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Abstract:

Objectives: To test the feasibility of a telephone-based intervention that prepares family caregivers to recognize delirium symptoms and how to communicate their observations to healthcare providers.

Design: Mixed-method, pre–post quasi-experimental design.

Setting: A Midwest Veterans Affairs Medical Center and a nonprofit health system.

Participants: Forty-one family caregiver-older adult dyads provided consent; 34 completed the intervention.

Intervention: Four telephone-based education modules using vignettes were completed during the 3 weeks before the older adult's hospital admission for elective hip or knee replacement. Each module required 20 to 30 minutes.

Measurements: Interviews were conducted before the intervention and 2 weeks and 2 months after the older adult's hospitalization. A researcher completed the Confusion Assessment Method (CAM) and a family caregiver completed the Family Version of the Confusion Assessment Method (FAM-CAM) 2 days after surgery to assess the older adults for delirium symptoms.

Results: Family caregivers' knowledge of delirium symptoms improved significantly from before the intervention to 2 weeks after the intervention and was maintained after the older adult's hospitalization. They also were able to recognize the presence and absence of delirium symptoms in the vignettes included in the intervention and in the older adult after surgery. In 94% of the cases, the family caregiver rating on the FAM-CAM approximately 2 days after the older adult's surgery agreed with the researcher rating on the CAM. Family caregivers expressed satisfaction with the intervention and stated that the information was helpful.

Conclusion: Delivery of a telephone-based intervention appears feasible. All family caregivers who began the program completed the four education modules. Future studies evaluating the effectiveness of the educational program should include a control group.

Delirium is a common, serious, underrecognized condition in older adults after surgery.

It is characterized by sudden onset and fluctuations in orientation, memory, disorganized thinking, perceptual disturbances, and compromised ability to communicate.¹⁻⁴ As many as half of older adults experience delirium after general surgery.¹ Adults aged 70 and older; those with comorbidities, uncontrolled pain, or dehydration; and those taking more than three prescription medications are at greater risk of delirium after hip or knee arthroplasty.³⁻⁷ Failure to recognize delirium early contributes to longer hospital stays, a cascade of functional decline, persistent cognitive decline, nursing home placement, and mortality. The duration of delirium accentuates these negative outcomes.⁷⁻⁹

Early recognition of delirium symptoms can shorten the duration of delirium and improve outcomes,^{10,11} but healthcare providers who are unfamiliar with the older adult's cognitive baseline often underrecognize or misdiagnose delirium as dementia.^{2,4,6} Family caregivers familiar with the older adult's usual cognitive status are more likely to recognize acute changes but lack knowledge of delirium.¹²⁻¹⁴ A survey of family caregiver delirium knowledge found that nearly half would wait a week to see if confusion improved before calling a doctor, and 64% had difficulty recognizing common delirium symptoms.¹⁵ Providing family caregivers with education to help them recognize delirium symptoms early has several potential benefits: it lessens family caregivers' distress, alerts them to the importance of contacting the healthcare provider promptly, might decrease delirium incidence, and also might shorten delirium duration.^{10,13} Determining whether family caregivers can learn to recognize delirium symptoms and take appropriate action in seeking a medical evaluation is a critical step in evaluating the benefit of delirium education specifically designed to promote early symptom recognition.^{10,14-17}

The aim of this feasibility study was to test an intervention that trained family caregivers to recognize delirium symptoms in their older adult family member during and after hospitalization for elective knee or hip arthroplasty and to take appropriate action in communicating their observations to healthcare providers. Primary outcomes measured in this study include family caregiver knowledge and recognition of delirium symptoms and the action taken in response to their observations.

Methods

Design

A pre–post, quasi-experimental design was used for this study; interviews were conducted before the intervention and 2 weeks and 2 months after the older adult's hospitalization. Delirium symptom data were obtained approximately 2 days after the older adult's surgery; family caregivers completed a family version of the Confusion Assessment Method (FAM-CAM), and a researcher completed the Confusion Assessment Method (CAM). After institutional review board approval, the study was introduced to eligible older adults and their family caregivers during a clinic visit or at the end of a preoperative joint education class. If the older adult and family caregiver were interested in the study, a member of the research team obtained consent and arranged times for the preintervention interview and telephone-based education intervention.

