

ORIGINAL ARTICLE

## Registered nurses' thinking strategies on malnutrition and pressure ulcers in nursing homes: a scenario-based think-aloud study

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**Aim.** The aim of this study was to explore the thinking strategies and clinical reasoning processes registered nurses use during simulated care planning for malnutrition and pressure ulcers in nursing home care.

**Background.** Clinical reasoning is an essential component of nursing practice. Registered nurses' thinking strategies and clinical reasoning have received limited attention in nursing science. Further research is needed to understand registered nurses' clinical reasoning, especially for prevention of malnutrition and pressure ulcers as they are important quality indicators of resident care in nursing homes.

**Design.** A qualitative explorative design was used with a think-aloud interview technique.

**Methods.** The transcribed verbalisations were analysed with qualitative deductive content analysis. Data were collected during six months in 2007–2008 from 30 registered nurses at nine nursing homes in Norway.

**Results.** The registered nurses used a variety of thinking strategies, but there were differences in the frequency of use of the different strategies. The three most commonly used thinking strategies were 'making choices', 'forming relationships' and 'drawing conclusions'. None of the nurses performed a structured risk assessment of malnutrition or pressure ulcers. Registered nurses started with assessing data from the scenarios, but after a short and elementary assessment they moved directly to planning.

**Conclusion.** Many different thinking strategies were used in registered nurses' clinical reasoning for prevention of malnutrition and pressure ulcers. The thinking strategy 'making choices' was most commonly used and registered nurses' main focus in their reasoning was on planning nursing interventions.

**Relevance to clinical practice.** This study showed that most of the registered nurses go directly to planning when reasoning clinically about residents in nursing homes. A lack of systematic risk assessments was identified. The insight gained from this study can be used to recommend improvements in tools designed for nursing homes to support the registered nurses.

**Key words:** clinical reasoning, content analysis, pressure ulcers, registered nurses, think-aloud method, thinking strategies

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## Introduction

Registered nurses' (RNs) clinical reasoning and planning represent the essence of nursing practice (Simmons *et al.* 2003) and vary depending on task and context (Lauri & Salanterä 1998, Thompson *et al.* 2009). Although clinical reasoning could have an impact on quality in the health care delivered to residents, little is known about the clinical reasoning and decisions RNs make (Dowding & Thompson 2003). The quality in health care delivered to residents in nursing homes is reported as challenged and inadequate (Fahey *et al.* 2003, Malmedal *et al.* 2009). The increased number of older people who need more complex health care services requires focus on best practice and safety in the delivery of high-quality health care (Fernández *et al.* 2009). Understanding of RNs clinical reasoning is important for education, research, and clinical practice to increase our knowledge about the relationship between RNs' clinical reasoning, their experience, and resident outcomes (Fonteyn & Ritter 2008). This paper presents a study designed to explore RNs' thinking strategies on malnutrition and pressure ulcer (PU) for residents in nursing home care.

## Background

### Clinical reasoning and the nursing process

The nursing process, which could be described as a systematic and dynamic way to deliver nursing care, is a method used in clinical problem solving (Pesut & Herman 1998). The method has had a strong impact on guiding education and clinical practice in nursing care and consists of five steps: assessment, diagnosis, planning, implementation and evaluation (Chitty 2001). Clinical reasoning is used for the cognitive processing performed by RNs when they gather, assess and evaluate data relevant to nursing care (Grobe *et al.* 1991, Fowler 1997). Clinical reasoning, defined as 'a recursive cognitive process that uses both inductive and deductive cognitive skills to simultaneously gather and evaluate assessment data' (Simmons *et al.* 2003, p. 701), is an important part of the professional nurses' clinical practice and is central to the delivery of safe and effective high quality care (Simmons *et al.* 2003). Decision-making (Aitken 2003), clinical judgment (Benner & Tanner 1987) and diagnostic reasoning (Ritter 2003) are other terms used to express the concept of RNs' decision-making in clinical practice. In this study, clinical reasoning is investigated as part of the nursing process (Grobe *et al.* 1991) and focuses on RNs' thinking strategies.

### Information process theory and thinking strategies

Information processing theory (IPT) emphasises that human decision-making could be separated into short-term and long-term memory with different capacities (Ericsson & Simon 1993). IPT is used as a basis in many studies in nursing to describe clinical reasoning using the think-aloud (TA) method (Simmons *et al.* 2003, Funkesson *et al.* 2007, Göransson *et al.* 2008). The TA method is a way to access the cognitive processes used by RNs in clinical reasoning (Simmons *et al.* 2003). This exploratory study was also conceptually based on IPT.

