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Early Nonspecific Signs and Symptoms of Infection in Institutionalized Elderly Persons: Perceptions of Nursing Assistants

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Authors contribution

All three authors contributed to the design of the study, analysis and drafting of the manuscript. Märtha Sund-Levander and Pia Tingström performed the focus interviews.

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Early Nonspecific Signs and Symptoms of Infection in Institutionalized

Elderly Persons: Perceptions of Nursing Assistants

Abbreviated title: Early Signs and Symptoms of Infection

ABSTRACT

Aim. To explore early nonspecific signs and symptoms of infection in elderly institutionalized individuals as described by nursing assistants.

Background. Nonspecific signs and symptoms and lack of specific ones are common in connection with infection in institutionalized elderly persons and contribute to a delayed diagnosis and treatment. In clinical care, the nurse makes notes on the individual status of the patient on a daily basis and decides whether to contact the physician or not. However, in Sweden nursing assistants provide most of the daily care and therefore have many opportunities to observe subtle changes that may be early signs of infection.

Method. Data were collected in 2006 from focus interviews with 21 female nursing assistants. The interviews were verbatim transcribed and analyzed with qualitative content analysis for manifest content with no preconceived categories.

Findings. Nursing assistants' descriptions of nonspecific signs and symptoms of infection comprised two exclusive categories. *Is not as usual* described general signs and symptoms of discomfort related to possible infection, such as discomfort, unrestrained behavior, aggressiveness, restlessness, confusion, tiredness and feebleness, and decreased eating.

Seems to be ill was more distinctly related to signs and symptoms of established infection in general terms of fever and pain or more specifically related to pneumonia, urinary tract infection, skin infection, cold, and eye infection.

Conclusion. Nursing assistants have a keen observational ability to detect early signs that might help to confirm suspected infections in elderly nursing-home residents early on.

Whether or not the cited categories are actual early signs and symptoms of infectious disease needs to be further investigated. Key words: elderly, infection, signs, symptoms.

INTRODUCTION

Elderly individuals >65 years old are at risk of developing infection, with the highest rate occurring in institutionalized elderly persons (1). Infectious diseases increase the need for hospital care (2), which is independently associated with poorer prognosis and increased mortality (3). In addition, infectious disease in this population is associated with long rehabilitation and decreased physical function, which may reduce the general well being. The predominant infections are urinary tract, respiratory and skin and soft-tissue infections (4-6). Iatrogenic complication, such as an infection, can be as lethal as the primary condition that brought the resident to the nursing home. Recent research in Sweden shows that pneumonia is as common as cerebral vascular insult and heart failure as the cause of death in nursing-home residents (7).

The presence of nonspecific signs and symptoms and lack of specific ones are common in relation to infection (1, 8, 9), especially in the weak elderly (8). For example, in pneumonia, the presence of cognitive decline (50%) was as common as symptoms more specific for respiratory tract infection, such as cough and sputum production (10). The assessment of possible infection is therefore difficult and contributes to a delayed diagnosis and treatment (8). A suggested contributing factor to the lack of specific symptoms is a deregulated immune defense (8, 11, 12), which mainly affect the adaptive immune system (13), particularly in the “elderly-elderly” (> 80 years) (14). Furthermore, elevated body temperature, as a part of the febrile response, is often absent (1). Proposed explanations for a decreased febrile response are changed temperature regulation and reduced production of cytokines (8). Also, the definition of fever as $\geq 38^{\circ}\text{C}$ may be inadequate in this population (15-18). That is, the nursing home resident may actually have a significant rise in body temperature, which is not recognized due to a low basal body temperature (15).

