

# Association of the Resident Assessment Instrument (RAI) with Changes in Function, Cognition, and Psychosocial Status

Charles D. Phillips, PhD, MPH,\* John N. Morris, PhD,<sup>†</sup> Catherine Hawes, PhD,<sup>‡</sup>  
Brant E. Fries, PhD,<sup>§</sup> Vincent Mor, PhD,<sup>||</sup> Marianne Nennstiel, BS<sup>‡</sup> and  
Vincent Iannacchione, MS<sup>‡</sup>

**OBJECTIVE:** To evaluate the impact of the Resident Assessment Instrument (RAI) on changes in nursing home residents' functional status, cognitive status, and psychosocial well-being.

**DESIGN:** A quasi-experiment involving the collection of longitudinal data on two cohorts of nursing home residents. One cohort was assessed before the implementation of the RAI, and the other was assessed after the implementation of the new assessment process.

**SETTING AND PARTICIPANTS:** Over 2000 nursing home residents in 267 nursing homes located in 10 geographic areas were assessed during the pre-RAI period. In the post-RAI period, 2000 new residents in 254 of the same facilities were assessed.

**INTERVENTION:** RAI implementation began in October 1990 and continued until October 1991. The RAI includes a structured, multidimensional resident assessment and problem identification system designed to form the basis for residents' care plans.

**MEASUREMENTS:** All residents were assessed at baseline and at 6 months using the Minimum Data Set for Nursing Home Resident Assessment and Care Screening (MDS) and its protocols. All data were collected by research nurses employed and trained by the research team.

**RESULTS:** Implementation of the RAI significantly reduced the rate of decline in seven of the nine outcomes under consideration. Reductions in improvement were also observed in all outcomes. In activities of daily living, social engagement, and cognitive function, the reduced decline far outweighed any reductions in improvement. In mood problems, problem behaviors, and understanding others, how-

ever, reductions in improvement were greater than any reductions in decline. Changes in the rates of decline and improvement were not uniform across all residents.

**CONCLUSION:** The RAI may have improved the quality of care of nursing home residents by reducing overall rates of decline in important areas of resident function. However, this innovation may have generated trade-offs in that it may have reduced improvement rates in some areas of function. The system's implementation also seems to have focused staff's attention on the needs and strengths of specific subpopulations of residents. Revisions of the RAI must assist staff in generalizing their efforts to all residents and to increasing improvement rates, especially in areas related to mood and behavior. *J Am Geriatr Soc* 45:986-993, 1997.

There is little dispute in the clinical literature concerning the importance of assessment in caring for individual geriatric patients. As Applegate et al.<sup>1</sup> indicated, "Comprehensive functional assessment of elderly patients in clinical settings is becoming essential for optimal clinical management." However, the available research on the effects of comprehensive geriatric assessment on population outcomes is somewhat contradictory. Reuben and his colleagues<sup>2</sup> noted that "the usefulness of comprehensive geriatric assessment as a method of improving the health care of frail elderly persons is still in question."

A number of studies of geriatric assessment have demonstrated positive effects on geriatric patient outcomes, such as functional status, mortality, hospital use, and nursing home use.<sup>3-11</sup> Other studies, looking largely at the effects of geriatric consultation teams, have shown little positive effect.<sup>2,12-14</sup>

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**For editorial comment,  
see pp 975, 1025, and 1027**

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Our research expands the discussion of the effects of comprehensive geriatric assessment by evaluating its effects in an environment quite different from that in which this process has traditionally been evaluated. First, the assessment process under investigation was implemented in a long-term care setting—nursing homes. Second, it was mandated and supported by federal regulations.<sup>15-17</sup> Third, the assessment system was implemented in a clinical environment largely controlled by nurses with limited physician involvement.

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From the \*Myers Research Institute, Menorah Park Center for the Aging, Beachwood, Ohio; <sup>†</sup>Research and Training Institute, Hebrew Rehabilitation Center for the Aged, Boston, Massachusetts; <sup>‡</sup>Program on Aging and Long-Term Care, Research Triangle Institute, Research Triangle Park, North Carolina; <sup>§</sup>Institute of Gerontology and School of Public Health, University of Michigan, and the Veteran's Administration Medical Center, Ann Arbor, Michigan; and <sup>||</sup>Center for Gerontology and Health Care Research, Brown University, Providence, Rhode Island. This research was supported by the Health Standards and Quality Bureau (HSQB) of the Health Care Financing Administration under Contract 500-88-0055. The views expressed herein are, however, those of the authors and are not necessarily shared by the Health Care Financing Administration or the authors' sponsoring organizations.

