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Improving Nutrition Care for Nursing Home Residents Using the INRx Process

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Abstract

The purpose of this article is to describe the Individual Nutrition Rx (INRx) assessment process and report findings on elder nutritional status, common nutrition problems identified by the INRx process, resolution outcomes from each problem, and the most efficacious approaches used to address the identified nutrition problems. The study used a two-group prospective quasi-experimental design with measures taken at baseline and at 6 months. Participants in the treatment group (n = 41) received the 6-month INRx assessment process, while residents in the comparison group (n = 40) received routine care specific to their nursing home. The most frequent nutritional problems identified were appetite change, poor positioning while eating, and problems with oral status. A total of 39 approaches were recommended by the interdisciplinary research team. Serum albumin and prealbumin, and depression scores were all significantly improved post intervention. The problems, approaches, and outcomes identified during the INRx process support the premise that interdisciplinary teams following the INRx process can assess complex nutritional problems and influence outcomes for older adults living in nursing homes.

Keywords

Nursing home; aging; nutritional status; assessment process

INTRODUCTION

Nutrition is a major problem in nursing homes as evidenced by up to 85% of elders suffering from malnutrition (Rowe & Kahn, 1998). Nutritional deficiencies are frequently not recognized, are often the common underlying cause of adverse clinical outcomes, and are often not treated despite the fact that opportunities for preventing or correcting under nutrition are available. Abbasi and Rudman (1994) identified 14 modifiable causes of malnutrition, however, no intervention studies were found to target these modifiable causes. In response to this need, the researchers developed and pilot tested the INRx (Individual Nutrition Rx) assessment process. The INRx process is a six-step, systematically applied, proactive treatment package. The purpose of this article is to describe the Individual Nutrition Rx (INRx) assessment process and report findings on elder nutritional status, common nutrition problems

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identified by the INRx process, resolution outcomes from each problem, and the most efficacious approaches used to address the identified nutrition problems.

Individualized Nutrition Rx (INRx) Process

The INRx assessment process can be best described as a systematically applied, *proactive* treatment package with six components. In Step 1, high-risk residents are identified using variables from the Minimum Data Set (MDS), found to be predictive of weight loss during a preliminary study (Crogan & Corbett, 2002; Crogan, Corbett, & Short, 2002; Corbett, Crogan, & Short, 2002).

In Step 2, these same high-risk residents are given the choice of eating in family-style dining, small group dining, or in-room dining (by the research nurse). Family-style dining promotes socialization with thepassing of food among residents and allows the residents to select the types and amounts of food they want to eat (Klusch, 1995).

Step 3 details the comprehensive assessment. Items assessed in Step 3 include those areas that are assessed by the Registered Nurse, Dietitian, and Pharmacist. The Registered Nurse was responsible for assessing ability to follow instructions, vision/hearing, dental status, finger movement/grasp, wrist/elbow movement, hand-to-mouth coordination, positioning, upper extremity tremors, chewing/swallowing ability, resident motivation, and food intake. The nurse's assessment summary included recommendations regarding specific adaptive devices, strategies for addressing food concerns, type and amount of eating assistance needed by the resident, a progressive self-feeding program (for residents needing retraining in how to feed themselves), and needed referrals to other health care practitioners.

The Dietitian queried resident's food likes and dislikes, determined resident food choice, ensured good food quality and presentation, and assessed the resident's nutritional status using a standardized nutritional assessment format. The Dietitian's assessment summary included recommendations regarding the addition of food during activity programs; changing food presentation to finger foods that are easily self-fed by the resident; or the initiation of one-item feeding (for residents needing less stimuli or who feel overwhelmed with a full plate of food). Nutrition summaries and recommendations were routed to the Registered Nurse on the research team to incorporate into the plan of care.

