While the payment for a particular level of care does vary from one nursing home to another, it is fixed for all patients

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in a particular nursing home. Thus, given their historical costs, a nursing home can profit by selecting light-care patients into any of the levels of care for which it is licensed. Given the current scarcity of nursing home beds for public-pay patients,<sup>2</sup> this approach to reimbursement has created an incentive for nursing homes to recruit light-care patients while leaving heavy-care patients backed up in acute care institutions.<sup>1(p111)</sup> Nursing homes are overpaid for some patients they admit, and many potential nursing home patients experience long stays in expensive hospital beds.

The situation has a unique impact on the Veterans Administration. The VA supports an average daily nursing home census of nearly 20,000 patients, almost one half in community contract nursing homes. The VA generally sets its nursing home contract rates to be competitive with Medicare and Medicaid rates in each primary service area. In so doing, the VA establishes a flat rate for each nursing home with which it contracts. The result has been that in many areas the VA is unable to place patients with behavioral problems in community homes and is forced to maintain these individuals in its own nursing homes or on hospital wards. This is often an unfortunate situation because the lighter-care patients with greater potential to return to the community could better utilize the extensive rehabilitation services available at most VA medical centers.

The most promising approach to correcting the biases of the current reimbursement system is to measure the intensity of services that each patient receives and to pay accordingly. There are two principal

variants to this approach: patient groups and service intensity.

The service intensity approach has been tested in West Virginia<sup>3</sup> and in Maryland.<sup>4</sup> In general terms, this approach seeks to document the types and intensity of services that each nursing home patient receives. Equitable prices are then derived for the resources used, and with these prices a total bill specific to each patient is computed. If the plans of care are appropriately formulated, this approach eliminates any incentive to avoid the heavy-care patient. Both West Virginia and Maryland report that the problems in placing heavy-care Medicaid patients have diminished substantially. The disadvantage of this approach is the enormous quantity of detailed data that must be gathered and processed.

The alternative approach, to be explored here, is patient grouping, where identifiable characteristics of patients are used to place each patient into one of several groups using similar levels of resources. Each group has associated with it a specific price or reimbursement level. This is an extension of the diagnosis related group (DRG) methodology, but not substance, because diagnosis has not played a major role in any of the systems developed to date. The administrative overhead for the patient grouping approach is considerably reduced when compared to the service intensity method.

Early development of patient classification for nursing homes began with two studies undertaken by the Battelle Human Affairs Research Center.<sup>5,6</sup> These studies compiled extensive information on patient-specific resource use (especially nurs-

58 ing times) and related this resource consumption to patient characteristics, such as activities of daily living, diagnosis, and age. Most of the crucial relationships that have been discovered subsequently were first found in the Battelle analyses. However, the statistical analysis relied on a regression approach and the results were not directed to development of patient groups. The Battelle studies demonstrated that activities of daily living are the most significant factors affecting the variation in nurse's aide time across patients, and that this also applies to licensed nursing time, but the amount of variation explained is considerably lower.

Two major efforts at patient classification have been undertaken to date. The first, by Cameron and Knauf<sup>7</sup> was based on slightly over 1,100 California Medi-Cal nursing home patients. An exhaustive effort was made to measure resource costs, including pharmaceuticals, supplies, equipment, therapy, and nursing tasks. Personnel costs were estimated in a manner different from either the Battelle studies that preceded it or the Fries and Cooney<sup>1</sup> study that followed it. Data were collected only on which nursing tasks were performed. A panel of experts was assembled to determine how much time each task should take, a normative standard. Total nursing time was determined by multiplying the number of actual tasks performed for a patient by the normative time per task and adding over the various types of tasks.

Cameron and Knauf forced the grouping algorithm to split the patients according to the presence or absence of a diagnosis of severe neurological impairment. This decision was not supported on statistical grounds, and other research efforts

have not shown neurological impairment to be a relevant diagnostic category.

Cameron and Knauf used service characteristics (eg, tube feeding, catheter) to help define patient groups. Use of service characteristics for defining patient groups is often thought undesirable because it will encourage unnecessary utilization of those services. Lastly, Cameron and Knauf used the presence of decubitus (Stages II-IV) to define one group. Since decubitus can result from poor nursing care, it seems inadvisable to pay more when it occurs. The result of their analyses was a patient classification with 13 mutually exclusive groups.

The second major classification study, conducted by Fries and Cooney,<sup>1</sup> collected resource and functional assessment data on 1,400 Connecticut Medicaid nursing home patients. Resource utilization was limited to nursing times, and functional assessments were derived from the assessment instruments of the utilization review by Professional Standards Review Organization nurses. Nursing times were subjective assessments by RNs and nurse's aides of the time spent with specific patients. An objective assessment of nursing times was also made to cross-validate the subjective assessments. Correlations between the subjective and objective estimates of time spent per patient varied from modest to

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The Fries and Cooney analysis produced a patient classification system with nine resource utilization groups (RUGs), which are derived almost exclusively on the basis of activities of daily living. The only service characteristic included in the classification scheme was intake and output monitoring.

The Fries and Cooney system has been tested by Evans<sup>8</sup> of the VA and adapted for use in the VA budget allocation process. The system was tested by using functional assessments and task requirements from several thousand VA nursing home patients. Nursing times were calculated by collecting nursing tasks and patient characteristics for VA nursing home patients and combining them with a time requirement algorithm from the National Health Care Corporation. This analysis produced a reasonably good fit for the Fries and Cooney model.