Setting and Sample

Participants were recruited from an orthopedic clinic at a Veterans Affairs Medical Center and from preoperative joint classes at a nonprofit health system, both located in the Midwest. Criteria for inclusion were that the older adult was aged 70 or older by the date of surgery; there was a minimum of 3 weeks before the surgery date to allow time to introduce the study, obtain consent, complete baseline data, and deliver the intervention; the family caregiver planned to visit during hospitalization and to assist the older adult with care after hospitalization; and the family caregiver was aged 18 or older, had telephone access, and was able to read and understand English. Exclusion criteria were not having a family caregiver and situations in which the older adult was receiving chemotherapy or had history of mental illness such as schizophrenia or advanced dementia.

Approximately 75% of the family caregiver–older adult dyads who met the eligibility criteria agreed to participate. Forty-one dyads signed consent and 39 completed the preintervention interview. Seven of the 41 dyads did not begin the intervention, because the surgery date was moved up, leaving insufficient time to initiate and complete the intervention, or the surgery was postponed for several months. This left a total of 34 dyads, for a power of 99.7% for delirium knowledge with an

alpha level of .05 for a two-tailed test. All 34 family caregivers who began the intervention completed it.

Intervention

The telephone-based education modules were grounded in the theoretical perspective of the Symptom Interpretation Model (SIM),¹⁸ the evidence-based literature on care for older adults with delirium, and the literature on family caregiver needs for education about delirium. Although symptoms are an individual's subjective experience, family caregivers who interact with older adults observe symptoms in the form of the older adults' diminished functioning and altered social interaction. The SIM begins with awareness that a behavior or disturbance is different from the older adult's normal or usual behavior. Next, the symptom is named or labeled and assigned meaning based on the family caregiver's knowledge, beliefs, and experience. In the SIM, the outcome is the decision to take action based on symptom interpretation. For instance, the family caregiver might decide to do nothing or to contact the healthcare provider.¹⁸

The content of the education modules is outlined in Table 1. Objectives, script, and evaluation mechanisms were developed for each module. Two modules were offered each week so that all four modules were delivered before the older adult's admission to the hospital. Each module required 20 to 30 minutes. The nurse's delivery of the education modules was audiotaped to assure program fidelity.

Table 1. Description of the Education Modules

Module	Important Content Areas
FAM-CAM = Family version of the Confusion Assessment Method.	
Awareness of behavior change	Provide overview of Resource Booklet Describe what delirium is and why it is a problem

Module	Important Content Areas
Interpreting the symptoms	<p>Describe delirium symptoms and types of delirium</p> <p>Role of family caregiver in identifying symptoms</p> <p>Review three case-study vignettes</p> <p>Using FAM-CAM as an aid to interpreting symptoms</p> <p>Label the symptoms in vignettes using the FAM-CAM</p> <p>Discuss what the symptoms mean</p> <p>Discuss possible causes of delirium in the vignettes</p>
Deciding on Action	<p>Review three new case-study delirium vignettes using FAM-CAM</p> <p>Take action</p> <p>Decide on action</p> <p>Package observations for healthcare providers (what to report, when)</p>
Delirium Symptoms Revisited	<p>Review two new case-study vignettes using FAM-CAM</p> <p>Practice symptom recognition and action steps using the vignettes</p>

Module	Important Content Areas
	<p data-bbox="820 327 1279 384">Discuss family caregivers' questions and experience using FAM-CAM</p> <p data-bbox="820 451 1300 695">Provide information on evidence-based activities family caregiver can perform while visiting older adult in hospital that might help prevent delirium (e.g., conversation about current events; taking activity bag with cards, word puzzles or other things older adult enjoys doing; ensuring eyeglasses are clean and available)</p> <p data-bbox="820 762 1292 789">Discuss actions that can be used at home</p>

Each family caregiver received a resource book containing case study vignettes; copies of the FAM-CAM for each case study; and blank pages to record questions, concerns, and observations. The FAM-CAM consists of questions that aid recognition of delirium symptoms and appropriate actions. The questions address sudden changes in the older adult's cognitive baseline, including seeing things that are not there, excessive drowsiness, agitation, and illogical thinking. Family caregivers were instructed to use the questions on the FAM-CAM with each vignette. The same family member rated the vignettes and the older adult. The FAM-CAM maps to the algorithm of the CAM, which assesses inattention, disorganized thinking, lethargy, disorientation, perceptual disturbances, and inappropriate behavior or agitation.¹⁹ Sensitivity of 87.5% and specificity of 94.2% were reported for the FAM-CAM with two samples that included older adult–spousal caregiver dyads and older adult–daughter or –son caregiver dyads.²⁰

Instruments

The Family Caregiver Delirium Knowledge Questionnaire is a 19-item questionnaire that assesses knowledge of delirium symptoms, risk factors, and appropriate actions when an older adult has symptoms of delirium. Items include appropriate and inappropriate action. The items are scored 1 for correct answers and 0 for incorrect answers. The possible

range is from 0 to 19, with higher scores reflecting more knowledge about delirium. Three subscale scores are risks (range 0–10), actions (range 0–4), and symptom recognition (range 0–5). Acceptable content and construct validity have been reported; internal consistency reliability for the total instrument has been reported as 0.76.²¹ The questionnaire requires approximately 5 to 10 minutes to complete and was administered in pre- and postintervention telephone interviews.

