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Factors Associated with Time to Identify Physical Problems of Nursing Home Residents with Dementia

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Abstract

This study describes new problems emerging over six weeks for nursing home residents with advanced dementia and factors associated with time to identify the problems. The sample of 65 developed 149 new acute problems or exacerbations of existing conditions over the six weeks of data collection. The majority of these problems involved uncontrolled pain, new infections and severe psychoses. Nurse assessment skill was associated with a shorter time to identify the new problem and more time spent on the problem. A higher ratio of new to existing interventions was also associated with a shorter time to identify the problem. Other patient characteristics associated with time to identify problems included non-specific vocalizations, physical signs, cognitive status and length of stay. While future research is warranted, findings from this study highlight the frequency of problems requiring treatment and suggest that improved assessment of residents may decrease the time to identify new problems.

Keywords

Dementia; Comorbid Conditions; Agitation; Nursing Home; Assessment; Nursing

Introduction

Nursing home residents with advanced dementia are at high risk for developing new comorbid conditions and for exacerbations of their existing conditions.¹ Most people with Alzheimer's disease (93%) have at least one comorbid condition, and approximately 61% have three or more.² At least 45% have musculoskeletal, genitourinary and/or ear, nose and throat disorders, with 48% of people at moderate stages and 69% at the severe stage of dementia having genitourinary disorders.³ Pneumonia is the leading cause of death with six month mortality rates reported at 36.4% to over 50%.^{4,5} These problems are discomforting and are associated with increased use of costly acute care services.⁶ Costs for treating these problems are substantially higher for people with Alzheimer's disease than for matched cases without dementia.^{7,8} Even after adjusting for differences in illness burden, health care costs are 34%

higher for people with Alzheimer's disease compared to demographically matched nondemented controls.⁹

Evidence suggests that nursing action is associated with incidence, severity and duration of comorbid conditions as well as hospitalization.¹⁰ Carter & Porell¹¹ found increased risk of hospitalization by residents of nursing homes when nursing personnel expenses were more heavily allocated to LPNs versus RNs and stated that one plausible explanation for the differences is that LPNs may be less capable of identifying medical symptoms and initiating effective interventions. Another study¹² found that 48% of nursing home residents with acute infection had received no physical assessment.

Early recognition and treatment of new problems and exacerbations of existing conditions has been identified as a potential strategy for decreasing severity of problems, preventing hospitalization and maintaining both physical comfort and quality of life.¹³ Estimates are that over 42% of hospitalizations could have been avoided with better care in the nursing home. 14 Loeb et al¹⁵ found that a nurse clinical pathway involving surveillance, early diagnosis and treatment of nursing home residents with lower respiratory infection resulted in an average reduction in hospitalizations of 12% (95% confidence interval [CI], 5%–18%; $p < .001$) and an overall cost savings of US \$1016 per resident (95% CI, \$207–\$1824; $p < .001$) treated. The nursing care and patient factors associated with earlier or later recognition of new or worsening conditions are unknown.

The older adult with dementia is at increased risk for delays in recognition and treatment of new or exacerbating conditions. Older adults often present with vague and atypical symptoms of acute illness.¹⁶ Studies of people with moderate to severe dementia have shown that an array of changes in behavior often accompany acute illness and exacerbations or worsening of chronic illnesses.¹⁷

We report here a secondary study conducted within a randomized experiment to better understand nurse and resident factors that may contribute to timely recognition and treatment of new or exacerbating problems. We describe problems developing over six weeks in a sample of nursing home residents with moderate to severe dementia and examine the relationship of patient and nurse factors to the time it took from onset of changes in resident symptoms to identification of the existence of the problem. We investigated the impact of nurse assessment skill, number of interventions, and ratio of new to existing interventions on two outcomes: time to identify new problems and nurse time.