Fries, in collaboration with Donald Schneider at Rensselaer Polytechnic Institute, has recently begun a new patient classification project based on 3,400 New York State Medicaid nursing home patients.<sup>9</sup> Preliminary results have identified a patient classification system with 16 groups. Initial splits are made on diagnostic and clinical considerations, and the remaining groupings result from breaks on three activities of daily living: eating, toileting, and transferring.

The purpose of the present study was to evaluate the usefulness of the Fries and Cooney patient classification methodology on a VA nursing home sample population. Two efforts were undertaken independently. Evans<sup>8</sup> collected functional assessment

and service information on a large group of VA patients and used an existing staffing algorithm to impute nursing times. These nursing times became the dependent variable in a regression analysis with each patient's assignment to one of the nine Fries and Cooney RUGs as an independent categorical variable. As mentioned earlier, a reasonably good fit was achieved. The shortcomings of the approach are obvious: The same functional assessment items that are used to generate nursing times are also used to assign patients to one of the RUGs, eg, the dependent and independent variables are both functions of the same set of functional assessment items. The regressions demonstrate a high level of consistency between the staffing algorithm and patient classification system. Although this is an interesting result, an independent analysis based on original data is desirable. While a validation of the RUGs system is interesting (and was done), a stronger verification is to duplicate the entire classification process and compare the independently generated results with the RUGs system.

## MATERIALS AND METHODS

Data for our research were collected on 290 residents from all six wards in two VA nursing homes. The two homes were selected because their patient populations were representative of the VA nursing home population in the Great Lakes region. Functional assessments were performed on all patients by two nurse caregivers from the patients' wards. The assessment instrument has been based in large part on the Long-Term Care Minimum Data Set format.<sup>10</sup> The reliability of these

60 assessments was extensively analyzed and reported by Hogan et al.<sup>11</sup> Interrater reliability was generally acceptable given current standards.

Since two raters were used for all functional assessments, it was not possible to assign a single rating for the various functional assessment items used in developing the patient classification systems. As an alternative, it was decided to add the two assessment scores together and use the combined rating, ranging from two to eight instead of one to four. This is equivalent to using an average score for the two raters where disagreements existed.

Nursing times were collected by each of the 74 nurse caregivers in diaries that were completed for each shift. The nursing times were collected over the course of one seven-day week in both nursing homes. There were approximately 11,000 interactions between the nursing staff and the 290 patients during the study week. The diary has a separate page for each patient, with each page divided into 12 types of nursing activity. The Appendix provides the definitions of each of these activities. These 12 activity types were subsequently grouped into three categories:

1. Personal
  - Personal care
2. Skilled
  - Diagnostic support
  - Complex nursing procedures
  - Planning and recording
  - Medication
3. Other
  - Social and emotional care
  - Noncomplex treatments
  - Patient and family education
  - Patient group activities
  - Observation and emergency care

- Transport
- Other patient-specific activities

The purpose of these combinations was to separate strictly personal care from skilled nursing care. The residual category, Other, contains a variety of activity types that will be analyzed further in future research. Nursing personnel were asked to record only their patient-specific activity times. Activities performed for all patients (for example, changing linen) were not recorded, since they could not help to distinguish one group of patients from another. Analyses reported here are based on these measures of patient-specific nursing time.

Data were also collected on all active diagnoses for the 290 nursing home patients. Each of these diagnoses was then grouped under one of the 19 diagnostic categories listed in Table 1. (Exact groupings are available on request.) The first 13 categories were used by Fries and Cooney in their study. The 14th category was taken from Cameron and Knauf. The remaining five categories were developed by Denise Kuder, a member of the staff of the Great Lakes Health Services Research and Development Field Program.

To produce patient groupings, the SEARCH subroutine of the OSIRIS IV statistical package of the University of Michigan's Institute for Social Research was employed. SEARCH is the successor of AID (Automatic Interaction Detection) developed by Sonquist et al.<sup>12</sup> AID was adapted for interactive use and named AUTOGRP (automatic grouper), and was used by Fetter et al.<sup>13</sup> to develop the DRGs and by Fries and Cooney<sup>1</sup> to produce the RUGs mentioned earlier.

Since the dependent variable, patient-

Table 1. Diagnostic categories

Category no.	Name
1*	Dementia
2	Neurological motor dysfunctions
3	Psychoses and neuroses
4	Musculoskeletal disabilities
5	Cardiac diseases
6	Pulmonary diseases
7	Neoplasms
8	Urinary tract disorders
9	Gastrointestinal disorders
10	Eye disorders
11	Skin disorders
12	Endocrine disorders
13	Peripheral vascular diseases
14†	Severe neurological impairments
15§	Anemias
16	Auditory disorders
17	Dental disorders
18	Infectious diseases
19	Reactions

\*Categories 1-13 are from Fries and Cooney.

†Category 14 is from Cameron and Knauf.

§Categories 15-19 are from Kuder.

specific nursing time, could be disaggregated by nurse provider type and by the type of nursing activity, it was possible to develop classification systems for six different nursing times in addition to total nursing time. (Total LPN time was too small to warrant separate analysis and was included with nurse's aide time.) Furthermore, average wage levels were available for RNs, LPNs, and nurse's aides during the study period. Thus, we were able to develop patient classification systems for total unweighted and salary-weighted nursing time. RN nursing time was weighted 1.0, LPN nursing time 0.65, and nurse's aide time 0.57. Nursing times are presented in Table 2.