Fonteyn (1998) has described 17 heuristics or thinking strategies for clinical reasoning based on a TA study on RNs with extensive expertise from different fields of nursing. The 17 strategies describe the thinking that nurses use in clinical practice. Table 1 lists the 17 thinking strategies with their definitions. Fonteyn *et al.* (1993) argued that TA studies may provide insight into how RNs structure information during problem-solving tasks. In this study, these thinking strategies will be used as a qualitative framework to explore thinking strategies of nursing home RNs.

The context where clinical reasoning takes place influences the nursing process (Thompson 1999, McCarthy 2003, Carr 2004). Studies have investigated clinical reasoning in different contexts, such as older people's care, medical-surgical care, primary health care, psychiatric care (Lauri & Salanterä 1998), emergency department triage (Göransson *et al.* 2008), intensive care (Bucknall 2000), children's nursing (Twycross & Powls 2006), care planning (Grobe *et al.* 1991, Fowler 1997) and PU prevention in nursing homes (Funkesson *et al.* 2007). The results from these studies show that clinical decision-making is context-specific and that RNs use a variety of thinking strategies (Funkesson *et al.* 2007) to link problems and interventions (Grobe *et al.* 1991, Fowler 1997).

### Malnutrition and pressure ulcers

Older people in nursing homes are exposed to risk of malnutrition and PUs (Kagansky *et al.* 2005, Vanderwee *et al.* 2007, Meijers *et al.* 2009a,b). The prevalence of malnutrition varies depending on the health care setting: from 10–60% in hospitals (Sullivan *et al.* 1999) to about 20% in studies conducted in nursing homes (Meijers *et al.* 2009a,b). The prevalence of PUs in nursing homes varies between about 14–25% (Whittington *et al.* 2004, Woodbury *et al.* 2004, Vanderwee *et al.* 2007). Malnutrition and PUs in older populations are associated with poor clinical outcomes and have been associated with increased

Table 1 Thinking strategies with definitions (adapted from Fonteyn 1998) and per cent of the total coded thinking strategies

Thinking strategy	Definition	Per cent of the total coded thinking strategies ( <i>n</i> = 3510)
Making choices	Selecting from a number of possible alternatives to decide on and pick out	24.4
Forming relationships	Connecting information to further understanding	18.2
Drawing conclusions	Reaching a decision or forming an opinion	12.5
Providing explanations	Offering reasons for actions, beliefs or remarks	8.9
Searching for information	Mentally looking for missing or concealed information	6.7
Asserting a practice rule	Asserting a truism that has been shown to consistently hold true in practice	6.2
Generating hypotheses	Asserting tentative explanations that account for a set of facts	4.3
Posing questions	Asking for answers without really expecting to receive them	3.6
Judging the value	Forming an opinion or evaluation about worth in terms of usefulness	3.0
Setting priorities	Ordering concepts in terms of importance or urgency	2.8
Stating a proposition	Stating a rule governed by IF-THEN proposition	2.0
Recognizing a pattern	Identifying characteristic pieces of data that fit together	1.9
Pondering	Mentally pausing to reflect on the meaning of a piece of information	1.7
Qualifying	Modifying, limiting or restricting, as by given exceptions	1.6
Making a generalization	Inferring from many particulars	0.9
Making assumptions	Taking for granted or supposing	0.9
Making predictions	Declaring in advance	0.4

morbidity, mortality, extra length of hospital stay and increased costs (Isabel *et al.* 2003, Kagansky *et al.* 2005, Capon *et al.* 2007). Both malnutrition and PUs can be prevented if residents at risk are identified early and relevant preventive measures are implemented (Baier *et al.* 2003, Kondrup *et al.* 2003). The reason we choose malnutrition and PU was the close connection between them and the well-documented challenge they present in nursing home care. Moreover, it is expected that RNs in nursing homes play a key role in preventing malnutrition and PUs.

Our understanding of RNs' thinking strategies in nursing homes remains incomplete. Previous studies have shown that there were no clear limits between steps in the nursing process and thinking strategies used (Grobe *et al.* 1991, Simmons *et al.* 2003, Funkesson *et al.* 2007). Clinical reasoning is a highly complex phenomenon. Therefore, more knowledge about RNs' clinical reasoning in malnutrition and PUs are necessary for the development of decision support tools for evaluating risk assessment, choosing prevention strategies and to manage these conditions.

## Aim

The aim of this study was to explore the thinking strategies and clinical reasoning processes used by RNs during simulated care planning for malnutrition and PUs in nursing home care.