Methods

The main experimental study compared a protocol for assessing and treating unmet needs of people with dementia (5-step Serial Trial Intervention) (STI) to a more comprehensive 9-step version of the STI. All residents in this study received the 5-step STI. Nurses caring for residents in this study were taught to recognize behavior change or other unclear symptoms, and to respond by using sequential assessment, treatment and consultation steps until the problem or symptoms were identified and resolved.¹⁸

Setting and Participants

Resident participants were from six nursing homes in the Midwest and a total of 65 people with dementia participated. Written consent was obtained from either the Durable Power of Attorney and verbal assent was obtained from the resident. Subjects had an average age of 87.92 (SD = 5.39) and length of stay of 31.85 months (SD = 25.46). The sample had severe cognitive impairment, with an average mini mental status exam score of 7.60 (SD = 5.95).¹⁹ Functional impairment was also severe with 24 participants in the most severely impaired Stage

7 of the Functional Assessment Staging Tool, 40 in Stage 6 and one person was in Stage 5.20 All subjects were Caucasian and there were 52 females and 13 male participants. Excluded from the study were people with chronic psychiatric illnesses other than the condition identified as causing dementia.

While the current study is primarily focused on newly developing or worsening physical problems, the sample had a heavy burden of existing chronic illness. According to measures taken using the Cumulative Illness Rating-Scale-Geriatric ratings of severe disability for chronic problems, 64 of the 65 had dementia associated with severe disability.²¹ Severely or extremely severely disabling vascular problems were present for 19, severely disabling eye, ear, nose and throat problems, including sensory deficits were present for 16, 8 had chronic severely disabling heart conditions, 8 had severely disabling lower gastrointestinal problems and 4 had severely disabling respiratory problems.

Fifteen nurses (11 LPNs, 4 RNs) were asked to participate based on working day shift fulltime on one of the units that housed resident participants. All 15 provided written informed consent.

Procedures and Measurements

For six weeks following initiation of the STI, the primary nurse recorded in a daily tracking form the behaviors, problems, assessments, interventions, consultations and new medical orders and diagnoses. To assure accurate and complete tracking of information, research staff met with the nurse twice a week and cross-checked the tracking forms with resident records. When discrepancies existed between the two records these were immediately resolved with the nurse.

Resident data extracted from the tracking forms included: physical signs, behaviors and new problems. Nursing care data coded from the tracking forms included: assessment skill, time to identify new physical problems, interventions delivered, start of a new intervention, and nurse time spent on problems. More specific information on data extraction and coding is available in Table 1.

Of the 65 subjects whose problems were studied over six weeks, 61 developed new problems. Of the 61, 45 developed new problems after the first day of data collection and for 41 it was possible to clearly isolate from the tracking forms a distinct time period from onset of change in condition to problem identification. Time to identify new problems could not be determined for 4 subjects; in two cases problems co-occurred and two cases had incomplete information on the tracking forms.

Analysis

Due to skewness of some variables, descriptive information was summarized using frequencies, ranges and medians. Because we were particularly interested in understanding behaviors that accompany changes in physical condition, we used content analysis to count behaviors and verbalizations that accompanied infections and other new physical problems (i.e. Table 3 results). The condition of being unresponsive to stimuli was omitted from these analyses. Behaviors unique to severe psychosis were analyzed separately (i.e. Table 4 results). Log transformations of the response variables (i.e. Time to identify new physical problems, Nurse time spent on problems) were used to correct for skewness and eliminate curvature in the associations with predictors. Mixed models were used to analyze the association of demographic factors and nurse assessment/interventions with each of the two outcomes. These mixed models incorporated a random effect for nurse, since multiple patients were often treated by a common nurse. Stepwise model building was used to select variables for inclusion in the model. Pairwise interactions were tested, but none were identified as significant.