## RESULTS

As part of the 1980 VA nursing home patient census, activities of daily living information was collected on all VA nursing home residents. These results were compared to the 1977 National Nursing Home Survey.<sup>14</sup> The results show that the VA population was almost exclusively male, while the national population is predominantly female. The VA population was younger with only about 40% older than 74 years *v* over 60% in the national survey population. Finally, the VA population was less physically disabled, as mea-

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sured by the Katz Index of activities of daily living.<sup>15</sup> The VA population had significantly longer attained length of stay and greater incidence of diagnoses of mental disorder.

Our study's nursing home patients have substantially lower Katz Index scores than the 1977 community nursing home population and roughly mirror the 1980 VA nursing home census population. Of the 290 patients in this study, 87% had at least one active diagnosis falling into the categories of dementia, neurologically impaired or psychosis-neuroses. Sixty-three percent had a diagnosis in two of the three categories, and 11% had at least one diagnosis in all three categories.

Given these differences between the

62 Table 2. Average patient-specific nursing minutes by type of nursing care and type of nurse\*

Type of nursing care	Type of nurse			Total	Cost-weighted total
	RN	LPN	Aide		
Personal	40.12	22.08	197.56	259.76	168.72
Skilled	31.80	6.09	18.73	56.62	46.60
Other	29.77	11.60	83.07	124.44	85.36
Total	101.69	39.77	299.36	440.82	300.68

\*Data for 290 patients in six wards.

national and VA nursing home populations, we decided to attempt to cluster patients by using subsets of nursing time that would differ most between the national and VA populations. Since the RUGs system was based on observations from a female-dominated Medicaid population, we hypothesized that the disaggregation of nursing times by personal *v* skilled care might illustrate some weaknesses in the RUGs as applied to the VA nursing home population.

We selected the five patient classification systems presented in Figs 1 through 5. Fig 1 presents the groupings for total unweighted nursing time as the dependent variable. Intermediate groups are designated by boxes. Each box contains the group number, the number of patients falling into the group (N), and the average (AVE) and the coefficient of variation (CV) of nursing time for patients in the group. The circles denote final groups and contain the same information as the boxes. The triangles enclose the names of the functional assessment or diagnosis variables that are used to define the next set of groups. On each of the branches of the splitting variable are values of the splitting variable that are used to divide the higher

group into the two subsequent groups. The process of subdividing groups ends when the groups become too small (fewer than 30) or when the average nursing time between the possible subgroups is not significantly different. The definition of each final group can be ascertained by following the branches of the tree back to the first group. For example, in Fig 1, group 10 is defined as: anemia, yes; dressing independent/supervision; toileting independent/supervision. Of the 285 subjects in Group 1 (the total population), 44 fell into Group 10, using 267 variable nursing minutes per week, on average. The variability of nursing times in Group 10 is less than in Group 1 ( $CV = 68$  *v*  $CV = 101$ ), indicating that one can predict variable nursing time requirements for Group 10 patients better than one can for the patient population as a whole. This indicates that the classification system has some explanatory power.

Fig 2 reports the classification system for total nursing time weighted by the salary scale (cost). There is a slightly less variance reduction than for unweighted nursing time, but it is otherwise identical to Fig 2. If these classification systems had stopped with groups 4 through 7, they would have