Address correspondence to Charles D. Phillips, PhD, MPH Myers Research Institute, Menorah Park Center for the Aging, 27100 Cedar Rd., Beachwood, OH 44122-1156.

This report presents the results of one aspect of the more general evaluation — the assessment of the Resident Assessment Instrument (RAI)'s impact on resident outcomes. Specifically, in nine functional areas, we investigated hypotheses concerning whether residents in the post-RAI period experienced functional decline less frequently and functional improvement more frequently than did residents in the pre-RAI period.

## METHODS

### *Research Strategy*

Because the RAI was implemented nationally beginning in the fall of 1990, a pre/post quasi-experimental design was used for the evaluation. In the pre-RAI cohort, baseline assessments occurred in September and October 1990; follow-up assessments occurred 6 months later. The post-RAI resident cohort came from the same facilities as the pre-RAI cohort and were assessed in the spring and fall of 1993. By that time study facilities had used the RAI for approximately 2 years.

The 10 study states were selected to ensure that the RAI's impact would be evaluated in diverse environments with different Medicaid rates and staffing. Data collection in each state was concentrated in the counties in one metropolitan statistical area (MSA) and in the more rural counties adjacent to the chosen MSA. The study areas were Oakland, CA; Hartford, CT; Des Moines, IA; Baltimore, MD; Minneapolis, MN; Cleveland, OH; Portland, OR; Nashville, TN; Dallas, TX; and Virginia Beach/Newport News, VA. Some 24 to 28 facilities were chosen in each area. In both cohorts, an average of eight residents were randomly sampled in each facility. The sample was representative of the more than 50,000 nursing home residents in our 10 study areas.

All data collection was completed by registered nurses employed and trained by project staff. The research nurses reviewed a resident's medical record, the most recent 3 months of nursing notes related to the resident, and the resident's care plan. They then completed a full MDS assessment, which involved interviewing multiple caregivers (e.g., aides and licensed staff from different shifts) for each resident, observing the resident's care, and interviewing the resident.<sup>17,18</sup>

The 267 facilities participating in the pre-RAI data collection comprised 85% of the eligible facilities contacted and chosen for participation by project staff. Ninety-five percent (254) of these 267 facilities also participated in the post-RAI data collection. The pre-RAI cohort included 2170 residents in 267 facilities; the post-RAI cohort included 2088 residents in 254 facilities. Residents in facilities that dropped out of the study did not differ from residents in facilities that remained. In addition, at the resident level, there was no differential attrition across the cohorts. In both cohorts, just over 80% of the residents assessed at baseline were assessed at the 6-month follow-up.<sup>18</sup>

We investigated two initial hypotheses about rates of change for each of our outcomes. These hypotheses grew out of the expected effects of bringing systematic, multidimensional assessment into nursing homes. The following specific hypotheses were tested:

1. Residents in the post-RAI cohort were significantly less likely to experience decline than were members of the pre-RAI cohort.

2. Residents in the post-RAI cohort were significantly more likely to experience improvement than were members of the pre-RAI cohort.

### *Measurement*

All the measures included in these analyses were based on MDS items. Activities of daily living (ADL) function, cognitive performance, urinary incontinence, bowel incontinence, making oneself understood, understanding others, social engagement, mood, and problem behaviors were the nine outcomes of interest. These outcomes were chosen for analysis because they are important functional areas, well captured by the MDS, that have major effects on residents' quality of life.<sup>19</sup>

To summarize the highly intercorrelated ADL measures a six-category ADL index was constructed from self-performance scores on six ADLs: transfer, locomotion, dressing, eating, toileting, and bathing, as well as the score on urinary continence.<sup>20</sup> The final reliabilities for the ADL Self-performance measures used in this analysis ranged from .89 to .98, whereas the reliabilities for bowel and bladder continence were .92 and .90, respectively.<sup>21</sup>

The primary analysis of cognitive function used a summary measure that combines MDS items into a functional hierarchy of cognitive performance. The MDS Cognitive Performance Scale (CPS) has seven categories that move progressively from relatively independent cognitive performance to extreme cognitive impairment.<sup>22-25</sup>

