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EFFECTS OF THE RESIDENT ASSESSMENT INSTRUMENT ON THE CARE PROCESS AND HEALTH OUTCOMES IN NURSING HOMES. A REVIEW OF THE LITERATURE

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ABSTRACT. The objective of the paper is to review the effects of the implementation of the Resident Assessment Instrument (RAI) on process measures (quality of care plans and staff satisfaction) and outcome measures (health problems and quality of life) in nursing homes. All available publications on the effects of the RAI were included in the review. The most positive effects of the RAI were found in improvements in the comprehensiveness and accuracy of the care plans. As regards outcome quality, the RAI method had most positive effects on the health condition of nursing home residents with diminished physical and mental functioning. In psychosocial areas of assessment, fewer positive effects were found. We concluded that positive effects have been found, based on pre-test–post-test non-controlled designs. Control-group designs are needed in future evaluation studies to determine if these positive results will hold.

Key words: Resident Assessment Instrument; nursing homes; quality of care; care plans; staff satisfaction; health problems; quality of life; literature review.

INTRODUCTION

The Resident Assessment Instrument (RAI) was originally developed in the United States in response to poor quality nursing-home care that gave rise to public concern (17). In 1986, the Institute of Medicine reported on the quality of care in nursing homes. To improve the quality, the need for a uniform assessment instrument was identified as a key component (14). In 1987, the U.S. Congress mandated the use of a comprehensive validated assessment instrument for nursing homes as part of the Omnibus Budget Reconciliation Act (OBRA '87). The Health Care Financing Administration contracted a research consortium to design the system, which is now known as the *Resident Assessment Instrument* (RAI) (10).

The RAI describes a nursing home resident on multiple domains of function and is derived from caregiver observations (see Appendix). These data (the Minimum Data Set or MDS) can identify ("trigger") potential problems in 18 different areas. Special Resident Assessment Protocols (RAPs) have been designed for each of these areas. These RAPs provide directional aids for the analysis and optimal management of each problem. The MDS, triggers and RAPs lead to individual care plans formulated on the basis of a structured assessment (18, 20).

The contribution of the RAI to quality assurance and improvement is expected on the basis of the following thesis: Patient assessment by means of the RAI will provide more accurate information about patients' needs. Client-tailored care plans will be formulated on the basis of this information (MDS and RAPs), which will diminish the gap between patients' needs and the care provided, and, consequently, quality of care will be improved. In this article, the effects of the implementation of the RAI in nursing homes are subdivided into process measures (effects on quality of the care process) and outcome measures (effects on health and quality of life) (4, 22).

The objective of this article is to review evaluation studies on the effects of the RAI on process and outcome measures of quality of care. The research question is: What are the effects of the RAI on: (a) process measures (the quality of care plans and staff satisfaction), and (b) the outcome measures of health problems and patient quality of life?

METHODS

The databases of Medline, Online-Current Contents, CINAHL

and Psychlit were searched using the key-words "Resident Assessment Instrument" and "Minimum Data Set". Further, members of the group working on cross-national implementation of the RAI (interRAI) were asked for manuscripts and work in progress. It is almost certain that all publications evaluating the effects of the RAI on nursing home populations or other elderly populations in long-term care facilities have been covered.

Nine publications were found, three of which concerned the same study (see Table I for methodological characteristics). We will discuss the U.S. and Japanese studies in more depth because of their complexity. In Canada and the European countries, several RAI-evaluation studies are in progress and the first publications are expected in 1999.

RESULTS

The evaluation study in the U.S. had a longitudinal cohort pre-implementation–post-implementation design, with four waves of data collection: two before implementation (fall 1990 and 6 months later), and two after (spring 1993 and 6 months later) (6, 9, 11, 16, 23, 27). The pre-RAI cohort consisted of 2,170 nursing home residents from 268 institutions in 10 states (the states were carefully selected to minimize bias). The post-RAI implementation cohort included 2,088 patients from 254 (out of the pre-test 268) nursing homes. The data were collected by specially trained research nurses. The sample was representative of U.S. nursing homes (23).