Results

Descriptive Results

Sixty-one of the 65 participants (94%) developed new physical problems over the six weeks of data collection and the majority of the participants had two or more new problems develop ($n = 41$; 67%). A total of 149 new problems developed and, as seen in Table 2, the majority of these problems involved uncontrolled pain, new infections and severe psychotic behavior. Musculoskeletal pain occurred frequently and four participants had uncontrolled pain from metastatic disease. Pneumonia, urinary tract infections and cellulitis were common infections. Twelve participants had psychotic behavior that included delusions or hallucinations and was accompanied by signs of severe distress. Seven people experienced nausea, vomiting and/or diarrhea that were attributed to viral illness and one contracted a *clostridium difficile* infection in the gastrointestinal system. The time it took from onset of change in condition to identification of the problem ranged from .5 days to 29 days and the median was 4 days.

Of the sixty-one participants who developed new physical problems, 24 (39%) had specific physical signs of a problem and 10 (16%) had vague physical signs. Examples of specific signs are skin breakdown, bradycardia and fever. Examples of vague signs were weakness, decreased food intake, and new falling behavior. Of the participants that developed infections ($n=36$), a temperature above 99 degrees Fahrenheit was present for 9 of the 22 (41%) of those assessed. Fourteen residents who developed an infection did not have a temperature documented during the time period from the onset of a change in condition to identification of the problem.

Twenty-nine participants (47%) voiced specific verbal complaints or symptoms, 27 (44%) had nonspecific vocalizations such as calling out and 21 (34%) voiced fearful comments that could not be tied to reality. Thirty-five of the participants (57%) had motor symptoms such as restlessness or bracing of a body part and 12 (20%) displayed more passive or withdrawn behavior.

Table 3 describes results of the content analysis of the behaviors that accompanied the 36 new infections and 98 other newly developing physical problems. Resistive behavior was the most frequent behavior. Calling out, "help me" or verbally stating "something is wrong" were frequent for those with infections. A distressed facial expression was evident for 25% of people with infections and accompanied other problems 36% of the time. Restlessness frequently accompanied musculoskeletal pain, cancer pain and gastrointestinal discomfort.

Of the twelve participants with acute psychotic behavior, six had a documented past history of psychotic symptomatology and five were taking antipsychotic medications. Table 4 describes the symptomatology of this subgroup during the acute episode. Treatments given in response to the acute psychosis included nonpharmacological (reassurance(5); remove from stressor(5); distraction (4); allow to vent (3)), psychotropic medication (anxiolytic (7); antipsychotic (3); antidepressant (3); mood stabilizer (1)), and analgesic medication (acetaminophen (2); hydrocodone and acetaminophen combination (1)).

Nurses had a median assessment score of 3 (range 0–5), used a median of 1 (range 0–4) intervention per day, used a median of 0.4 (range 0–3) new interventions per day, and had a median ratio of new to old interventions of 0.5 (range 0–1). The median days from symptom presentation to diagnosis was 4 (range .5–29), the median time (average nurse contacts per day shift for days between symptom presentation and identification of the problem) spent on the problem was 2 (range .17–6), and the median time (nurse contacts per day shift averaged for 30 days) spent with the patient over the 30 day period was 1(range .13–4.56).

Inferential Results

Separate mixed models were fit for the two outcomes and are summarized in Table 5. Note that log transformation of the days from symptom presentation to diagnosis was used to reduce the skewness and improve the linear association with predictors. Quality of nurse assessment, ratio of new to standard interventions and presence of specific physical symptoms were all statistically significantly associated with decreases in the log days from symptom presentation to diagnosis. Increased length of stay was statistically significantly associated with an increase in days from symptom presentation to diagnosis. The interpretation of these parameter estimates are on a relative scale rather than an absolute scale due to the log transformation. A one unit decrease in nurse assessment skill was associated with a 54% increase (since $\exp(0.43) = 1.54$) in the time to identify new physical problems ($p < .001$). A 0.1 unit decrease (10% reduction) in the ratio of new to standard interventions was associated with a 14% increase (since $\exp(.135) = 1.14$) in the time to identify new physical problems ($p = .002$). Patients without specific physical symptoms had 127% longer times to identify new physical problems ($p = .009$). A one month increase in the length of stay was associated with a 1.3% increase in the days from symptom presentation to diagnosis.