Early detection of nonspecific signs and symptoms related to infection may reduce the risk for hospitalization and have an impact on the quality of life for this population. Although it is known that nonspecific symptoms are often present in infection, only a few studies have addressed early signs, preceding clinical symptoms, in the institutionalized elderly. In one study nurses described confusion and reduced mobility as early signs of infection; however, no further detailed description of this changed behavior or how it was detected and assessed was given (19). Boockvar (20) used focus groups with nursing home staff to generate items for an instrument for nursing assistants to enhance their observations and documentation and predict accuracy for short-term illness. The nursing assistants observed nonspecific signs and symptoms daily for four weeks. The results revealed that the occurrence of lethargy, weakness, and decreased appetite gave a predictive value of 0.50 and a likelihood value of 6.9 of an acute illness (21).

In clinical care, it is the nurse who performs the initial formal assessment of the presence of infection and decides whether to contact the physician or not (4). Although nurses make notes on the individual status on a daily basis, there are inaccuracies of patient records in nursing homes (22). Nursing assistants are not experts in assessing the presence of infection, but are the ones who provide most of the daily care of elderly individuals in the community settings (23). One can assume that they spend more time together with the elderly individuals than the nurses do, and then have many opportunities for early observations on subtle changes that may be signs of infection. However, neither the possible contribution of nursing assistants' observations in relation to early detection of infections in this group of individuals has been studied, nor are there any standardized assessment criteria validated for this staff category to use in their everyday work with institutionalized elderly persons to detect early signs and symptoms of infection.

AIM

The aim was to explore early nonspecific signs and symptoms of infection in elderly institutionalized individuals as described by nursing assistants.

DESIGN

The study is the first part of a larger prospective, longitudinal project with the aim of studying early signs of infections among institutionalized elderly persons including identifying serum proteins predicting or verifying infection, as well as generating an instrument used by nursing assistants for early detection of infection in this setting. For example, biochemical markers, such as serum proteins, x-rays and urine culture, as well as data concerning functional status (Katz Activity of daily living) (24, 25), cognitive status (Mini mental state examination) (26), nutrition (Mini nutritional assessment (MNA) (27), pain (Doloplus-2) (28, 29) change in behavior including sleep and depression (Neuropsychiatric inventory for nursing home (NPI-NH) (30) will be collected to validate and select the signs and symptoms used in the final instrument. In order to generate possible categories, describing nonspecific signs and symptoms, we conducted, as a first phase of the project, a qualitative study. We used focus group interviews with nursing assistants as they performed their daily care duties and, therefore, were close to the residents. To obtain a wealth of information in an efficient manner we choose focus group interviews in order to take advantage of the group dynamics (31). We assumed that the participants could be stimulated by each other to remember situations and encounters with residents that alerted them to suspect infection. We also assumed that a group of participants with similar education and working in the same organization would feel more comfortable and secure, since both moderators were nurses and researchers not employed in the organization.

Participants

All nursing assistants employed in one community care organization in southeast Sweden were invited to participate in the study, which took place in 2006. The final convenient sample consisted of 21 female nursing assistants (median age 50, range 22–61 years), 16 worked part-time, three fulltime and two night shift. Their experience of working in community care for the elderly amounted to a median of 18 years (range 4–34 years). They were all born in Sweden and Swedish was their first language.

Setting

The setting was an urban community cares organization for elderly people in a small town with 15,000 inhabitants. The community cares organization included nonprofit nursing homes, as well as individuals in need of daily care living in their own apartment. Roughly 75% of the elderly, for whom the nursing assistants cared for, were ≥ 80 years of age, their functional activities of daily living (ADL) status (24, 25) was 8 ± 2 (mean \pm SD) on a scale ranging from 0 = independent to 10 = total dependency, approximately 8% suffered from chronic obstructive pulmonary disease and 56% from chronic heart failure, 61% were diagnosed with dementia, and 37% have had a stroke (unpublished data). The nursing assistants in the nursing homes are supervised by a community nurse who is responsible for approximately 60 to 200 elderly residents, and those caring for individuals living in their own apartment turn to the primary care nurse. Both the community nurses and the primary care nurses consult the general practitioner at the primary care center for medical advice, prescriptions etc.