Communication is also a major focus of inquiry in the MDS. For this analysis, we chose the two most general items for communication, "making oneself understood" and "ability to understand others." Both items had interrater reliability values above .90.<sup>21</sup>

The MDS includes three sets of items to detect psychosocial impairment: social engagement, mood distress, and behavioral symptoms. The MDS social engagement scale is a six-item scale described elsewhere.<sup>26</sup> The MDS sad or anxious mood scale is based on 12 MDS items and exhibits moderate to good sensitivity and specificity when compared with clinical judgments made by trained facility staff.<sup>27</sup> Using these items, residents were categorized as having no problem, a mild, a moderate, or a severe problem. The MDS unsettled behavior scale is based on the four MDS behavior items (i.e., wandering, physically abusive behavior, verbally abusive behavior, socially inappropriate behavior) and the MDS items on decision-making and persistence of a mood problem. The scale placed residents in one of four categories: no problem, mild, moderate, or severe problem. Early research indicates that this scale correlates well with staff judgments concerning the severity of a resident's behavioral problems.<sup>28</sup>

For each of the nine dependent variables, a resident's status at baseline was compared with her or his status at the 6-month follow-up. Based on these comparisons, each resident was placed in one of four outcome categories: exit, declined, improved, or stable. Those residents who left the facility before the follow-up had "exited." Residents whose score on a dependent variable at follow-up was better than their score at baseline had "improved." If a resident's follow-up score was worse than their baseline score, then that resident was placed in the "decline" category.

Covariates were included in the model to ensure that the results were adjusted for changes across the two cohorts that might affect outcomes. These independent variables included

**Table 1. Pre-RAI and Post-RAI Baseline Values in Two Cohorts**

Outcome	Pre-RAI Baseline	Post- RAI Baseline	Significance of Baseline Differences*
Physical Function			
ADL Index	3.11	3.18	1.36 (.17)
Urinary Incontinence	1.85	2.06	3.12 (.002)
Bowel Incontinence	1.87	1.89	0.42 (.67)
Cognition, Communication, and Psychosocial Well-Being			
Cognitive Performance	3.03	3.06	0.36 (.72)
Being Understood	0.98	1.00	0.50 (.62)
Understanding Others	1.05	1.08	0.70 (.49)
Social Engagement Scale	3.96	4.10	1.62 (.10)
Sad or Anxious Mood Scale	1.30	1.29	-1.50 (.13)
Unsettled Behavior Scale	1.29	1.25	1.38 (.17)

\* Entries are *t* values with their probabilities in parentheses. Higher values indicate poorer function.

baseline values for the dependent variables. In addition, three scales were included in the models. Two of these scales, the CPS and the ADL index, were discussed above. The third scale was an MDS-based version of the Resource Utilization Groups-Version III (RUG-III) model.<sup>29</sup> A resident's score on this scale reflects the relative amount of direct care they receive.

### Analytic Strategy

The multivariate results derive from two logistic regression models estimated for each of the nine outcomes. One model estimated the likelihood that a resident would remain stable versus decline. One model estimated the likelihood that a resident would remain stable versus improve. When a resident had no likelihood of achieving the outcome under consideration, that resident was not included in the analysis. For example, a resident who could decline no further in urinary continence was excluded from the analysis of decline in urinary continence. Additional models were estimated to test whether other individual- or facility-level variables affected any observed differences between the cohorts. Alternative specifications for the dependent variables were also tested. Results for the individual ADLs were compared with those for the summary scale. A variety of multinomial logistic regression models were also estimated. All these analyses provided results completely consistent with the results presented below. To adjust for the effects of clustering, all results were produced using SUDAAN software,<sup>30</sup> which provides appropriate variance estimates for clustered data. In addition, in some of our 10 geographic areas, our facility sample included a large proportion of the available facilities, and

SUDAAN allowed us to use the finite population correction in our variance estimates.

The main focus of the multivariate analysis was on the presence or absence of significant parameters in the logistic regressions. Although such parameters are important, they do not provide a clear picture of what happened to the resident population as a whole. For example, assume that in the post-RAI cohort, the relative, adjusted odds of improving in ADLs were only half the odds of improvement experienced by those in the pre-RAI cohort. Also, the relative, adjusted odds of decline in the post-RAI cohort were only half the odds of decline in the pre-RAI cohort. Fewer people declined and fewer improved in the post-RAI period.