Since the use of multiple medications by nursing home residents may contribute to malnutrition (Varma, 1994), a pharmacist reviewed residents' medical records for pharmaceutical causes of anorexia, signs of confusion, agitation, or over-sedation that might be drug related, and possible drug-drug or drug-nutrient interactions. She/he assessed drug dosages and scheduling problems that could have affected food intake or nutritional status. The pharmacist's assessment summary included recommendations regarding drugs, drug doses, and scheduling. Pharmacy summaries and recommendations were routed to the registered nurse on the research team to incorporate into the plan of care.

Step 4a includes multiple approaches to meet the individualized care needs of residents. The specific approaches were chosen based on their proven ability to increase food intake. In a study to improve self-feeding skills in demented nursing home residents, Van Ort and Phillips (1995) tested contextual (environmental) and behavioral approaches with seven residents from one nursing home. Nursing interventions to modify the environment (positioning of residents at a dining table, offering fingerfoods or items one at a time) and behavior modifications (use of systematic prompting, cueing, verbal and tactile prompts, verbal reinforcements) were found to promote self-feeding skills and maintain residents' weight. Baltes and Zerbe (1976) had similar results in reestablishing self-feeding in nursing home residents using behavior modification approaches.

Step 4b is the organized referral to other healthcare practitioners or supportive programs, such as specialized rehabilitation (speech therapy, occupational therapy), dentistry, or the resident's primary care physician. Internal programs such as a "Progressive Self-Feeding Program" or an "Activity Program with food" use the same behavioral and environmental approaches (discussed already), but in a more supportive and structured setting within the nursing home. This process was used any time the resident required services outside what the intervention team could initiate (e.g., occupational therapist can recommend adaptive equipment to support resident while eating) or when the service requires a referral within the nursing home (e.g., referral to progressive self-feeding program).

Step 4c is the orientation of staff to the implementation of new approaches. A training and resource manual was developed for use by research team members and staff of the treatment nursing home. Section three of the manual is a treatment guide to assist research personnel to understand each step of the process and identify appropriate interventions. It includes approaches to eating rehabilitation, guidelines to correct positioning, a list of positioning problems and interventions, and a table of resident problems, equipment options, and related interventions. The goal of the training guide was to provide the framework for the review of study procedures with facility staff, and to periodically orient or train staff when new interventions were added to the plan of care.

Three orientation sessions, led by the principal investigator (PI), were presented during the study to orient the treatment nursing home's healthcare team to study procedures, introduce members of the research team, describe linkages between research personnel and nursing home staff, review the care plan evaluative process, discuss the study time line, and provide an opportunity for questions. Periodic mini-training sessions, led by the PI or Registered Nurse (on the research team), described the assessment process leading to the identification of the individualized intervention, provided an opportunity for learning "how to" implement the intervention and review the care plan evaluative process, and provided an opportunity for questions.

After the initial assessment and identification of approaches and needed referrals, weekly re-assessments by the nurse and dietitian and monthly re-assessments by the pharmacist (Step 5) were followed by additional modifications to the plan of care, if necessary (Step 6). This included additional referrals and feedback to staff regarding the progress of residents within the study.

Different from the initial in-depth assessment, the weekly assessments involved the review of previous assessments and included a review of the medical record (for documented changes from the last assessment), and included other approaches such as observation (of the resident while eating), interview of care staff, or an interview with the resident. The goal was to determine the effectiveness of the original approaches and to identify new or ongoing resident problems.

METHODS

Research Design

This study used a two-group prospective quasi-experimental design with measures taken at baseline and then at 6 months. Participants in the treatment group (Nursing Home A) received the 6-month INRx assessment process while residents in the comparison group (Nursing Home B) received routine care specific to their nursing home.

Sample and Setting

A convenience sample of nursing home residents (N = 81) from two 250-bed for-profit southwest nursing homes were invited to participate in the study. To be included in the study, residents had to be at least 65 years of age, have one of more risk factor for malnutrition (i.e., weight loss, leaves 25% or more of food uneaten at most meals, depression, or change in ability to participate in ADL/a.m. to p.m.), had lived within the nursing home at least 3 weeks, exhibited normal to moderately impaired cognitive abilities (measured by Mini Mental State Examination (MMSE) > 11), and not have an end-stage terminal diagnosis (renal disease, cancer, primary diagnosis of COPD). All procedures were approved by the University of Arizona Institutional Review Board (IRB) prior to recruitment of participants.