DATA COLLECTION

The data were generated from four focus groups with three to six participants. The

interviews took place at two different special houses for the elderly and were audiotaped for later verbatim transcription. One of the researchers acted as a moderator and one observed the process and took notes on initial impressions during the data collection (32). To start with, all participants filled out a questionnaire on baseline data and an introduction question: “What are your experiences in evaluating the presence of infection in an elderly person?” using a five-item category scale ranging from “most of the time it is difficult” to “no problem”. This item was aimed at individual reflexion on the main topic of the interview before the discussion started. The same question then started the interview and was followed by the question “What makes you perceive that the resident is feeling unwell?” During the interview probes like “How do you mean?” “Can you explain more?” and so on were used to add more depth to the answers. The interviews lasted between 50 and 90 minutes and ended with the participants answering an open-ended item in the questionnaire in order to evaluate their experience of taking part in the focus group.

DATA ANALYSIS

The data analysis was conducted using qualitative content analysis with no preconceived codes and each interview was regarded as one unit of analysis (32). The main purpose of the analysis was to search for manifest content, i.e., the visible and obvious outcome of the text, in order to explore possible nonspecific signs and symptoms of infection in elderly people. In the first step, three researchers (A M, M S-L, and P T) read the transcripts individually several times to become familiar with the text. After that, meaning units (words, sentences, or paragraphs) (33) related to the topic were identified and condensed by two of the researchers (M S-L and P T). These condensed meaning units were coded with labels emerging directly from the context. The next step in the analytical process was the abstraction of codes into subcategories and categories (31, 32). The goal was to achieve

mutually exclusive categories (32). In the final step the three analysts (A M, M S-L and P T) discussed the coding and category system to reach a consensus, (34) and content descriptions and relations to other categories were developed.

ETHICAL CONSIDERATIONS

All the participants gave both their oral and written informed consent. The study was conducted in accordance with the Declaration of Helsinki and was approved by The Ethics Committee for Human Research at the Faculty of Health Sciences, Linköping University (M82-06).

FINDINGS

A majority, 13 out of 21 respondents, found it rather difficult to evaluate the presence of infection, four found it rather easy, one found it hard, one found it easy, and no one found it to be “no problem”. The content analysis of the nursing assistants’ descriptions of nonspecific signs and symptoms of infection resulted in two exclusive categories, Is not as usual and Seems to be ill. The category Is not as usual described general signs and symptoms of discomfort related to a possible infection, while Seems to be ill related more specifically to signs and symptoms of established infection. These two categories were then divided into ten different subcategories (Table 1) that may be related to an infection according to the informants.

Is not as usual

Observations in this category concerned changed individual behavior and discomfort, which differed from what was considered normal in relation to the individual. s The nursing assistants described that it was often difficult to sort out such changes because of

large inter-personal differences, that is what was normal appearance and behavior for one elderly person could be a sign of possible infection for another. Although the changes could be subtle and indistinct to start with, the nursing assistants collected information to get a more complete picture to make an assessment if there were enough changes for suspecting a possible infection or not. The information in relation to Is not as usual was collected mostly during observations of and interactions with the elderly in their everyday life, e.g. when they were eating, dressing, or in small talks. The information to base the decision on was often non-verbal, because many of the residents had a cognitive impairment. If the changes were not only occasional due to external factors, such as altered routines, many visitors, etc, but was repeated and/or becoming worse, this resulted in a general conclusion by the nursing assistant that *“He/she is not as usual today”* and that the changes might be a sign of infection.

The category Is not as usual was described in seven subcategories. Discomfort was described as an expression of general distress in the eyes and face, often expressed especially as early signs, by such as *“You can see in their eyes that they do not feel well. The look. The eyes become very small or staring, sort of help me, help me”*.

Unrestrained was described as being social in an abnormal manner, both in behavior and speech, as illustrated by *“a man who is not talkative and social. When he has a urinary tract infection he comes out of his room and sits among all the others and talks and laughs”*.