What we do not know, however, is how the changes in improvement and decline "balanced out." In other words, did the intervention keep more people from declining than it kept from improving? Using our multinomial logistic regression models, we generated estimates of the differences in the number of residents who declined and improved in the pre-RAI and post-RAI cohorts. With these estimates of the number of residents declining and improving, we constructed ratios that compared the change in decline to the change in improvement (i.e., the difference in pre-RAI and post-RAI decline divided by the difference in pre-RAI and post-RAI improvement). These ratios, basically weighted rate ratios, are reported for each outcome. A ratio above 1.0 means that the reduction in the number of residents declining was greater than the reduction in the number of residents improving.

### RESULTS

To place the results of the evaluation in context, it is important to provide some sense of how the study facilities and residents compared with the nursing home industry and nursing home resident population as a whole. Two such comparisons were carried out.

First, we compared the facilities in the MDS evaluation sample with all other Medicare- or Medicaid-certified facilities in the country using data from the Health Care Financing Administrations (HCFA)'s Online Survey and Certification Automated Record (OSCAR) system. The study sample mirrored the remaining facilities extraordinarily well in ownership, percentage Medicaid, and percentage Medicare. However, the study sample contained more large facilities due to the chosen sampling strategy, and the study facilities were somewhat better staffed than other facilities.

Second, we compared the 1990 baseline resident sample with the nationally representative sample from the 1987 National Medical Expenditures Survey-Institutional Population Component (NMES-IPC).<sup>31</sup> The study sample contained significantly more females than did the NMES-IPC (78 vs 73%,  $P < .001$ ). It also contained significantly fewer individuals with moderate ADL impairment (13 vs 19%,  $P < .001$ ), with slightly more individuals at either end of the ADL impairment scale. There were no significant differences in dementia levels, wandering, presence of physically abusive behavior, or in the age distribution of the over-65 population.

Table 1 presents residents' pre-RAI and post-RAI baseline scores on the nine outcome measures. In seven functional areas, residents' baseline scores in the post-RAI period were slightly higher than in the pre-RAI period. In two areas, mood and behavior, one saw no change or a minor reduction. However, only in urinary incontinence was the difference large enough to be statistically significant.

**Table 2. Decline, Stability, and Improvement in the Pre-RAI and Post-RAI Cohorts**

Outcome	Pre-RAI Cohort	Post-RAI Cohort	Statistical Significance*
<b>Physical Function</b>			
<b>ADL Index</b>			
Decline	25.9	18.8	<.001
Stable	43.3	55.0	<.001
Improve	12.9	9.5	.001
<b>Urinary Incontinence</b>			
Decline	19.2	17.1	.114
Stable	52.0	57.0	.003
Improve	11.0	9.1	.080
<b>Bowel Incontinence</b>			
Decline	17.7	14.9	.040
Stable	54.5	61.1	<.001
Improve	9.9	7.2	<.001
<b>Cognition, Communication, and Psychosocial Well-Being</b>			
<b>Cognitive Performance</b>			
Decline	15.3	9.5	<.001
Stable	34.5	51.5	<.001
Improve	17.3	12.1	<.001
<b>Being Understood</b>			
Decline	19.9	14.6	<.001
Stable	46.9	58.9	<.001
Improve	15.0	9.6	<.001
<b>Understanding Others</b>			
Decline	21.6	16.4	<.001
Stable	44.0	56.0	<.001
Improve	18.4	10.8	<.001
<b>Social Engagement</b>			
Decline	30.2	24.3	<.001
Stable	27.2	37.3	<.001
Improve	24.5	21.5	.039
<b>Sad or Anxious Mood</b>			
Decline	9.9	9.6	.808
Stable	59.7	65.1	.002
Improve	12.0	8.2	.002
<b>Unsettled Behavior</b>			
Decline	10.5	11.2	.547
Stable	58.0	63.0	.004
Improve	13.2	8.7	<.001

\* Probability that the sample proportions for each outcome in the pre-RAI cohort are equal to those for the post-RAI cohort.

The two cohorts were also quite similar demographically. There were no significant differences in the gender distributions or age structures of the cohorts. However, there was a significant increase ( $P < .001$ ) in the proportion of residents receiving Medicaid. In the post-RAI cohort, 65% of the residents were on Medicaid, and in the pre-RAI cohort 59% were on Medicaid.