Study Measures

Body Mass Index (BMI) is determined by dividing the person's weight in kilograms by the height in m^2. Resident weights were obtained by the research Registered Nurse (or research associate) on a chair scale that was calibrated by nursing home maintenance staff on a weekly basis. Each participant was weighed at rising while she/he was still dressed in bed clothes. Heights were calculated based on kneeheight calculations using calipers (completed by research Registered Nurse). Obtaining accurate values for heights in the elderly can be problematic. Loss of vertebral mineralization and volume in intervertebral disks results in loss of height. However, long bones do not shorten with age (Moore, 2001). Therefore, knee height (length from sole of foot to anterior thigh with both ankle and knee bent at 90[H11034] angle) was determined and height calculations based on gender specific formulas (Moore, 2001) were done. BMI was calculated from these two figures.

Serum albumin is an indicator of depleted protein status and decreased dietary protein intake. Normal values for serum albumin are 3.5-5.0 g/dL. Serum albumin is slow to change during malnutrition because of its long half-life (14-20 days). Thus, when used alone, albumin is not the best way to measure nutrition status. Another indicator of serum protein is prealbumin. Prealbumin changes rapidly in malnutrition because of its short half-life (2-3 days) (Moore, 2001). Normal values for prealbumin are 10-40 mg/dL. Both albumin and prealbumin were measured. A local laboratory company provided phlebotomy services and laboratory analysis using standard testing methods for albumin (Bromcresol green testing method) and prealbumin (Photometric turbid metric testing method). Both of these methods have good sensitivity and reproducibility (Sonora Quest Laboratories, 2002; Henry, 2001).

Functional status was measured using the Katz Index of Independence in Activities of Daily Living. The Katz Index of Independence in Activities of Daily Living (Katz ADL), an observational tool, is a measure of performance (what the person does rather than what the person is capable of doing). The tool has consistently demonstrated its utility in evaluating the functional status in older populations. Clients are scored "yes" or "no" for independence in each of six functions (bathing, dressing, toileting, transferring, continence, feeding). A score of six indicates full function; four indicates moderate impairment, and two or less indicates severe functional impairment. It was found to be highly reliable and sensitive to change in the elderly in homecare and boarding homes (Sherwood, Morris, Mor, & Gutkin, 1977). Overall ADL scorescorrelate with range of motion and cognitive function (Katz, Down, Cash, & Grotz, 1970). The coefficient of reproducibility (which measures Guttman characteristics) is 0.95-0.98. Tests of validity show the scales is highly correlated with house confinement, mobility post-hospital, and with the MMSE (r = 0.76) (Katz, 1983; Katz et al., 1970).

Depression was measured using the Geriatric Depression Scale (GDS) (Yesavage et al., 1983; Sheikh & Yesavage, 1986). The GDS is a brief questionnaire that asks participants to respond yes or no to 30 questions in reference to how they felt on the day of administration.

Items are summed to obtain a total score and scores of 0-10 are considered normal, 11-20 indicates mild depression, and 21-30 indicates severe depression. The scale has been shown to have internal consistency (Brink et al., 1982). Tests of validity show the scales correlates highly with other established depression scales (e.g., Hamilton Rating Scale for Depression, Zung Self-Rating Scale for Depression). The GDS has been found to be a valid indicator of depression in mildly to moderately cognitively impaired elders (Parmelee, Kats, & Lawton, 1989).