To be angry was a common sign, alerting nursing assistants that something was wrong. For example, the one who normally was *“proper and careful”* could become *“wayward and*

completely upside down". Other descriptions in relation to the presence of infection included forceful actions, such as *"the lady tore down all her flowerpots; otherwise she was such a nice person"*.

The subcategory restlessness included increased activity both during the daytime and night, for example *"Gets up during the night, messing around and everything becomes a jumbled."* An opposite behavior, e.g., *"those who are calm become restless in contrast to their usual behavior; maybe they start tinkering"*, was frequently described. Confusion was a significant sign, including misunderstandings and hallucinations, expressed as *"someone who normally has a clear head and always gives the right answer and I come in and speak to her, asking what day it is, and everything is completely wrong"*, or *"when she had a urinary tract infection she saw horses on the table"*. The nursing assistants also observed impaired cognitive status in elderly persons diagnosed with dementia: *"She became more and more senile so to speak"*. Tiredness and feebleness were described as both physical and mental exhaustion, decreased mobility, or avoiding social contact, exemplified as *"they prefer to stay in bed, they do not want to do anything"* or *"he does not want to come out and have coffee, and normally he is so incredibly social and nice"*. The last subcategory was decreased eating expressed as not wanting or not being able to eat.

Seems to be ill

The second category comprised subcategories that the nursing assistants more typically regarded as being related to infection. These were easier than aspects of Is not as usual to base their decision on, if the elderly person had a possible infection or not, because they were more distinct as indicators of illness and not usually present among elderly persons in good health. The information in relation to Seems to be ill was collected mostly during

observations of the elderly individuals' physical appearance, e.g. the color and temperature of the skin, incontinence, or noise from the airways. In addition, nurses and doctors seem to put more emphasis on specific signs and symptoms related to illness, according to the nursing assistants' experiences.

General signs and symptoms of illness were often described as signals indicating fever, first of all a warm skin, with the explanation that *"they feel warm when they have fever"*. This was also the main reason for measuring body temperature: *"If we think they are enormously warm we fetch the fever thermometer"* Other signs of fever were the color of the skin, described as *"Sometimes they are red and sometimes very pale"*.

According to the nursing assistants, the nurse and doctor defined fever as 38⁰C. In contrast, nursing assistants themselves stated that fever could be present even with a temperature below 38⁰C as *"They can be feverish even if it's just 37"*. Other general signs and symptoms were gastrointestinal and urinary problems, and also more serious symptoms, such as cyanosis and short periods of unconsciousness.

Pain was described as a separate possible symptom of infection, which could be expressed both verbally and bodily as *"He complained when we turned him around"* and *"Well, sort of tense, never really relaxed"*.

Specific signs and symptoms of infection related to pneumonia, urinary tract infection, skin infection, cold and eye infection, was describes as *"Panting and they want to have head higher or more pillows, difficulties in breathing and wheezing...it's the urine, you can notice a bad smell and it's thick"*.

DISCUSSION

Methodological considerations

A critical issue in qualitative content analysis is to select the most suitable meaning units (32). In our study, two researchers (M S-L, P T) read the text and marked meaning units independently and then compared the markings. At this first coding, 11% of the marked meaning units differed between the two researchers. These differences were discussed until agreement was reached. To ensure coding consistency, a third researcher (A M) independently categorized the coded data and then all category systems were reviewed and discussed. Involvement of several researchers is a way of reducing the risk of investigator bias, by the researchers supplementing and contesting each other's readings, corresponding to reflexivity (34). This study involved three researchers representing different professional backgrounds (two nurses and one MD specialist in geriatrics) all women with a PhD degree but with different methodological as well as clinical backgrounds. In addition, the actual words expressed by the informants were used to the greatest possible extent during all the analytic steps. As the final step a linguistic expert performed the translation of the quotations into English. The intention of this strategy was to retain the original language used by the nursing assistants in their everyday practice as far as possible, as our intention was to develop an instrument for detecting infections, which will be used by nursing assistants. To further strengthen the validity of the results (34), a summary of the findings was sent to each of the participants in the focus interviews, which gave them the opportunity to comment the findings by asking them questions such as "Can you find your own experiences in the results?" The comments from the participants revealed that they recognized their own experiences and found no misunderstandings nor wanted to add any details.