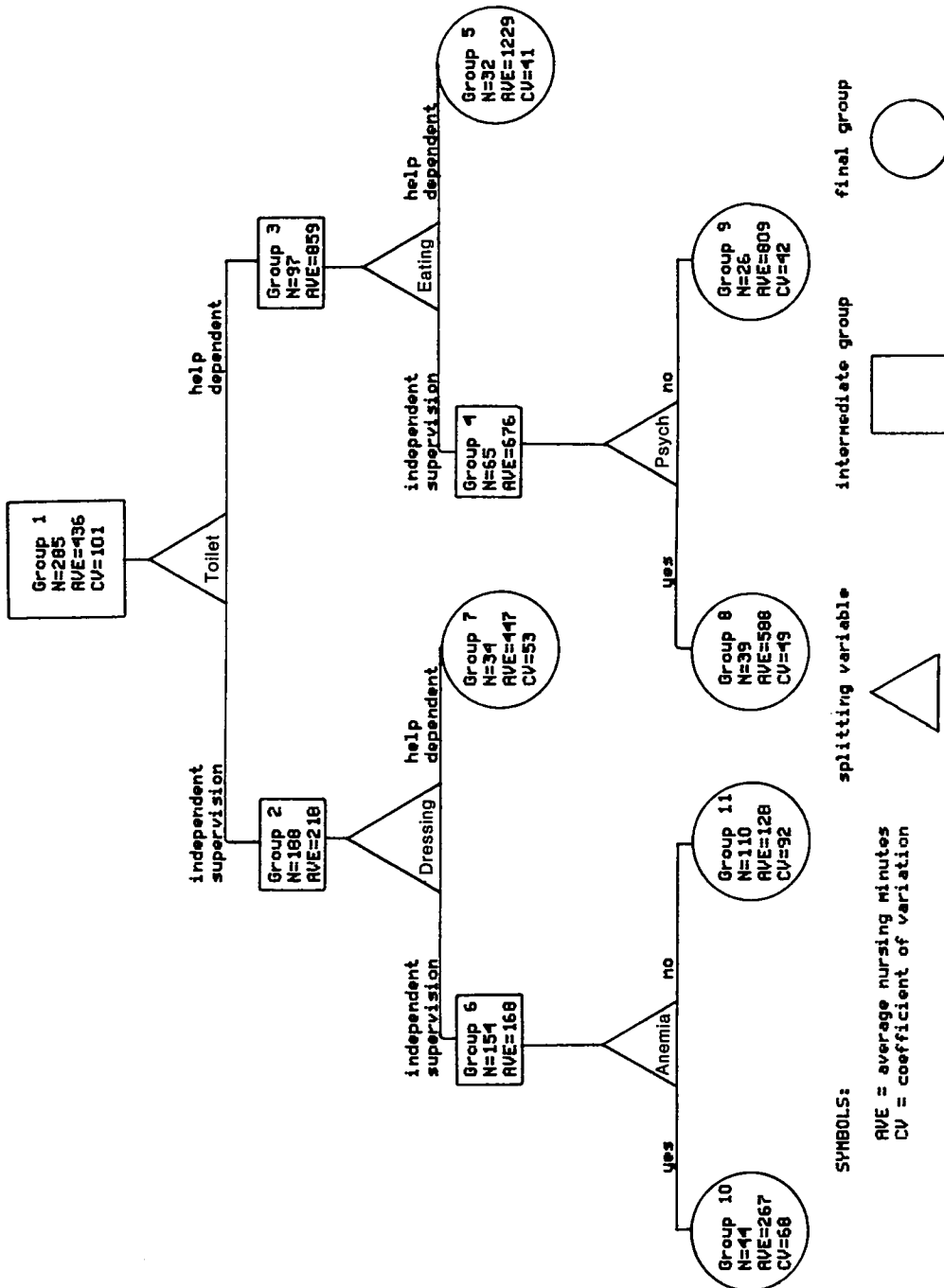


Fig 1. Total unweighted time as a function of activities of daily living, behavior, and diagnoses. Six final groups explain 66.3% of variation.

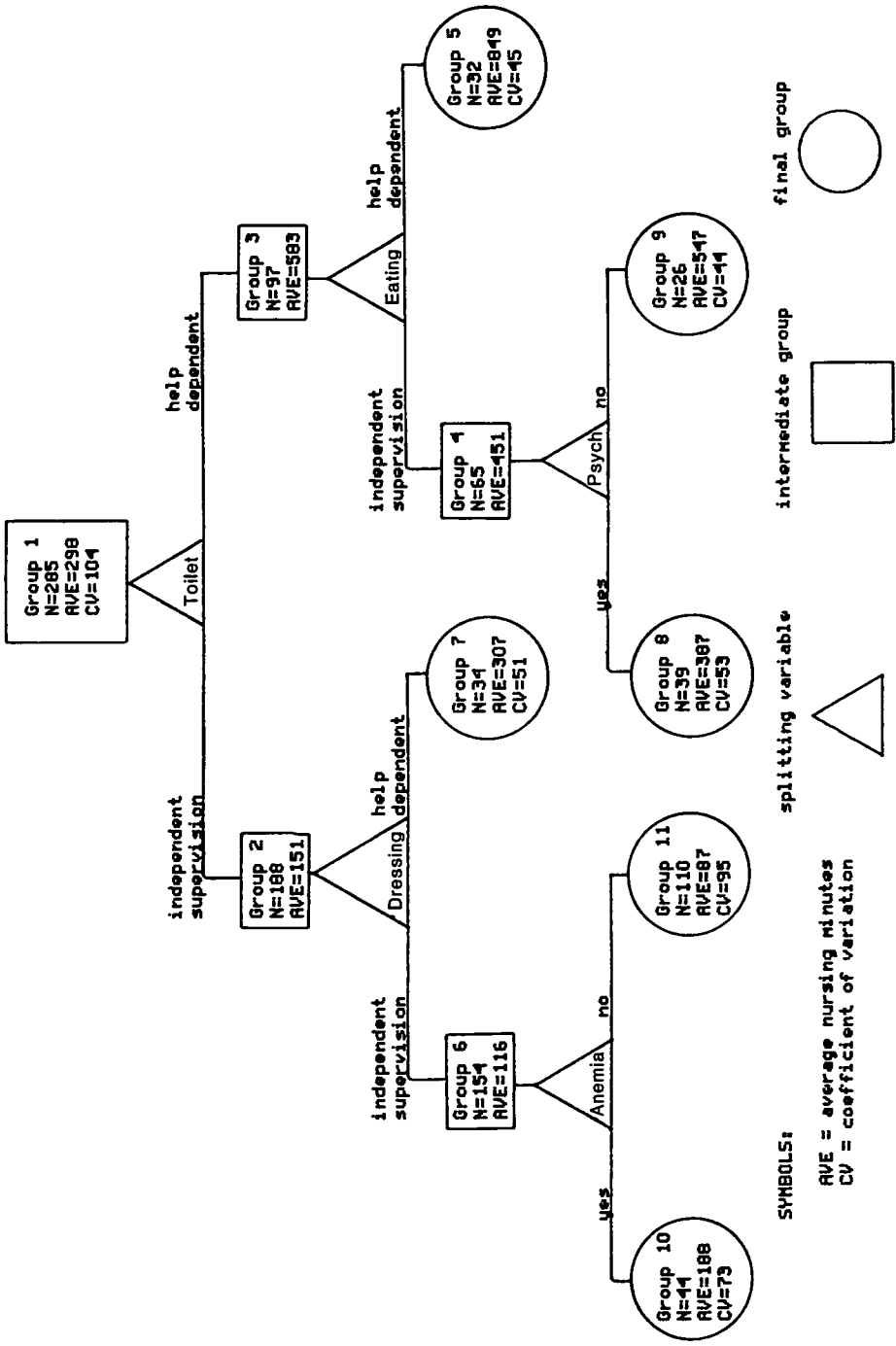


Fig 2. Total weighted time as a function of activities of daily living, behavior, and diagnoses. Six final groups explain 63.2% of variation.