The CAM was used to screen for delirium symptoms approximately 2 days after the older adult's surgery and to validate family caregiver's FAM-CAM ratings.¹⁹ The CAM is the most widely used tool to screen for delirium in clinical practice and research and assesses symptoms related to acute onset, inattention, disorganized thinking, and disturbance in consciousness. The scoring algorithm results in a positive or negative screen for delirium. Reported sensitivity of the CAM ranges from 94% to 100%, and specificity ranges from 90 to 95%.^{22,23}

The Bakas Satisfaction Scale consists of nine items that address convenience, usefulness, and acceptability of the education modules. Respondents rate their satisfaction on a Likert scale ranging from 1 to 5, with higher numbers reflecting greater satisfaction. The score is obtained by summing the individual items (possible range 9–45). Internal consistency reliability for the scale was reported as 0.93 in a sample of family caregivers for stroke survivors.²⁴ One open-ended question was added asking family caregivers for suggestions for improving the intervention.

Statistical Analysis

Descriptive statistics were examined for all study variables. Paired t-tests with false discovery rate–adjusted P-values were used to examine the difference in delirium knowledge before and after the intervention.²⁵ Cohen kappa was used to examine the extent of agreement between researcher scores on the CAM and family caregiver scores on the FAM-CAM.²⁶

Results

Demographic Characteristics

Family caregivers ranged in age from 29 to 86 (mean 63.9 ± 13.6). Most were white and female. Education ranged from tenth grade through completion of graduate school. Nearly two-thirds were spouses of the older adults. The average age of the older adults was 76.1 ± 5.3 . Their education ranged from sixth grade through completion of graduate school (Table 2). Ninety-one percent of the older adults in this sample received a general anesthetic. Older adult participants had an average of 14.2 ± 6.5 medications at hospital discharge and would have been considered at risk for delirium.

Table 2. Demographic Characteristics of the Sample (N = 39)

Characteristic	Family Caregiver	Older Adult
SD = standard deviation.		
Age, mean \pm SD (range)	63.9 ± 13.6 (29–86)	76.1 ± 5.3 (70–88)
Education, years, mean \pm SD (range)	14.0 ± 2.7 (10–20)	12.7 ± 3.1 (6–20)
Female, n (%)	35 (89.7)	6 (15.4)
White, n (%)	37 (95)	37 (95)
Relationship to older adult, n (%)		
Spouse	24 (62)	
Daughter	8 (21)	
Other relative	7 (17)	

Delirium Knowledge

Family caregiver knowledge of delirium on the total scale increased significantly ($P < .001$) from before the intervention to 2 weeks after the intervention. There was no statistically significant difference in delirium knowledge scores between 2 weeks and 2 months after the intervention, suggesting that knowledge was retained (Table 3). Family caregiver knowledge of delirium symptoms was also evident in the extent of agreement between their ratings on the FAM-CAM and researcher ratings on the CAM 2 days after the older adult's surgery. There was agreement in 32 out of 34 cases (94%). In two cases, family caregivers noted excessive drowsiness that the trained researcher did not observe. Cohen kappa for agreement was 0.477 ($P = .001$), indicating statistically significant agreement. A kappa of 0.477 is considered a moderate level of agreement.²⁶

Table 3. Family Caregiver Delirium Knowledge and Satisfaction Scores

Variable	Before Intervention	2 Weeks After Intervention	P-Value	2 Months After Intervention	P-Value
<p>Reported false discovery rate–corrected P-values for delirium knowledge compare before intervention with 2 weeks after intervention and before intervention with 2 months after intervention.</p> <p>a Higher scores reflect more knowledge.</p> <p>SD = standard deviation.</p> <p>Caregiver Delirium Knowledge Questionnaire score, mean \pm SD (range)^a</p>					
Total	11.4 \pm 3.6 (2–18)	13.9 \pm 2.0 (10–18)	<.001	14.0 \pm 2.2 (9–18)	<.001
Risk subscale	5.8 \pm 2.4 (0–10)	7.4 \pm 1.4 (5–10)	<.001	7.5 \pm 1.0 (6–10)	<.001