Perceived Quality of Life was measured using the Quality of Life-AD Scale. This instrument measures quality of life of older adults with Alzheimer's disease (AD). Since many nursing home residents suffer from cognitive changes and/or dementia, an instrument that can be successfully administered and completed by most residents was chosen. The Quality of Life-AD Scale is a 13-item instrument that asks respondents to rate physical health, energy, mood, living situation, memory, family, marriage, friends, self, ability to do chores, ability to do things for fun, money, and life as a whole. To obtain a total score, the items are simply summed. The instrument has acceptable internal consistency (alpha = .84) and test-retest reliability (.76) (n = 30; 1 week). Tests of validity show the scale correlates well with related, objectively assessed constructs such as the ADL-IADL, Geriatric Depression Scale, PES-AD, and Physical functioning (SF-36) ($p < .001$) (Logsdon, Gibbons, McCurry, & Teri, 2002). The SF-36 was not chosen for this study because McHorney (1996) found that when used with older adults floor effects were problematic for the role-functioning scales and ceiling effects were problematic for pain, social functioning, and role-emotional. Moreover, the sensitivity to change of the SF-36 for this population has not been demonstrated (McHorney, 1996). In a study by Logsdon et al. (2002), older adults (N = 177) who scored >10 on the MMSE were able to complete the Quality of Life-AD instrument. Scores ranged from 0 to 29, with a mean score of 16 (SD = 7).

Implementation of INRx Process

An extensive, biweekly Registered Nurse assessment process and chart review by a licensed dietician and registered pharmacist was used to identify nutritional problems in the treatment group. The interdisciplinary research team, consisting of an experienced long-term care Registered Nurse, a doctorally prepared nurse researcher, a long-term care consulting pharmacist, and a Registered Dietitian met weekly to review assessment findings for treatment group residents. Research-based approaches were collaboratively determined and relayed to nursing home staff for implementation. Recommendations were routed (by the research Registered Nurse) to the facility dietitian/food service supervisor for diet changes, to the charge nurse for supportive programs, to the physician for medication changes, and to specialized rehabilitation for position and adaptive equipment.

Problems, approaches, and outcomes were recorded for each resident in the treatment group. Nutritional problems were grouped into seven main categories by the interdisciplinary research team. The team served as their own panel of experts, offering support for the face validity of the categories. Approach and outcome categories for each problem were established in a similar manner. Outcome categories included resolved, improved, no change, or declined. At the conclusion of the study, the interdisciplinary team coded an outcome for each resident nutritional problem.

Data Management and Analysis

A research associate entered all research outcome variables into a computer database. Outcomes included: demographic data, body mass index (BMI), serum albumin, serum prealbumin, depression [Geriatric Depression Scale], functional status (Katz ADL scale), and

quality of life (Quality of Life-AD scale)]. All data were cleaned and organized prior to analyses and is reported only in the aggregate.

Resident groups were compared on all demographic and study variables at baseline to ensure initial comparability using *t*-tests for interval data, Chi-square for nominal data and the Mann-Whitney U statistic for ordinal data. Outcome data were analyzed using repeated measures ANOVA. The dependent variables were nutritional status (BMI, albumin, prealbumin), depression (GDS), functional status (Katz ADL scale), and quality of life (Quality of Life-AD scale).

RESULTS

A total of 81 residents participated in the study (n = 41 treatment (Nursing Home A), n = 40 comparison (Nursing Home B)). Treatment group residents were significantly older than comparison group residents (mean 84.8 years of age (SD 7.29) vs. 79.0 years of age (SD 8.04); $p = .001$) and most residents were female (Nursing Home A: 33 female, 8 male; Nursing Home B: 28 female, 12 male). Thirty-one treatment group residents and 30 comparison group residents completed the study. Resident discharge (to acute care, assisted living, or home) or death led to participant attrition from the study.

Pre and Post Resident Outcomes

Study outcomes of BMI, measures of serum protein (Albumin & Prealbumin), depression (GDS), functional status (Katz ADL scale), and quality of life (Quality of Life-AD scale) are described in Table 1. Serum albumin and prealbumin, and GDS scores were significantly different post intervention.