been quite similar in spirit to the Fries and Cooney RUGs. The last two splits, however, use the diagnostic categories of anemia and psychosis-neurosis. To our knowledge, this is the first time that a diagnostic category has been incorporated into a long-term care patient classification system on purely statistical grounds.

Fig 3 presents the classification system for personal care time delivered by nurse's aides and LPNs. (Personal care by aides and LPNs constitutes almost two thirds of all nursing time.) Here the variance reduction is remarkably high (almost 80%), and only two activities of daily living, bathing and toileting, are required to produce the six final groups. This is the greatest variance reduction reported in the long-term care patient classification literature as of this writing.

Fig 4 reports the classification system for RN personal care time. The splits are made on bathing, bowel, and dressing activities of daily living. However, the diagnostic category psychosis-neurosis also proved relevant. Clearly, the presence of this diagnostic category in Figs 1 and 2 results from the need of an overall classification system to explain RN personal care time. Note that in Figs 1, 2, and 4 the presence of a diagnostic code indicating a psychosis or neurosis corresponds to a lower demand for care. Both of the VA nursing homes participating in this study are part of larger medical centers that are primarily psychiatric facilities with many long-term patients. After many years of socialization to institutional life, and with the aid of psychotropic drugs, these psychiatric patients can often be placed in nursing homes where they may demand less skilled supervision than do patients with more severe medical prob-

lems. Such a group may have been quite prevalent in community nursing homes during the massive deinstitutionalization of psychiatric patients of the early and middle 1970s. They are likely to be somewhat less common today.

Fig 5 represents the attempt to find variables to explain RN skilled care. The variance reduction is quite small, less than 26%, and there are only three groups. RN skilled care includes diagnostic support, noncomplex treatments, complex nursing procedures, planning and records, and medications. These are precisely the kinds of activities that require licensed nursing skills, and RNs spend roughly 30% of their time performing these activities. This result is consistent with the findings of the Battelle studies, where skilled nursing times were not closely related to patient characteristics.

We tested the Fries and Cooney classification system, modified to eight categories by collapsing the split on intake and output monitoring, on our data and found similar results. Variance reduction for total weighted time was 63% and for total unweighted time 66%; for personal care time it was 73% for aides and 49% for RNs; skilled care was 30% for nurse's aides and 26% for RNs; other care was 17% for aides and 6% for RNs. While overall variance reduction is high, skilled components are low. This raises questions concerning the incentives to perform skilled and other care for any activities of daily living-based classification system.

## DISCUSSION

The results reported suggest, when combined with the results from Evans,<sup>8</sup> that the