Nurse time spent on the problem was statistically significantly associated with nursing assessment skill, presence of nonspecific vocalizations, and cognitive status. A one unit increase in nurse assessment skill was associated with a 0.48 increase in nurse time spent on the problem ($p < .001$). Presence of nonspecific vocalizations was associated with a 0.65 increase in nurse time spent on the problem ($p = .031$). A one unit increase in MMSE scores was associated with a 0.06 unit decrease in nurse time spent on the problem ($p = .024$).

Discussion

Results of this study highlight the multiple comorbid conditions and frequent physical problems that nursing home residents with dementia experience. The presence of comorbidities in nursing home residents may alter the presentation of common illnesses.²² Complicating identification of illness further, people with dementia are often unable to provide accurate verbal reports of symptoms. Behaviors evident during acute physical problems, such as those displayed by this sample, may be expressions that the person is feeling physically ill or may simply be symptoms of the dementia related cognitive decline. For example, some residents in this study verbalized symptoms clearly while others stated vague verbal complaints such as “help me” or “something’s wrong.” Resistiveness, displayed by 47% of those with acute infection, was the most frequent behavioral symptom. Because we did not have a comparison group and no studies have directly addressed whether certain nonspecific vocalizations or behaviors are uniquely associated with physical illness, it is unclear if the associations found in this study between dementia related behaviors and physical problems are higher than that seen in people without physical problems. Behaviors that accompany new physical problems should be studied further to determine if early behavioral warning signs of possible physical illness can be predicted. If vaguely stating that something is wrong or displaying restlessness or a distressed facial expression are even modestly sensitive indicators of an emerging physical problem, training health care professional to routinely assess for these early behavioral warning signs of illness may lead to earlier identification and treatment of physical problems in this population.

The finding that 41% of those with acute infection who were assessed had a temperature above 99 degrees is consistent with literature suggesting that fever accompanying infection in the very old is less frequent than in younger adults.²³ The finding that fourteen of the residents who developed infection did not have a documented assessment of temperature may have influenced the percentage with a temperature above 99, but also suggests the need for more vigilance in routinely assessing this basic vital sign.

Despite the need to detect subtle clinical changes in those with dementia, in many nursing homes physician's and advanced practice nurses are rarely present.^{24,25} This study contributes to our understanding of the significance of nursing assessment skill and its impact on the identification of physical problems among nursing home residents with dementia. This is important information for any long-term care organization concerned with decreasing health care costs or improving the quality of care giving and resident outcomes. Costs of treating many acute illnesses of nursing home residents are directly related to illness severity.²⁶ A more thorough nursing assessment may reduce the time to identification of nursing home residents' physical problems, such as musculoskeletal pain, skin infection, gastrointestinal bleeding, urinary infection, pneumonia, weight loss, lower extremity edema, and heart failure.

Several prior studies within the long term and acute care settings have identified the critical importance of nursing assessment. Assessment has been identified as an important missing process at critical points in residents' care in the areas of pressure ulcer prevention and treatment,^{27,28} post-fall assessment,²⁹ and acute changes in residents with infection.³⁰ Sign and symptom recognition and illness identification have been identified as two distinct stages in managing acute problems in nursing home residents.³¹ These stages share similarity with the phases involved in preventing 'failure to rescue' within the acute care setting.^{32–33} As described by Clarke and Aiken³³, the phases involved in rescuing patients from possible dangers include surveillance, timely identification of complications and acting by mobilizing necessary resources.

We also found that those who had a higher ratio of new to existing interventions given for a problem had their problem identified more quickly. This may simply indicate that physical problems that are more easily identified are more likely to require a new medical order or treatment. However, in an earlier study we found that repetitive use of the same ineffective treatments was common in nursing homes and was strongly associated with the recurrence of behavioral agitation.³⁴ We used the term 'static care' to describe this approach which may indicate that assessments and information transfer to decision makers who change treatment orders are inadequate.