Nutrition Problems

Using the INRx assessment process, 57 nutritional problems (within seven categories) were identified by the interdisciplinary research teamwith an average 1.83 (SD 0.96) problems per resident (see Table 2). The most frequent nutritional problems identified were appetite change, poor positioning while eating, and oral status. These problems included such issues as chronic pain, depression, weight loss, very high table, and uncomfortable wheelchair (see Table 2). More than 50% of all intervention group residents had one or more of these modifiable problems. Other problems identified included difficulty feeding self (owing to poor hand/mouth coordination, poor vision, or unable to reach items on tray); poor nutritional status (abnormal serum potassium, albumin or prealbumin levels); environment not conducive to eating (noisy dining room, nonsupportive dining room staff); and personal preferences not honored. Of the problems identified, 68% (39 of 57) either improved or were resolved post intervention, 28% (16 of 57) did not change, and only 3.5% (2 of 57) deteriorated (declined) (see Table 2).

Approaches

The interdisciplinary research team recommended 39 approaches, grouped into 6 categories, a total of 103 times. The category with the largest number of approaches was Diet Change (43 recommended diet changes), followed by referrals to all disciplines (see Table 3). Approaches most commonly recommended were: High Density Diet (the addition of butter, protein powder to foods), the addition or deletion of a High Protein Drink, resident-requested small group dining (family stylein private area), the use of antidepressant medications, and the repair of dentures (see Table 3).

DISCUSSION

Prior to the initiation of this study, 11 treatment (26.8%) and 6 comparison (15%) group residents had a BMI < 22, indicating malnutrition. The number of residents with a BMI < 22 did not change significantly post intervention for either group. However, the percentages were lower than the prevalence of malnutrition in nursing homes reported in other studies (Rowe & Kahn, 1998; Frisoni et al., 1994).

Serum prealbumin was the most sensitive measure of nutritional status and evidenced the greatest improvement post intervention. Specifically, 35% of treatment group residents and 32.5% of comparison group residents had baseline values < 20 mg/dL (indicating decreased protein levels). Following the intervention, only 4% of treatment group residents and 10.3% of comparison group residents had prealbumin levels < 20 mg/dL, suggesting nutritional status improved for all residents in the study, with the most significant improvement found with the treatment group residents. Serum prealbumin has been previously reported as the most sensitive measure of protein-calorie malnutrition (PCM) available (Moore, 2001).

The most frequent nutritional problems identified through the INRx assessment process were appetite change, poor positioning while eating, and oral status. These problems are not new to older adults residing in nursing homes and are similar to the modifiable causes of malnutrition described by Abbasi and Rudman (1994). Issues such as positioning and dentition have a direct impact on food intake and may influence nutritional status. Addressing these problems using an interdisciplinary focused approach may reduce their impact on resident's overall health status and improve the quality of life for older adults.

Another problem that can influence elder nutrition status is depression. The overall incidence of depression in the elderly is approximately 10% (Schlenker, 1998). In the nursing home, the incidence of depression is unknown but it is believed to be relatively high. In this study, 46.3% (14 of 41 moderately depressed, 5 of 41 severely depressed) of treatment group residents and 50% (20 of 40 moderately depressed, none were severely depressed) of comparison group residents were depressed (GDS scores 11 or higher). During the INRx assessment process, the researchteam found that 7 of the 19 (36.8%) depressed treatment group residents did not have a medical treatment plan in their medical records to address depression. Early assessment of depression and the use of antidepressant medication can address depression as a risk factor for malnutrition among nursing home residents.

Inadequate food intake and the subsequent nutritional deficiencies can lead to depression in older adults (Shils, Olson, & Shike, 1994; Schlenker, 1998; Fitzsimmons, 2001). In this study, the percentage of treatment group residents with depression decreased 17.1% post intervention (46.3-29.2%). The percentage of comparison group residents with depression decreased 9.4% (51.3-41.9%). Concurrently, addressing depression and inadequate food intake could impact the subsequent nutritional deficiencies commonly found in nursing home elders.