Table 2 indicates, for each outcome, the percentage of each cohort who declined, remained stable, or improved from baseline to follow-up. In both the pre-RAI and the post-RAI periods, the modal outcome was stability (i.e., no change) between baseline and the 6-month follow-up. This

pattern was consistent across all nine outcomes. This increased stability in the post-RAI cohort was usually accompanied by both lower levels of decline and lower levels of improvement

As indicated earlier we estimated two multivariate models for each outcome. These models compared the likelihood, across the two cohorts, that a resident would experience decline or improvement versus the likelihood he or she would remain stable. The results are presented separately for those outcomes that represent physical function and for those outcomes closely tied to cognitive or psychosocial function. These dimensions of function are not independent, but they do reflect different goals of care that may demand different types of therapeutic efforts.<sup>32</sup> One might reasonably expect the RAI's impact to differ across these dimensions.

Table 3 presents the results of the analysis of differences in rates of physical decline by displaying the relative odds-ratios for the variables representing the differences between the pre-RAI and the post-RAI cohorts. In all three functional areas, residents in the post-RAI cohort were significantly less likely to decline. In addition, residents were significantly less likely to improve in the post-RAI cohort.

As the last row in Table 3 indicates, for the ADL index and urinary continence, the reductions in decline in the post-RAI cohort heavily outweighed the reductions in improvement; on balance, population outcomes in these areas were much better in the post-RAI period. For changes in bowel continence rates, the differences in decline and improvement basically balanced each other; overall population outcomes in bowel continence did not really differ across the two cohorts.

To understand more clearly exactly which residents experienced a reduction in decline or improvement, residents were categorized into four groups. The two major covariates (i.e., the ADL index and the CPS) used in the logistic regression were transformed into dichotomies. These two dichotomies created four categories of residents. The difference in the decline rates and improvement rates for each group was directly compared across the two cohorts.

The results of these comparisons appear in Table 4. The cell entries indicate for each group whether significantly fewer residents declined in the post-RAI period, whether significantly fewer residents improved in the post-RAI period, or whether the outcomes for residents in a group displayed a "mixed" pattern of both significantly less improvement and less decline. Because a number of differences were evaluated, only those differences significant at .01 are displayed. Because these analyses are bivariate, they may not exactly mirror the results presented in Tables 3.

As Table 4 indicates, in the physical functioning areas, the RAI's implementation seems to have focused staff on reducing decline among the more functionally impaired, at the possible expense of less improvement among the less impaired. Two of the three instances of significantly less improvement occurred among those with better ADL and cognitive function, whereas all three instances of significantly less decline occurred among those residents with the poorest ADL function.

Table 5 presents the logistic regression results for the models examining the likelihood of changes in cognition, communication, and psychosocial problems. As the table indicates, residents in the post-RAI cohort were significantly more likely to remain stable in their cognitive performance,

**Table 3. Adjusted Odds-Ratios for Parameters Reflecting Differences Between the Pre-RAI and Post-RAI Cohorts in Changes in Physical Function**

Outcome	Effects of the RAI on the Likelihood of:		Difference in Decline Divided by Difference in Improvement
	Decline vs Stability	Improvement vs Stability	
ADL Index	.495 (.398-.616)	.574 (.454-.727)	2.02
Urinary Incontinence	.682 (.533-.872)	.540 (.430-.724)	1.57
Bowel Incontinence	.490 (.377-.637)	.328 (.229-.470)	1.05

Values appearing in parentheses below the adjusted relative odds-ratios are the 95% confidence intervals. Only those parameters for which  $P < .01$  are displayed. Tables containing the full equations are available from the first author.

**Table 4. Impact of RAI Implementation on Physical Functioning in Specific Resident Subpopulations**

Outcomes	Subpopulations			
	Good ADL, Good CPS	Good ADL, Poor CPS	Poor ADL, Good CPS	Poor ADL, Poor CPS
ADL index	Fewer improve		Fewer decline	Fewer decline
Urinary incontinence			Fewer improve	Fewer decline
Bowel incontinence	Fewer improve			

Entries reflect mean differences in the rates of change that are statistically significant at the .01 level.