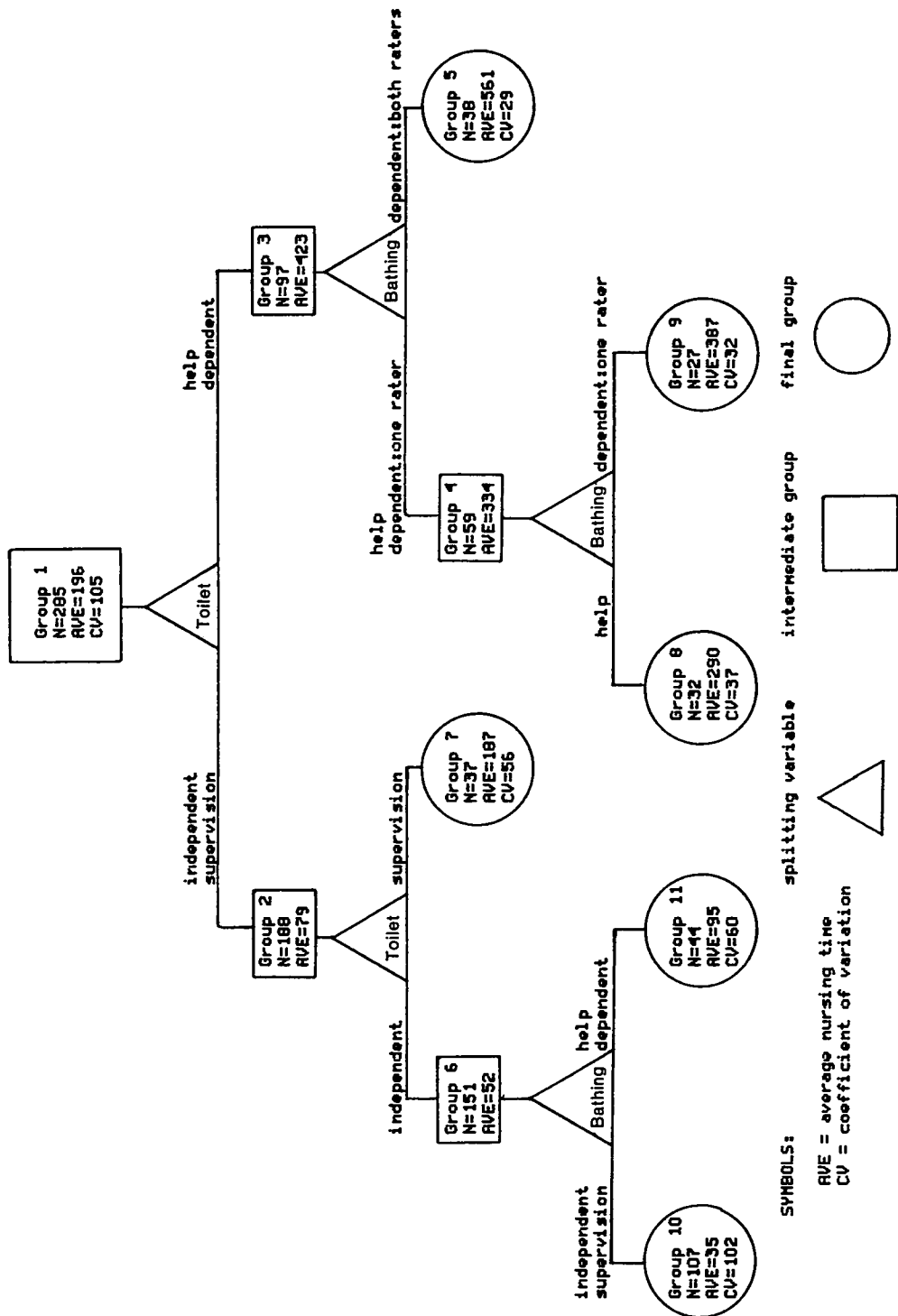


Fig 3. Nurse's aide care time as a function of activities of daily living. Six final groups explain 79.9% of variation.

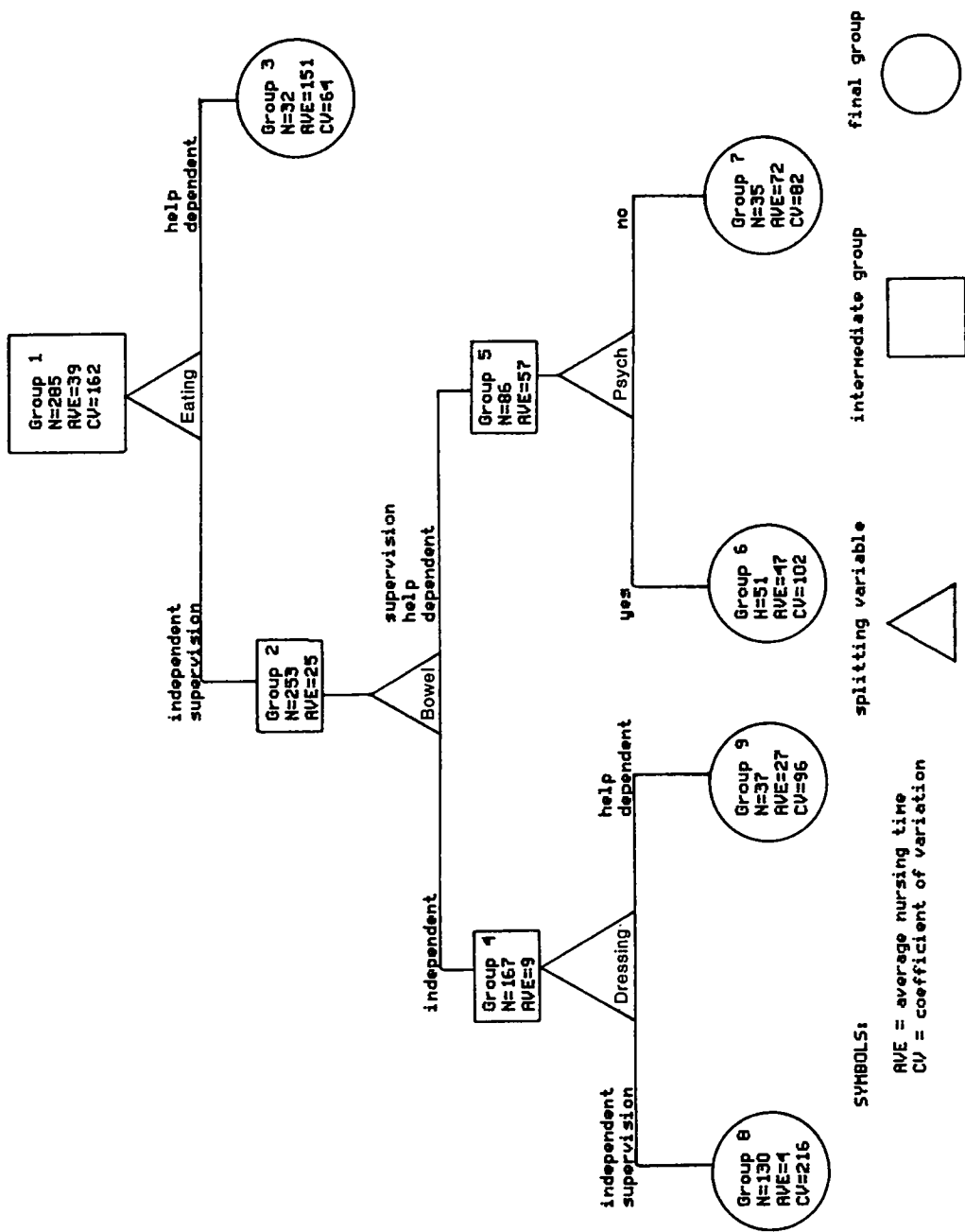


Fig 4. RN personal care time as a function of activities of daily living, behavior, and diagnoses. Five final groups explain 52.1% of variation.