## Methods

### Setting

The local municipalities are responsible for all the primary health care services in Norway, including older people's care. The Norwegian health care system and nursing homes are taxed-financed and mainly public. The majority of residents are over 80 years old and in need of long-term care services (The National Directorate for Health and Social Affairs 2005). RNs, nurse aides (NAs) with formal training from caring in nursing homes and employees without formal training in nursing homes are the three groups responsible for the care to residents. NAs and employees without formal training have the main responsibility for performing the daily care under the direction of RNs. Physicians are medically responsible for the residents, but they have limited time with the individual residents in nursing homes and consequently, RNs have great autonomy and responsibility for all aspects of the residents' care.

### Sample

A purposeful sample of 30 RNs (29 women and one man) working in nursing homes was recruited by their managers to participate in the study. Demographic data were collected from each participant and are summarised in Table 2. The RNs were employed at nine nursing homes in four counties in

**Table 2** Characteristics of respondents ( $n = 30$ )

	Years			
	Range	md	m	SD
Age	25–62	45	44.1	12.3
Experience from nursing homes	1–37	8	10.5	8.8
Experience from hospital health care	1–16	6	6.1	4.6

md, median; m, mean; SD, standard deviation.

the south of Norway. Participants met the following inclusion criteria: must be a RN and have a minimum of one-year nursing home clinical practice within the past five years. Two respondents had clinical experience from medical office and company health services. Five respondents had postgraduate education in older people's care, one in management, one in nutrition and one was a public health nurse. The sample size and the inquiry about the nurses' total time of experience, gained from hospitals and municipality care, were based on previous research using TA methods (Fonteyn *et al.* 1993, Simmons *et al.* 2003).

## Methods

In this qualitative explorative study, data were collected from RNs who used resident scenarios to simulate care planning during TA sessions (Fonteyn *et al.* 1993). The TA method has been described by Ericsson and Simon (1993). Resident scenarios in written form, presented with a clear focus on the primary task, have commonly been used as a stimulus to evaluate thinking strategies (Fonteyn *et al.* 1993, Simmons *et al.* 2003, Göransson *et al.* 2008). In this study, participants were asked to express their thoughts by thinking aloud without any reflections about their thinking. Brief remarks, such as 'please think aloud' and 'please continue' were used to prompt the participants to continue thinking aloud.

## Scenarios

Four simulated resident scenarios were used during the TA sessions. An example of one scenario is depicted in Fig. 1. All scenarios were based on authentic cases from nursing homes and developed in cooperation with RNs experienced in nursing home care. The scenarios contained information describing residents' symptoms related to malnutrition and PUs. The scenarios were validated for realism and relevance as recommended in earlier research (Fonteyn *et al.* 1993, Göransson *et al.* 2008) by two experienced RNs. The written comments from the two RNs resulted in changes in the way information was presented in the scenarios. For example, details about

medications were excluded, while more detailed information about residents' eating and drinking was included.

## Data collection

Data collection took place in 2007–2008 and was conducted in, or close to, the participants' workplace. The researcher collected demographic data, including gender, age and number of years in different nursing practices. Each RN was presented with four resident scenarios in three separate sequences. The participants were instructed to read the scenarios aloud and to think aloud their thoughts about each scenario. All sessions were tape recorded and transcribed verbatim.

## Ethical considerations

The study was approved by the Regional Committee for Medical Research Ethics in southern Norway (REK Sør, reference number S-07212b) and by the Norwegian Social Science Data Services (project number 16822) as a part of an intervention study in nursing homes. Written consent was obtained from the directors of all the nursing homes before the nurse manager selected the participants. Written consent was obtained from the participants after they had received oral and written information about the study, including the voluntary nature of participation and the right to decline participation at any time during data collection. Confidentiality was ensured by the removal of all personal identification material and assurance that the information would only be used for the purpose of research.

## Data analysis

The transcribed sessions were imported to QSR NVivo 7.0 (QSR International Pty Ltd, Doncaster, Australia) for qualitative data analysis. Analyses were performed in three steps. In the first step, all the verbal protocols were read as a whole to obtain a broad sense of the meaning (Graneheim & Lundman 2004). In the second step, data analysis was performed by a deductive content analysis to explore the RNs' thinking based on Fonteyn's 17 thinking strategies (1998) described in Table 1. In the third step, data were analysed to explore the RNs' clinical reasoning processes and to study whether there were similarities and differences in the way the clinical reasoning was conducted. The nursing process phases (collection of data, assessment and plan) were chosen as codes for the analysis. Collection was used to categorise when RNs were reading and looking for data in the scenarios, assessment was used when the RNs judged the

**Part 1:** A woman, 92 years old, arrived from the hospital to the current nursing home, where you are the RN responsible for the nursing care of this resident. This resident has had a stroke on the right side and is paralyzed in the left half of the body. She is now discharged from the hospital. The resident comes in the ambulance and in the note from the hospital they described that she is bedridden and has not been out of bed since she came to the hospital three days ago. Her body weight is 68 kg and she is 178 cm tall. The resident expresses that she has a lot of pain when moving from stretcher to bed and on the medication list you can see that she gets regular pain relief three times a day. She is also given Diural and Marevan. The resident has urine and bowel incontinence. She has both upper and lower dentures.