CONCLUSION

The problems, approaches, and outcomes identified during the INRx process support the premise that interdisciplinary teams following the INRx process can assess complex nutritional problems and influence outcomes for older adults living in nursing homes. The interdisciplinary team initiated all of the recommendations implemented during this study. Specifically, the team recommended 39 specific approaches, used a total of 103 times. Only 26 approaches (25%) needed a physician/provider order, demonstrating that many approaches aimed at improving nutritional status can potentially be achieved through collaboration of the facility's interdisciplinary team and are not dependent on a "top-down," provider-initiated process.

Limitations

This study had several potential limitations. First, by using only two nursing homes the results of the study have limited generalizability. However, the selected nursing homes were considered typical of those found in southern Arizona and the United States. Second, participating residents were not randomized into intervention and comparison groups. It was decided that since this was a feasibility study, it was more important to control for cross-over effects than to use random assignment. Third, the sample size was small. Study findings can not be generalized to other residents living in nursing homes. However, manyfindings are clinically significant and can be used for consideration in practice and to guide quality initiatives designed to prevent malnutrition among older adults living in nursing homes. Additional testing of the INRx assessment process with a larger sample size and multiple nursing homes is recommended.

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TABLE 1

Comparison of Pre and Post (6 month) Study Outcomes

Outcomes	Treatment Group (n = 31)		Comparison Group (n = 30)		F[a]	p*
	pre	post	pre	post		
Body Mass Index (BMI)	25.11	25.64	26.38	26.81	0.23	NS
Albumin	3.85	3.67	3.58	3.49	7.06	.01
Prealbumin	22.62	25.16	23.30	27.72	7.30	.01
Geriatric Depression Scale (GDS)	11.39	9.63	10.86	9.52	5.32	.03
Katz ADL Scale	2.46	2.30	2.75	2.48	0.05	NS
Quality of Life-AD Scale	32.68	33.80	31.59	31.35	0.01	NS

Note: BMI < 22 indicates malnutrition, albumin < 3.5 g/dL = malnutrition, prealbumin < 10 mg/dL = malnutrition; Katz ADL score of 6 = full function, 4 = moderate impairment, 2 or less = severe functional impairment; GDS score 0-10 = normal, 11-20 moderate depression, 21-30 = severe depression.

*$p < .05$

[a]F = Repeated measures ANOVA

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TABLE 2

Identified Nutritional Problems and Resolution Outcomes

Nutritional Problems		Resolution		
Item	**Frequency**	**Decline**	**No Change**	**Improve**	**Resolve**
Appetite change	16	1	5	5	5
Oral status	9	0	4	4	1
Position while eating	9	0	1	3	5
Difficulty feeding self	8	0	2	3	3
Nutritional status	7	0	2	5	0
Environment not conducive to eating	5	1	1	2	1
Personal preferences	3	0	1	2	0
Total	57	2	16	24	15

TABLE 3

Specific Approaches Recommended During INRx Process

Specific Approaches	Rank Order
Diet Change	
High Density Diet	7
Add/Delete High Protein Drink	7
Dietary Modification (i.e., bananas)	5
Remove sodium restriction	4
Ground meat	4
Mechanical soft diet	3
Change diet order to reflect personal choice	3
High protein drink if eats < 50% of meal	3
Addition of protein powder	2
Eliminate cardiac restriction	2
Liberalize diet	2
General (regular) diet	1
Nursing Referral	
Small group dining	8
Proper positioning by nursing	7
Adaptive equipment (i.e., plate guard)	3
Restorative feeding program	2
One-on-one feeding	1
Try over-bed table	1
Ask for specific OTC medication prn	1
Pain assess and treatment	1
Weight resident	1
Physician Referral	
Antidepressant medication	7
Multi-vitamin	3
Other medication change	3
Megace to stimulate appetite	2
Specialist consultation	1
Treat medical condition	1
Social Services Referral	
Dental Repair/appointment	6
Glasses	2
Occupational Therapy	
Adaptive equipment	3
Swallow evaluation	2
Physical Therapy	
Cushion in chair	3
Positioning (general)	1