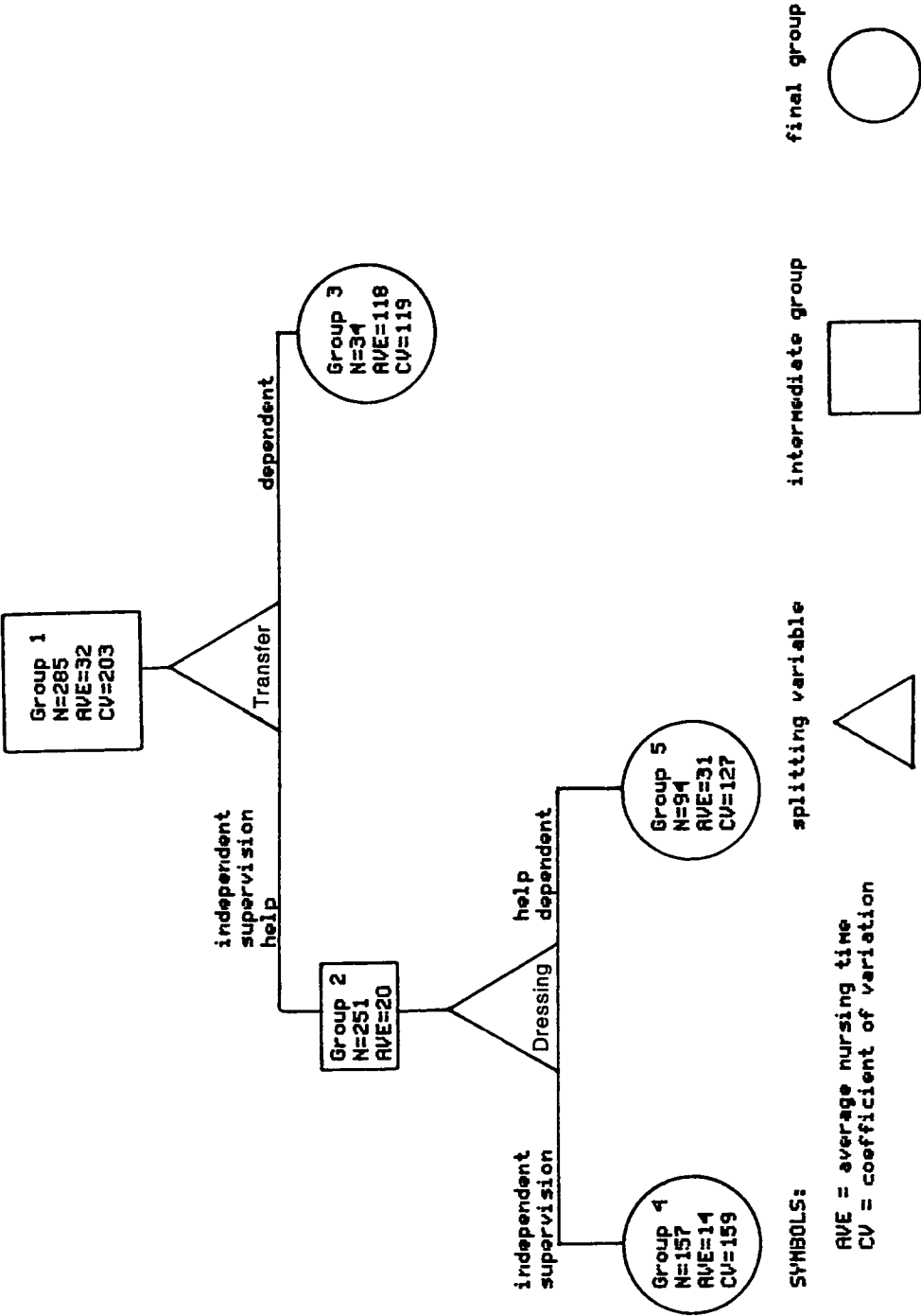


Fig 5. RN skilled care time as a function of activities of daily living, behavior and diagnoses. Three final groups explain 25.9% of variation.

RUGs are a reasonable classification system for VA nursing home patients. These results also point up some shortcomings in the RUGs that should be addressed in future research. With slightly less than 300 cases and only two facilities, the results are difficult to generalize. Nevertheless, the amount and quality of the nursing time data appear to be as good or better than any of the previously published studies. In particular, no other nursing home patient classification study appears to have collected direct observations of nursing activity for more than a few weekdays. Other data collection and analysis efforts being undertaken on behalf of the Medicaid and Medicare programs may benefit from the results obtained in this study.