The high number of participants in this study exhibiting psychotic behavior accompanied by severe distress warrants further study. It is noteworthy that three of the participants were given multiple doses of analgesics (prn or pro re nata orders) to treat their distress, even though no painful condition was documented. Analgesics may be more readily available with "prn" dosing orders so that the delay that can occur when contacting a prescriber for a possibly more appropriate psychotropic drug order is avoided. Also, the administration of psychotropic medications is more highly monitored and regulated in nursing homes and may impact drug administration decisions. It is laudable that the nurse's attempted to allay distress through nonpharmacological strategies. These treatments, however, have not been tested for efficacy, and may not effectively treat the extreme tribulation evident in this subgroup. There is a clear need to develop new and safe pharmacological and nonpharmacological therapies to address the severe distress of acute psychosis.

Due to the limitations in this descriptively designed study, which includes a small convenience sample, possible measurement errors and lack of a comparison group, findings raise more questions than provide firm conclusions. Results from this study underscore the need to determine the behavioral and physical signs and symptoms that may be early indicators of physical illness in those with advanced dementia. Research is needed to determine the physical and human costs associated with delayed identification of physical problems in this population, and if these costs can be ameliorated through better training, use of assessment protocols or staffing nursing homes with nurses or other health care professionals who have more advanced training in assessment and diagnostic techniques.

Summary

The occurrence of multiple coexisting conditions and the difficulty people with dementia have to either correctly perceive or communicate symptoms makes the task of identifying changes in physical condition particularly challenging. This study suggests that possible strategies to facilitate early identification of new physical problems of nursing home residents with dementia are better understanding of the unique early warning signs and symptoms of acute illness in this population and improving the vigilance and quality of assessment provided to those residents.

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Table 1**Information Regarding Measures Extracted from Tracking Forms**

Variable	Operational Information
Physical signs: Objective evidence of physical disorder or manifestation of illness	Signs that had a definite relation to a particular cause were coded as "specific;" others were coded as "vague."
Behavior: manner of action or verbalization.	Initially coded as specific verbal, nonspecific vocalizations, fearful verbal, motor, passive/withdrawn. After this initial coding, the high frequency of four specific behaviors lead to the analysis reported in Table 2.
New problems: the existence of a new or worsening change in a body system or function that was identified by the nurse	Excluded: <ul style="list-style-type: none"> -Routine behavior problems -Ongoing management of chronic conditions -Simple physical problems managed by the nursing staff
Assessment skill: Average breadth of the assessments done each day.	Rating: <ul style="list-style-type: none"> 0 = none 1 = behavior only 2 = < 3 body systems 3 = behavior + < 3 body systems 4 = ≥ 3 body systems 5 = behavior + ≥ 3 body systems Variable: ratings were summed and divided by the number of days from the onset of change in condition to identification of the problem
Time to identify new physical problems: days from symptom presentation to new physical problem identification.	Count of the number of days from the start of changes in symptoms to the identification by the nurse that there was a new condition or exacerbation of an existing condition. Excluded are problems identified on the first day of data collection since it was not possible to determine the time period before day 1 in which a change in condition existed.
Interventions delivered: Average number of interventions given per day to treat the change in condition	Scheduled drugs were counted as one per day rather than as the number of doses. Drugs given on an "as needed" basis were counted each time the drug was administered.
Ratio of new to existing interventions: Expression of the new treatments relative to standard treatments	A count of the start of a new interventions delivery divided by a count of interventions delivered for the days from symptom presentation to new physical problem identification
Nurse time spent on problems: Average number of contacts per day the nurse related to new problems or change in condition	A count of the number of distinct times the nurse had contact with the resident or with others regarding the residents new problem or change in condition