In Japan, the evaluation of the RAI implementation was carried out in 15 geriatric hospitals, 7 health facilities for the elderly and 5 special homes for the aged (13). The facilities were not representative of Japanese long-term care settings. The chosen facilities were selected by the research group on the basis of their high quality. However, even in these facilities, implementation was erratic, to the point that 9 facilities had to be excluded from the analysis. Data on the care plans were available from 7 geriatric hospitals, 6 health facilities for the elderly and 5 special homes for the aged. The evaluation consisted of two parts: first, cross-sectional samples from 90 care plans were compared at the time of their introduction with 92 care plans one year later, on the percentage of triggered RAP's addressed; second, 135 care plans at introduction were examined and compared with 147 care plans one year after introduction, using selected standards.

Process measures: quality of care plans and staff satisfaction

In the U.S. study, residents' care plans and the facilities' medical records were evaluated for accuracy of information and comprehensiveness of information (number of RAPs addressed in the care plan) (Table I) (9). For each resident in the pre- and post-implementation cohort, data in the medical record collected by specially trained research nurses were compared on 23 critical MDS items. In the post-RAI records, the information on MDS items was more accurate: the percentage of residents that had >90% of the 23 items accurate increased from 17.6% to 48.6% after RAI implementation. There was also a significant increase in the number of care plans, addressing 12 out of 18 RAP areas: cognitive loss, visual function, communication, ADL rehabilitation, incontinence–catheter, mood state, behaviour, falls, nutritional status, dehydration, dental care and psychotropic drug use. Pressure ulcer was significantly addressed less.

In the same study, other process measures of quality of care were evaluated. In the post-RAI group there were fewer residents' using physical restraints (9.5% decline) and indwelling catheters (29%); and increases in the use of toiletting programs (5.1%), behaviour management programs (5.9%) and hearing aids (9.6%) for those who seemed to need it. There was also an increase in the presence of advanced directives (64%). Changes on the following indicators were not statistically significant: "preventive skin care", the use of antidepressives or antipsychotics–hypnotics, the number of residents with inadequate vision who did not have glasses, toiletting programs for urine incontinency and residents with mood problems who receive therapy.

In Japan, the evaluation study showed that one year after the implementation of the RAI the following RAPs were at least 10% more frequently addressed in the 90 care plans: falls (13.3%), nutritional status (14.0%) and dental care (10.9%) (13). Interestingly, a number of psychosocial RAPs were less often addressed: mood state (36.8% less), behaviour problem (27.5%) and psychosocial well-being (12.5%) (Table I). An improvement in the quality of the contents of the care plans was found with respect to a number of selected standards that were derived from an expert panel: "relationships between problems taken into account" (21.1% increase), "specific, individualized contents" (20.3%), "role of each member of staff" (19.5%), "future risks, options, prognosis taken into account" (17.1%), "improving and maintaining ADL and quality of life" (11.1%), and "enliven daily through activities" (7.4%) (13).

As a second indicator of process quality, we examined the available studies to determine if the RAI was appreciated by the professionals who worked with it.

Table I. *Methodological characteristics of effect evaluations of RAI*

Study	Design	*n*	Dependent variable	Measuring instruments	Effects	
					Process	Outcome
Hawes et al. (9) (US)	quasi experimental repeated measure	ca. 2100 patients	- care plans accuracy and comprehensiveness - quality of care process indicators	- analyses of patient dossiers	- improved accuracy careplans - more comprehensiveness in 12 out of 18 RAPs - improvement on quality indicators	
Fries et al. (6) (US)	id.	id.	- selected health conditions and problems	- MDS items - RAPs - CPS - ADL		lower prevalence of dehydration and static ulceration - higher prevalence of pain - less decline and less improvement of vision, nutrition, falls, decubitus
Mor et al. (16) (US)	id.	id.	-transitions to hospital - mortality - transition to home	- analysis of records	- lower hospitalisation rate - no effect on mortality or home discharge	
Phillips et al. (27) (US)	id.	id.	- 9 physical, mental and social functional areas	- MDS items		- less decline in all but sad- - anxious mood and unsettled behaviour
Phillips et al (24) (US)	posttest	236 DONs	- satisfaction with RAI	- telephone interviews	- resistance to implementation - assessment and care planning qualitatively - better - more involvement resident and family	
Dorman-Marek (5) (US)	posttest	191 (staff and residents)	- staff and residents perceptions of progress since OBRA '87	- structured and open end interviews	- improvement quality of care	
Ikegami et al. (12) (Japan)	pretest–posttest	18 facilities	- quality of care plans - address of RAPs	- analyses of patient dossiers - MDS	- improvement process quality - 4 RAP areas more addressed - 3 RAP areas less addressed	- lower prevalence of falls nutrition and dental problems - decrease in psychosocial well-being, mood and behaviour