Prior research has not found diagnosis to be useful in grouping nursing home patients. The poor performance of diagnoses may have been due in part to the reliance on the primary diagnosis. It seems likely that a combination of diagnoses will be a better indicator of nursing home institutionalization and the need for nursing care. Diagnoses did prove useful with the patients in this study. The lower care needs of the patients with the psychosis-neurosis diagnostic category is consistent with the type of patient transferred from the psychiatric hospitals with which the two nursing homes are affiliated. Future research on the national nursing home

population should explore more carefully the usefulness of diagnostic categories for subpopulations like that of the VA. Further research should be conducted on combined diagnoses, particularly the presence of chronic conditions requiring regular treatment or medication complicated by another condition that compromises the treatment of the primary condition, such as diabetes complicated by dementia or alcoholism. It may well be that activities of daily living capture most of the valuable information that one would expect to obtain from diagnoses. It may still be valuable, if only for cross-validation or auditing, to develop patient classification systems based on diagnostic information.

The diagnostic category anemia was more problematic. The advisory panel hypothesized that the anemia could be secondary to alcoholism, to ulcer or intestinal bleeding, or to the side effect of inappropriate medications. As yet, we do not have an adequate explanation for the selection of this variable.

Finally, it does seem useful to disaggregate total nursing time by nurse provider and type of nursing activity. In the classification system presented here, it is evident that what is being explained is personal care, particularly by nurse's aides and LPNs but also by RNs. Other types of nursing activity are poorly explained by our classification systems and the RUGs.

Better disaggregation schemes are needed for nursing time. Current patient classification systems do not explain well what RNs are doing. A patient classification system should provide adequate incentives not just for maintenance care but also for rehabilitation. We should be

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*Prior research has not found diagnosis to be useful in grouping nursing home patients.*

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assured that classification of nursing home patients does not contribute to the "warehousing" syndrome.

Perhaps the most important lesson is one reiterated in a recent presentation by Schneider and Fries<sup>9</sup>: the need for clinical relevance in patient classification. Our advisory panel of clinicians did not find the groupings presented here or the RUGs intuitively useful. They felt that, in order to use patient groupings to manage nursing homes more efficiently, they needed to be able to identify patients who fit into particular groupings. Neither the classifications presented here nor the Fries and Cooney classification system met this criterion. If budgeting and reimbursement based on patient groups are to provide effective

incentives for efficiency, they must be managerially and clinically relevant.

Clearly, much has been accomplished in a relatively short time on classifying nursing home patients. The systems that have emerged appear relatively robust and simple to apply. In the five studies completed to date (this study, two by Battelle, Cameron and Knauf, and Fries and Cooney), all with different data sets and different patient populations, a considerable consistency of results has emerged. Nevertheless, when all of these studies are combined with the new study by Schneider and Fries,<sup>9</sup> only about 10,000 observations have been analyzed. Further testing is clearly required to prove the robustness of what has been learned to date.

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## Definition of nursing task patient-specific task list

1. *Personal care:* Assistance with activities of daily living (bathing, dressing, using toilet, transferring from bed or chair, eating or feeding); enemas, removal of fecal impaction, suppositories for bowel regulation; ex-dwell catheter application and care; grooming and hygiene (shaving, oral hygiene, cleaning ears, bed bath, Century tub, nail care, routine foot care); special cleaning of a patient's personal area (eg, cleaning due to incontinence or eating behavior; general housekeeping or cleaning are excluded); application or restraints.
2. *Diagnostic support:* Input and output; temperature, pulse, respiration, blood pressure; collecting specimens; testing urine, dextrose sticks.
3. *Noncomplex treatment:* Hot or cold devices, soaks, nonsterile dressings; treatment for pediculosis, scabies; range-of-motion exercises, ambulation exercises (support in doing, not primarily teaching, exercises); regular turning or positioning in bed or chair; special foot care (any care other than routine trimming nails and cleanliness), usual skin care.
4. *Complex nursing procedures:* IV care, sterile dressings, tube feedings, suctioning, catheterization, routine catheter care, colostomy and/or bladder irrigation, eye or ear irrigation, oxygen therapy, postural drainage, crutch walking, hypothermia, decubitus care, tracheostomy care, taking or assisting in taking medical or social histories and/or conducting physical examination.
5. *Individual (nongroup) social and emotional care:* Social and emotional care or support, reassurance, informal counseling, reality orientation. (Record substantial care only, ie, more than a few sentences of communication.)
6. *Patient and/or family education:* Instruction for patients and/or families (includes bowel and/or bladder training, meal training, individual reality orientation, activities of daily living training, speech training).
7. *Patient group activities:* Organized group activities, eg, group reality orientation, recreation, dinner trips, picnics, sing alongs, remotivation, exercise; patient government; encouraging and/or assisting new activities in groups.
8. *Planning or recording:* Patient-specific reporting, recording, planning, or review of care, discharge planning; placing patient on seriously ill status; notification of relatives; calls to arrange tests or appointments, recording results.
9. *Medications:* Medication-related tasks such as assistance/observation in taking medications; giving injections, suppositories not for bowel regulation, medicated ointments, eye drops (exclude IVs, see 4). Include drug regulation or review. Exclude handing out unit doses and opening packages only.
10. *Observation or emergency care:* Primary attention to patient for the purpose of observing, supervising, or protecting patient; assisting or providing care during emergencies or other critical situations.
11. *Transport:* Accompanying and/or waiting for patients for clinic appointments, ancillary services, therapy visits, other medical centers.
12. *Other patient-specific activities:* Maintain training relationships with patients and families; preparing body after death.