**Table 5. Multivariate Results of the Effects of the RAI's Implementation on Changes in Cognition, Communication, and Psychosocial Status**

Outcomes	Effects of the RAI on the likelihood of:		Difference in Decline Divided by Difference in Improvement
	Decline vs Stability	Improvement vs Stability	
Cognitive Performance Scale	.350 (.283-.433)	.429 (.336-.547)	1.92
Being understood	.549 (.448-.672)	.375 (.280-.504)	0.95
Understanding others	.553 (.441-.694)	.339 (.261-.440)	0.63
Social engagement scale	.495 (.390-.628)	.557 (.441-.702)	1.89
Sad or Anxious Mood Scale		.381 (.246-.590)	.10
Unsettled Behavior Scale		.495 (.366-.668)	NA

Values appearing in parentheses below the adjusted relative odds-ratios are the 95% confidence intervals. Only those parameters for which  $P < .01$  are displayed. NA = Ratio could not be computed because the post-RAI cohort evidenced increased decline and decreased improvement. Tables containing the full equations are available from the first author.

communication skills, and social engagement than were residents in the pre-RAI cohort. With this increased stability, one sees both less improvement and less decline. Only in mood and behavior was there no reduction in decline, only a reduction in improvement.

Again, we analyzed whether these outcomes were in general better in the post-RAI period by looking at the ratio of reductions in decline to reductions in improvement. For our measure of cognitive performance, the change in decline

far outweighed the change in improvement. For every individual who failed to improve in the post-RAI period, almost two individuals failed to decline. Roughly the same result occurred in social engagement. Reduced decline far outweighed reduced improvement. With being understood, the changes in decline and improvement rates were fundamentally equivalent; about as many people failed to decline as failed to improve. However, for understanding others, mood, and behavior, reductions in the post-RAI rates of improve-

ment significantly outweighed reductions in rates of decline. For these outcomes, the resident population in general fared worse in the post-RAI period than in the pre-RAI period.

Table 6 clarifies the issue of which residents declined or improved. For these more cognitive or psychosocial outcomes, residents were categorized into the same four groups used in Table 4.

Among the outcomes closely associated with cognitive or psychosocial function, the pattern of results was relatively mixed. Although most of the movement occurs among those with poor ADL status, the results for that group are relatively evenly split between reductions in improvement and reductions in decline. Among those with good ADL status, one sees three instances of less improvement and one instance of less decline. So, when compared to residents with better baseline ADL status, one sees more significant reductions in decline rates among those with poorer ADL status. When one looks at improvement rates, five of seven instances of reduced improvement occurred among two groups of residents: those with the best status (i.e., good ADL and good CPS) and those with the worst status (i.e., poor ADL and poor CPS).

**DISCUSSION**

The results supported our first hypothesis. Nursing home residents declined less rapidly after the implementation of the RAI than they did in the period before the implementation of the RAI. This result holds across seven of the nine clinical areas under consideration: ADL function, urinary incontinence, bowel incontinence, being understood, understanding others, cognitive performance, and social engagement. However, our second hypothesis, which implied an increase in improvement rates, was not supported. Significant reduction in improvement occurred in all nine clinical areas.

Looking at adjusted rates of change that balance raw changes in decline with raw changes in improvement, the resident population exhibited significantly less decline in three major areas of functioning—ADL function, cognitive performance, and social engagement. However, for understanding others, mood, and behavior, outcomes were significantly poorer in the post-RAI period.

In addition, the changes in decline and improvement were not uniform across all types of residents. In physical functioning, it seems that staff focused their efforts at reducing decline on those residents who were the most impaired. This may have occurred at the expense of dealing with opportunities to improve function among the less impaired. In other outcomes, communication, cognition, and psychos-

ocial status, we observed less improvement among those with the best or the worst baseline status in the post-RAI cohort.

Although there can be little question about the results themselves, there can be some concern about the interpretation of those results. We have attributed these changes to the RAI, but two questions must be addressed. First, how can one be sure that these changes resulted from the implementation of the RAI? Second, how could the implementation of a multidimensional assessment system reduce the rate of improvement for some residents?

It is impossible in quasi-experimental research to be absolutely certain about the genesis of any observed change. To attribute change to an intervention, one must evaluate the processes put into motion by the intervention and determine whether changes in these processes are consistent with the observed results. For example, one should not see changes in nursing home resident outcomes without seeing changes in the assessment process or in other indicators of process quality.

In this instance, evidence of the effects of the RAI on process quality is abundant. Related research has shown that the RAI generated a significant increase in the quantity and quality of data on which facility staff could base resident care plans. It resulted in facility staff addressing more of residents' care problems in their care plans, and it resulted in positive changes in other indicators of process quality.<sup>33</sup> In addition, facility staff indicated that they thought the RAI had helped them improve the quality of care in their facility.<sup>34</sup> These findings concerning facility staff perceptions and concerning changes in process quality provide a strong foundation for the claims that the observed changes in outcomes derive from the implementation of the RAI.