Table 2

Physical Problems of Nursing Home Residents with Dementia Over 6 Weeks 149 problems occurred in 61 participants

PROBLEM	FREQUENCY OF PROBLEMS	PERCENTAGE OF PROBLEMS
Musculoskeletal: pain (29); other (6)	35	23
Skin: infection (9); breakdown (6); other (2)	17	11
Neurological: psychosis (12); unresponsive episode (3); other (2)	17	11
Gastrointestinal: nausea, vomiting, diarrhea (8); constipation (6); bleeding (2); pain (1)	17	11
Genitourinary: infection (10); other(6)	16	10
Respiratory: pneumonia (9); upper infection (5); asthma (1)	15	10
Other: dying process (4); cancer pain (4); weight loss (3); unstable blood glucose (1)	12	8
Eye, Ear, Nose and Throat: impacted cerumen (4);dental (4); dysphagia (2); conjunctivitis (1)	11	7
Cardiovascular: leg edema (5); bradycardia (2); heart failure(1); stroke (1)	9	6

Table 3
Frequency of Behaviors Accompanying New Infections and Other New Physical Problems N = 134 New Problems *

New Problem	Resistive		“Help Me” “Something is Wrong,”		Distressed Facial Expression		Restlessness	
	f	%	f	%	f	%	f	%
Infection n = 36	17	47	14	39	9	25	7	19
Other Physical n = 98	38	39	15	15	35	36	29	30

* Problems of severe psychosis and unresponsiveness were omitted from this analysis

Table 4

Description of Psychotic Symptomatology

Symptom	<i>f</i>	Examples (n=12)
Delusions	9	"My food is poisoned." "Get me out of here." "It's not safe." "I'm so afraid...[indcipherable]." "They stole my clothes." "They put poison in this house." "You're going to throw me out the window." "People are looking at me." "I need to find my mother and talk about the oil well." "My son sold my table." "I'm 18 and I don't know why my mother left me here." "I haven't eaten in 3 days." Incomprehensible speech noted as "word salad."
Verbal or Physical Aggression	7	Swearing and yelling at others. Screaming. Tipping furniture over, throwing linens off bed. Removing belongings from closet and drawer and throwing in hallway. Striking out at peers. Taking others belongings. Yelling, kicking. See's her dead father. "It's that bastard in the mirror. He has no control."
Hallucinations	5	"April put a hot pipe on my chest and I had pain." See's men outside. See's dead people.
Restlessness	5	Voluntarily shaking arms and legs. Pacing hallways. Fidgeting.
Resistive	5	Will not eat. Refusing participation in activities. Refused care. Refused medications. Fixated on returning to her room.
Repetitive Nonspecific Vocalizations	4	Chanting. Complaining about everything. Calling out "Help me."
Distressed Facial Expressions	4	Look of terror on face. Looks sad. Facial grimace. Looks distraught.
Eloping	3	Trying to get out of facility or off of unit.
Crying	3	Tearful. Crying.

Table 5

Factors predicting Time to Identify New Problems and Nurse Time n = 41

Results of mixed model for log days from symptom presentation to new problem identification						
Variable	Estimate	SE	t	df	CI	p-value
Assessment	-0.43	0.09	-4.62	36	(-0.62,-0.24)	<0.001
Ratio of new to standard interventions	-1.35	0.40	-3.38	36	(-2.16,-0.54)	0.002
Specific physical symptoms	-0.82	0.30	-2.78	36	(-1.42,-0.22)	0.009
Length of Stay	0.013	0.006	2.40	36	(0.002,0.025)	0.022

Results of mixed model for time spent on the problems						
Variable	Estimate	SE	t	df	CI	p-value
Assessment	0.48	0.09	5.41	37	(0.30,0.66)	<0.001
Nonspecific vocalizations	0.65	0.29	2.24	37	(0.06,1.24)	0.031
MMSE	-0.06	0.027	2.36	37	(-0.12,0.01)	0.024