A limitation was that the study design was cross-sectional, and the nursing assistants referred to experiences of possible signs and symptoms of infection both in relation to patients with ongoing infections and to previous ones, i.e. there is a risk of recall bias in the second type of experience of what was perceived as early signs of infection. To reduce such a risk, the study design should have been prospective. Although we aimed to remain the voice of the nursing assistants along the analyzing process and the writing of the English article, some meaning may have been lost in the process, as there are likely words and phrases in Swedish that are challenging to fully translate. However, in the next phase of our larger project, we aim to develop an instrument using the possible categories generated in this study and then test the sensitivity and specificity of the instrument in a prospective, longitudinal study. This means that the next step exclude possible subcategories that show low validity (34). The reader should also be aware of the fact that all respondents were women in the same community care organization. Although this reflects the gender distribution in a common and representative community care organization in Sweden, it may have consequences for the transferability (34) of the results to male nursing assistants and to other types of organizations. Also, the Swedish organization with nursing assistants providing daily care of the nursing home resident may differ from other countries. However, we think the findings can be useful and generalized to other organizations, irrespective if nurses or nursing assistants perform the daily care.

Discussion of findings

It is well known that nonspecific symptoms and lack of specific ones are common in nursing-home residents (1, 8, 9), contributing to a delayed diagnosis and treatment (8). This study has explored early nonspecific signs and symptoms of infection in elderly

institutionalized individuals as described by nursing assistants. Two distinct categories emerged as possible early nonspecific signs and symptoms of infection, namely Is not as usual and Seems to be ill. The present findings are supported by previous research (19) and have also added detailed descriptions of possible signs and symptoms in relation to early detection of infections among elderly institutionalized persons. In line with other studies the results show that possible early signs of infection are very similar to and also as diffuse as signs of acute illness (19-21) in nursing-home residents.

Boockvar *et al.* (21) found lethargy, weakness, decreased appetite, agitation, disorientation, dizziness, falls and delusions to have the highest predictive values for acute illness in nursing-home residents. All of these, except falls, were early signs describing Is not as usual as expressed by the nursing assistants in the present study. The signs depressed mood, weight loss, and aggression were considered to be of less importance in the study by Boockvar *et al.* (21) with depressed mood and aggression being possible early signs of infections according to the respondents in the present study.

In the category Seems to be ill, the respondents made a clear distinction between general signs and specific signs and symptoms of disease. Since specific symptoms are often lacking (1, 8, 9) fever, in terms of elevated body temperature, becomes most significant as an indicator of infection. Hence, the presence of fever was evaluated as a significant symptom of illness and an important reason for taking further action. The nursing assistants stated that fever may be present even if the body temperature is below $\geq 38^{\circ}\text{C}$, but they also expressed that this was not accepted as fever by the nurses and doctors. The results indicates, in line with other studies (35, 36), that fever defined as $\geq 38^{\circ}\text{C}$ may still contribute to a delayed diagnosis and treatment and increased mortality. This fact illustrates the need to adjust the definition of fever in nursing-home residents due to both

lack of responsiveness to the pyrogenic cytokines (8) and an individual low baseline body temperature in this population (15, 17, 19). The nursing assistants were clearly aware of clinical signs and symptoms concerning specific diseases, such as eye infection, respiratory tract infection, skin infection and, most specifically, urinary tract infection. The latter is not unexpected since urinary tract infection is the most common infection in nursing-home residents (4-6).