Variable	Before Intervention	2 Weeks After Intervention	P-Value	2 Months After Intervention	P-Value
Symptom subscale	2.5 ± 1.2 (0–4)	3.5 ± 1.0 (2–5)	<.001	3.4 ± 1.1 (1–5)	<.001
Action subscale	3.0 ± 1.1 (0–4)	3.0 ± 1.0 (1–4)	.57	3.1 ± 1.0 (1–4)	.57
Satisfaction Scale, mean ± SD (range)		38.3 ± 4.1 (32–45)			

On the second postoperative day, there was one positive screen for delirium symptoms that the FAM-CAM and CAM ratings both noted. Anecdotally, eight family caregivers reported using the FAM-CAM the first postoperative day and reported a positive delirium screen to the nurse caring for the older adult. In four cases, the family caregiver said changes were made in the older adult's pain medication; in the other four cases, the nurse reassured the family caregiver that symptoms were probably due to the anesthetic. Performing a FAM-CAM on the first postoperative day was not part of the study protocol. Two family caregivers reported positive FAM-CAM ratings during the 2 weeks after hospitalization; they contacted the physician and reported that the physician changed the prescribed pain medication. This suggests that family caregivers were able to recognize the presence and absence of delirium symptoms in the older adults.

Satisfaction with the Intervention

The family caregiver average satisfaction score was 38.3 ± 4.1, reflecting high satisfaction with the intervention (Table 3). Responses to the open-ended question confirmed that family caregivers were satisfied and found the education helpful. Family caregivers younger than 65 suggested the intervention might be condensed to three modules instead of four to allow for delivery in less than 3 weeks. All of the family caregivers mentioned that it was helpful to have the information just

before the older adult's hospital admission because they had an opportunity to apply the knowledge during hospitalization.

Discussion

Delirium is a critical problem for hospitalized older adults, and healthcare providers who are not familiar with the older adult's cognitive baseline continue to underrecognize it. Family caregivers are a relatively untapped resource in the effort to identify delirium symptoms early and to improve health outcomes for older adults. The findings of this study indicate that family caregivers are motivated to learn about delirium, demonstrated short-term retention of delirium knowledge, and were able to apply their knowledge to the case vignettes and in observing and acting on symptoms in their older adult family members. All family caregivers who began the intervention completed the four education modules. Spontaneous narrative comments from family caregivers suggested that satisfaction with learning about delirium and strategies to help the older adult might partially account for the high retention. Some family caregivers might also have found the telephone calls from the nurse a source of emotional support.

Previous studies that provided education on delirium for family caregivers focused on family caregivers for individuals at the end of life or teaching family caregivers strategies to prevent delirium in hospitalized older adults.^{10,14,17} Only one study reported that family caregiver knowledge of delirium increased after education.¹⁷ The findings of the current study support the effectiveness of education in increasing family caregivers' delirium knowledge and provide initial support for family caregivers' ability to apply this knowledge in taking appropriate action by communicating their observations of delirium symptoms to healthcare providers.

The study findings with respect to family caregiver satisfaction with receipt of education about delirium support findings of other investigators.¹⁷ Family caregivers in the current study were particularly satisfied with the timing of the education because they were able to apply the knowledge gained during the older adult's hospitalization. Family caregivers did not report any adverse effects from the intervention. The findings provide initial evidence that a telephone-based education intervention preparing family caregivers to recognize delirium symptoms is acceptable and feasible.

Limitations

There were several limitations of this study. First, participants were recruited from two sites in a Midwest metropolitan area. One of the sites was a Veterans Affairs Medical Center, so most of the older adults in the sample were male, and family caregivers were predominantly female. Second, the sample was predominantly Caucasian. Further research is needed to examine the extent to which this intervention would be successful with a more diverse sample. Third, the study lacked a control group. Future research is needed using a design that randomly assigns participants to intervention and control groups. Fourth, the researcher validation with the CAM was limited to one time after surgery when the family caregiver was available to perform the FAM-CAM. Clinicians at the sites did not routinely assess for delirium incidence using a standardized measure. Despite these limitations, the intervention was successful in increasing delirium knowledge and enabling family caregivers to take appropriate action in contacting healthcare providers based on symptom recognition and did not appear to have any adverse effects for the family caregiver or the older adult.

Delivery of the telephone-based intervention appears feasible. Family caregivers were willing to participate in the study and were able to recognize the presence or absence of delirium symptoms and share these observations with healthcare providers. Future research might monitor delirium symptoms in older adults daily after surgery and include a control group and a more-diverse sample.

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