ADL = activities of daily living, CPS = Cognitive Performance Scale (derived from MDS-items), DON = Director of Nursing, MDS = Minimum Data Set, RAI = Resident Assessment Instrument, RAP = Resident Assessment Protocol.

Evaluation studies of staff satisfaction have been carried out in the U.S., where RAI was mandatory. A post-implementation telephone survey assessed the opinions of Directors of Nursing and facility administrators about the RAI (Table I) (11, 24, 25). On the basis of 236 interviews, it was found that 63% of Directors of Nursing said clinical staff had strongly opposed RAI during RAI implementation, and 43% said that staff was still resistant to using the RAI after implementation. Although 68% of the administrators thought RAI presented an excessive paperwork burden, 64% said it was worth the time and effort spent by staff. The vast majority of Directors of Nursing thought that the RAI was an improvement compared to the former assessment instrument, that assessment and care planning were qualitatively better and that the ability of the staff to assess the functional as well as cognitive status had improved after the implementation of the RAI.

In another study, 191 structured and open interviews were held in 18 nursing homes in 6 states in the U.S. (none of which were involved in the large evaluation study) (5). The sample included 132 professionals (21 administrators, 36 licensed nurses, 18 certified nursing assistants, 15 advocates, 15 professional associations, 27 regulators) and 59 residents (Table I). The interview contained 27 items about the changes in quality of care and quality of life after the OBRA '87 regulations. Ninety-six out of 132 professionals (73%) said the MDS was the most helpful component of OBRA '87. The MDS was described as a tool able to give a "whole picture" of the resident, allowing nurses to "know the resident better", and it was seen by care providers as a practical instrument for providing better care. Of 132 professionals, 86 (65%) stated that working with RAPs improved assessment, analysis and care plans. However, only 10 professionals indicated that it was a "major improvement"; others were less enthusiastic.

Outcome measures: health problems and quality of life

In the U.S., the prevalence and changes (improvement or decline) of eight selected health conditions and problems were studied in the evaluation cohorts (6). Dehydration had a lower prevalence after RAI implementation (2% pre vs 1% post), and the same applied for "static ulcers" (which showed a decline from 4.5% to 3%) (Table I). The prevalence of "daily pain" however had a higher prevalence after implementation (13.4% pre vs 17% post). Significant changes in the prevalence of "falls", "malnutrition", "decubitus", "vision" and "poor teeth" were not observed. For "malnutrition", "vison", "falls" and "decubitus" there were reductions in both the 6-month rate of decline and improvement.

Table II. *Effects of RAI on quality of life indicators*

Indicator	Difference in decline divided by difference in improvement (in pre-RAI and post-RAI cohorts)
Physical functioning	
ADL index	2.02
Bowel incontinence	1.05
Urinary incontinence	1.57
Mental functioning	
Cognitive Performance Scale	1.92
Sad or anxious mood	0.10
Unsettled Behaviour Scale	– *
Social functioning	
Social Engagement Scale	1.89
Being understood	0.95
Understanding others	0.63

This table is based on the results published by Phillips et al. (27).
Ratio >1 means reductions in decline outweigh the reductions in improvement.
* Increase of decline and decrease of improvement, no ratio could be computed.