When interpreting the results from quasi-experiments, one must also evaluate any reasonable alternative explanations for the observed results. One of the most obvious potential threats to the validity of the conclusions reached in this research is a measurement artifact. If this research used data gathered by facility staff, then one might reasonably be concerned about this possibility. However, these data were gathered by research nurses using the full MDS protocol at each round of data collection.

Alternatively, one might argue that the observed changes are the result of some "historical" factors or some trend. The major changes that the nursing home industry faced at a national level during this period were the implementation of other OBRA-87 requirements. To evaluate this possibility, it is important to recognize exactly what was included in the

**Table 6. Impact of RAI Implementation on Cognition, Communication, and Psychosocial Status in Specific Resident Subpopulations**

Outcomes	Subpopulations		
	Good ADL, Good CPS	Poor ADL, Good CPS	Poor ADL, Poor CPS
Cognitive performance scale	Fewer decline and improve	Fewer decline	Fewer decline
Social engagement	Fewer improve	Fewer decline	Fewer decline
Being understood		Fewer decline	Fewer improve
Understanding others	Fewer improve	Fewer improve	Fewer improve
Unsettled behavior			Fewer improve

Entries reflect mean differences in the rates of change that are statistically significant at the .01 level. There were no significant differences for those in the "Good ADL, Poor CPS" category.

OBRA-87 reform package. It included the RAI, aide training requirements, restraint reduction requirements, psychotropic reduction requirements, staffing requirements, and changes in the survey process.

None of these specific reforms seems to present a reasonable explanation for the observed changes. Research indicates that the requirement related to the use of physical restraints and antipsychotic medications did have a positive effect on quality.<sup>33,35</sup> However, when we added these factors into our multivariate models, the cohort (i.e., intervention) effect was unchanged. Aide training was implemented under OBRA-87, but it would have had no effect on changes in assessment or care planning that we observed and consider precursors to the observed changes in outcomes.

The facilities in our sample were subject to new nurse staffing requirements. These facilities were somewhat better staffed than the average facility in 1990, and a comparison of the 1990 and 1993 OSCAR data indicates that there was no significant change in licensed nurse staffing or aide staffing in the study facilities.

Finally, the changes in the survey process related to quality of care were intimately linked with the intervention itself. The MDS sections and the 18 Resident Assessment Protocols (RAPs) were keyed to the 18 quality of care requirements in the new survey process. If the changes in the survey process, which one must remember is a single visit each year to a facility, improved care, they did so on the foundation created by the RAI.

Although we feel relatively comfortable attributing the observed changes to the implementation of the RAI, it is not immediately clear why the RAI should have reduced the rate at which some residents improved. Our data limit our ability to provide well-substantiated explanations for this unexpected result, but the finding is too important to be left unexplored. A number of potential explanations for these results were considered. However, when tested against the available data, only one explanation maintained credibility. The explanation most consistent with the evaluation data is that the RAI's implementation resulted in the reallocation of care resources from some groups of residents to other groups of residents.

The RAI is problem-focused, emphasizes reducing unnecessary decline, and identifies those residents with multiple problems. At the same time, facilities have implemented the RAI in an environment with relatively stable levels of resources and increasing scrutiny of outcomes by regulators. In the areas of physical functioning, the RAI's emphasis may have interacted with these other factors and caused staff to shift their attention to those residents with the greatest care needs and the highest likelihood of decline. This shift may have come at the expense of those less functionally impaired residents who could have experienced some measure of improvement.

In cognitive performance, understanding, and psychosocial well-being, the pattern of changes is somewhat more complex. One sees less attention to improvement among those least in need (i.e., good ADL and good CPS) and those least likely to benefit (i.e., poor ADL and poor CPS). Efforts at decline reduction in these areas may have been focused on those with the cognitive skills necessary to respond to any cognitive or psychosocial intervention.

This interpretation of our results has important implications for HCFA both in its future revisions of the MDS and in its implementation of the survey process. The implementation of the RAI seems to have effectively focused facilities' attention on specific areas of function and decline for different subpopulations. It is now important that the resources available in the RAI that focus on improvement in both physical function and psychosocial status be brought to bear. This means a greater focus on these issues in revisions in the RAPs, in revisions of the RAI itself, and a greater emphasis on these issues in the survey process.

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