Since nursing assistants provide the vast majority of the direct daily care of frail elderly persons, it is important to take advantage of their experience in recognizing early signs and symptoms of infection (23). Boockvar *et al.* (20) developed an illness warning instrument for short-term acute illness and found that observations made by nursing assistants had high specificity and fair sensitivity for short-term acute illness. This study also showed that the nursing assistants possess a keen observational ability that might help to detect infection early on.

So why is it so difficult to detect infections among elderly institutionalized individuals? This is probably due to both difficulties in understanding and interpreting diffuse signs and symptoms of infection as well as to co-existing chronic diseases that blur the clinical picture. In addition, even if nursing assistants have a keen observational ability, as indicated by this study, and work close to the residents and, therefore, have the opportunity to detect signs and symptoms signaling infection early on, they do not participate by making notes in the patient record. Instead, they mostly communicate their observations to medical staff only informally (20) and have their own system of verbal reporting and handwritten records, which neither the nurses nor doctors usually read. This means that the responsible nurse and/or doctor may not further assess important information about

suspected infections that nursing assistants actually have observed. Also, others have found limitations in the nurses' patient records in nursing homes (22). If this includes data on possible early signs and symptoms of infection observed by the nursing assistants, there is a serious lack of information that could promote early diagnosis and treatment of infections. Others have found that nursing assistants' observations of residents' status correlated well with those of medical staff (37) and that nursing assistants in a standardized way could record changed status in nursing home residents (20). Hence, one way of improving identification of early signs of infection seem to be to construct an instrument especially tailored for assistant nurses working with patients in nursing homes. Another way may be to facilitate for assistant nurses in this processes.

In conclusion, nursing assistants possess a keen observational ability to detect early signs that might help to confirm suspected infection in elderly nursing-home residents. To the best of our knowledge, this is the first study focusing on the experiences of nursing assistants in this context. Whether or not the perceptions of possible early signs and symptoms are actually early, valid, signs and symptoms of infectious disease have to be further investigated. Within our longitudinal project (concerning detection of early signs of infection in elderly institutionalized individuals) these findings as well as biochemical markers will be evaluated. In addition, there will also be focus on the process. That is, what happens with the nursing assistants' perceptions of suspected infection in the interaction with those (nurses and physicians) with medical knowledge and power to act, i.e. make diagnosis and initiate treatment.

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Table 1. Overview of Possible Early Nonspecific Signs and Symptoms of Infection Among Institutionalized Elderly As Experienced by Nursing Assistants.

CODE	SUBCATEGORY	CATEGORY
Vacant eyes Hazy eyes Glassy eyes Wrinkle one's forehead Roaming eyes	<i>Discomfort</i>	Is not as usual
Unreserved Uncontrolled talk In high spirits More social	<i>Unrestrained</i>	
Aggressive Mean Breaks things Bad mood Perverse	<i>Aggressiveness</i>	
Over-excited Messy Does not sleep Anxiety Panic	<i>Restlessness</i>	
Increased signs of dementia Chaotic Does not understand Hallucinations Muddled Strange behavior	<i>Confusion</i>	
Cannot walk Sleepiness Decreased mobility Tired Needs more help Falls Quiet Does not care Apathy More relaxed Avoids social contact Depressed	<i>Tired and feeble</i>	
Does not open mouth Less appetite Does not want to eat or drink Decreased eating	<i>Decreased eating</i>	

CODE	SUBCATEGORY	CATEGORY
Fever Hot or cold Shaking Shivering Flushed face Pale Incontinence of urine Nausea Vomiting Cyanosis Unconscious	<i>General signs and symptoms of illness</i>	Seems to be ill
Tenderness Moanng Screaming Tense body Seeking comfortable position Seeking body contact Tears Grimacing	<i>Pain</i>	
Wheezing Out of breath Cough Having a cold Red eyes Infected eyes Local redness and swelling UTI*	<i>Specific signs and symptoms of infection</i>	

*UTI: Urinary tract infection. Expressed as "often goes to toilet, smarting pain, smell, increased thirst, thick urine".