In the large U.S. evaluation study, several quality of life indicators were assessed twice in each of the pre- and post implementation waves (Table I) (19, 27). Baseline differences for these two groups existed only in the incidence of urinary-incontinence (in the post-RAI cohort there was more incontinence). In this study, the hypothesis was tested that residents in the post-RAI group improved more and declined less on several functions. It was found that in all three functional areas, residents in the post-RAI cohort were less likely to decline, but also less likely to improve. To compare change in decline to change in improvement, estimates were generated of the differences in the number of residents who declined and improved in the pre-RAI and post-RAI cohort. With these estimates, ratios were calculated that compare the change in decline to the change in improvement in the cohorts (Table II) (27).

In general reductions in decline in the post-RAI cohort outweighted reductions in improvement. However, for "understanding others", "sad mood" and "unsettled behaviour" the reduction in improvement outweighted the reduction in decline. It should be noted that the changes were not the same for all groups of patients: for example, the residents who scored better on ADL and cognition in particular showed less improvement, and the

most impaired residents showed less decline after RAI implementation.

Analysis of the two cohorts revealed that the RAI had no significant effect on mortality (6.8% vs 7.5%) or home discharge (1.9 vs 1.1%) (Table I) (16). However, an overall 28% decline in transfers to hospitals was noticed. Hospitalization in those with severe cognitive impairment declined from 20.1% to 13.5%. Furthermore, 15.9% of survivors with stable ADLs were hospitalized in 1990 while in 1993 the hospitalization rate declined to 10.9%. For those who declined in ADL, there was an increase in hospitalization from 25.2% in 1990 to 40.6% in 1993 after RAI implementation. These results suggest that there is better selection of those residents who will benefit most from hospitalization.

DISCUSSION

The most important effects of the RAI are found in indicators of the care process. The comprehensiveness and accuracy of the care plans improved, especially in the U.S. From a methodological point of view, one could object that the standard by which these care plans were compared was itself derived from the MDS items or RAPs. The research into the development and testing of the MDS and RAPs created a standard for quality of care in the U.S. (21). In Japan, improvements were found in the quality of care too. However, these results must be interpreted carefully, because of the selection-bias and fall-out of the participating facilities. In interviews with Directors of Nursing in the U.S., resistance to the implementation of the RAI was found. This may be related to the fact that the implementation of the RAI was mandatory and that the RAI training programmes offered by the nursing home management differed greatly from one nursing home to another (personal communications).

As regards outcome indicators of care, the implementation of the RAI showed encouraging general effects. The RAI method appears to have the most positive effects on the most impaired residents, since they declined less rapidly in function. Residents who score better on physical and mental functioning improved less after the RAI implementation. This could be due to a statistical ceiling effect. Another explanation could be that there is a shift in care to those who seems to need it most, potentially a result of the RAI's objective to assess patient needs. The overall effects showed a stabilization of the sample, with fewer residents declining and fewer improving.

Positive effects on specific health problems were found, particularly on dehydration and pressure ulcers. An interesting fact was that more daily pain was registered. Perhaps this is because there is no RAP for pain. This result suggests that assessment with the RAI is strongly guided by the other RAPs.

In general, the psychosocial areas of assessment showed few positive effects. Indeed, in the U.S. study three indicators of psychosocial functioning showed a net negative result (Table II). The lower impact of the RAI on psychosocial outcomes deserves more study.

An important positive effect was the decline in hospital admissions in the U.S. and the shift in residents who were hospitalized. This can be attributed partly to a trend in the U.S. towards death occurring in nursing homes rather than in hospitals (2, 16, 29). However, the increase in the proportion of deaths occurring in nursing homes was small in comparison to the decline in hospitalization. It seems possible that the RAI helped reduce the incidence of serious conditions, or exacerbations of chronic diseases, and may have been helpful in selecting residents who could benefit most from hospitalization.

With regard to the methodological soundness of the evaluation studies, it should be noted that the positive effects found in the U.S. studies were based on a non-controlled design. Although the interrupted time series design (with large representative cohorts) that was used is a powerful approach, without control groups it is difficult to attribute the observed effects *solely* to the implementation of the RAI. Because the RAI was nationally implemented, a randomized controlled trial was impossible. Furthermore, as one part of a set of regulations (OBRA '87) for improving the quality of care, one could argue that these regulations highlighted the flaws and were an incentive to provide better care. The research design of the Japanese evaluation study also lacked a control group. With regard to the outcome measures of the RAI, some have argued that the perspective of the residents has received little attention in the evaluation studies (30, 33).

The lack of randomized controlled trials and the lack of information on residents' experiences has prompted the call for a definitive evaluation study, with control groups, in the Netherlands. This evaluation includes studies on process measures of quality of care plans and staff satisfaction, as well as process and outcome measures of perceived quality of life.

For future research, the implementation of the RAI in different countries on different continents provides excellent opportunities. Data sets with identical patient

records have become available, since in each country the standardized RAI method is being implemented in a similar manner, a process that is monitored by the interRAI group with members in all participating countries (1, 3, 7, 8, 12, 15, 28, 31, 32). However, international comparisons have their drawbacks. Because of baseline differences (e.g. patient populations, local health policies) and contextual factors (e.g. accreditation, reimbursement, quality assurance) for the implementation of the RAI in the different countries, the impact of the RAI cannot be expected to be internationally consistent, and also needs to be considered from national and local perspectives.

Improving quality of care and quality of life in long-term elderly care is a major challenge worldwide, and the implementation of the RAI has shown it to be a very promising scientific and practical instrument for these improvements (26).

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APPENDIX 1.THE RESIDENT ASSESSMENT INSTRUMENT FOR NURSING HOMES

The Resident Assessment Instrument (RAI) is a method for comprehensive functional assessment of nursing home residents, with the object to guide the development of individualized care plans.

RAI consists of:

- a Minimum Data Set (MDS)
- an identification of problem areas
- specific Resident Assessment Protocols (RAPs)
- a user's manual

The MDS is a core of assessment items that provides a comprehensive picture of each resident's functional, cognitive and emotional status and a variety of other areas, including resident's strengths, preferences and needs (see MDS sections in table below). The full MDS assessment is repeated yearly. In addition, a quarterly review is done with a subset of MDS assessment items. This review is intended to monitor the resident's response to the care plan and determine whether sufficient change has occurred to trigger a more comprehensive assessment.

Problem areas are identified by applying a set of algorithms to a resident's MDS data, that will suggest problems, risks for development of a problem, or potentials for improved function.

The 18 condition-focused RAPs (see table below) specify additional assessment of identified problem areas in the resident's status. The protocols are intended to more directly link the MDS information to care plan decisions. Facility staff then use the more specialized assessment guidelines found in the RAPs to identify potentially treatable causes and focus decisions about the resident's plan of care and services.

The user's manual provides detailed specifications about how to complete the MDS and RAP assessment process (e.g. interviewing staff, residents and family members, reviewing records), and contains item definitions, examples of coding options and clinical guidelines for using the RAPs to develop care plans.

Minimum Data Set items (MDS)

- Background and customary routines
- Communication–hearing patterns
- Physical functioning and structural problems
- Mood and behaviour patterns
- Disease diagnoses
- Oral–nutritional status
- Skin condition
- Special treatments and procedures
- Cognitive patterns
- Vision patterns
- Continence
- Activity pursuit patterns
- Health conditions
- Oral–dental status
- Medication use

Resident Assessment Protocols (RAP's)

- Delirium
- Visual function
- ADL functional–rehabilitative potential
- Psychosocial well-being
- Behaviour problem
- Falls
- Feeding tubes
- Dental care
- Psychotropic drugs
- Cognitive loss–dementia
- Communication
- Urinary incontinence and indwelling catheter
- Mood state
- Activities
- Nutritional status
- Dehydration–fluid maintenance
- Pressure ulcers
- Physical restraints

In the U.S., the RAI is mandated for all Medicare–Medicaid nursing homes. In Europe, Canada and Japan the RAI has been implemented in the assessment of institutionalized, frail elderly people on a more voluntary basis. In Japan, RAI is recommended (not mandated) by the Ministry of Health and Welfare for three types of long-term care facilities for the elderly: geriatric hospitals, health facilities for the elderly and special homes for the aged. In several European countries (Iceland, Denmark, Sweden, United Kingdom, France, the Netherlands, Germany and Italy), local initiatives have been taken to start implementation of RAI in a restricted number of nursing homes. In Iceland, RAI is mandatory and used in all nursing homes.