**Part 2:** After two weeks in the nursing home, the resident's body weight is 66 kg. She eats usually one slice of bread for breakfast and two slices of bread in the afternoon or porridge with milk. Dinner is a small portion. She drinks usually from three to five glasses of liquid a day. The resident says that she does not feel well. She has been in bed the past two days. In the electronic health care record your colleague has written that the resident ate and drank very little the past three days. She is red on the left heel.

**Part 3:** Six months after the resident was admitted into the nursing home, she sleeps most of the time, but is up two or three times a week in a wheelchair. They use a lift device to help her transfer or change positions. A blood test was taken and the result showed that her serum albumin level was low. The resident drinks less than three glasses of liquid a day.

Figure 1 Resident scenario number 3.

information from the scenarios and plan was used as a code when RNs stated the residents' needs and their planned nursing interventions. These three phases from the nursing process were used as a framework to search for patterns in the RNs' clinical reasoning process. To ensure credibility, verbal protocols from four sessions were analysed separately by four of the researchers and coding categories were compared and discussed until agreement was reached (Patton 2002). The findings will be presented in two parts: first, the analysis of the thinking strategies and second, the analysis of the clinical reasoning process.

## Results

### Thinking strategies

The sessions were between 16–44 minutes long. The RNs used a variety of thinking strategies for the four scenarios and all of Fonteyn's (1998) 17 thinking strategies, as displayed in Table 1, were used. However, not all thinking strategies were used by all RNs. Table 3 presents three of the most commonly used thinking strategies with definitions and quotations.

Table 3 Examples of thinking strategies with definitions and examples from the deductive analyses

Thinking strategy (Fonteyn 1998)	Definition (Fonteyn 1998)	Example
Forming relationships	Connecting information to further understanding	There she is... we have to take a look at this. I think that she is too much in the wheelchair and I will be slightly aware on the danger of pressure ulcer. Also, when she starts to get thinner. It is a greater risk to get more pressure or force on the buttocks. (RN no 16)
Making choices	Selecting from a number of possible alternatives to decide on and pick out	The goal is to prevent pressure on skin. The first thing to come to mind is how she sits and lies in bed. (RN no 1)
Drawing conclusions	Reaching a decision or forming an opinion	Weighs 68 kg and is 178 cm tall. It is a normal weight. (RN no 25)

RN, registered nurse.

*Thinking strategies frequently used in clinical reasoning*

'Making choices' was the most commonly used thinking strategy by all RNs and was used to a similar extent by most of the participants. RNs often started by suggesting interventions and then they went on to explain these interventions. Making choices was the thinking strategy that varied the least in frequency of use by individual RNs. One other commonly used thinking strategy was 'forming relationships'. When the RNs were forming relationships, they linked together relevant data from resident scenarios for further understanding (e.g., they interpreted residents' symptoms, initiated appropriate assessment, interpreted resident responses and suggested nursing and medical diagnoses). Forming relationships was also used when assessing data, suggesting appropriate intervention and reasons for action. For example, one RN stated 'Prosthesis in the upper and lower jaw. Make sure they fit because if the patient loses weight, they can become too large'.

'Drawing conclusions' was often done in connection with 'asserting a practice rule'. All the RNs made comments on the body-weight reduction presented in the resident scenarios, but less than half expressed that the residents were at risk of malnutrition. There were also variations in how the RNs assessed body-weight changes in the residents. Only half of the RNs referred to body mass index (BMI) to assess body weight. RNs justified a resident's risk of malnutrition based on their basic knowledge or their clinical experience, but half did not give any reasons. One example is 'for such an old person, her body weight is OK when correlating her body weight and height'. In conclusion, less than one-third of the RNs connected nutritional status and skin condition related to risk of PUs.

All RNs used the strategy of 'providing explanations' by interpreting data and providing reasons for the information given in the resident scenarios. Some RNs reasoned about the importance of documentation in clinical practice. In their clinical reasoning, none of the RNs included a structured nutrition or PU risk assessment at the residents' arrival to the actual nursing home. All RNs did reason about the residents' well-being and 12 RNs (40%) highlighted the residents' ability to participate in the care planning process. Half of the RNs reported understaffing as a problem and that they were therefore not able to provide optimal care. As one RN said, 'A problem in the nursing home is that we are understaffed. We are really struggling with residents who do not drink. We would like to have more staff, so we could go in every 10 minutes to ensure that they drink. But there is not enough time for that'.

All 30 RNs 'searched for information' about the residents' functional ability, medications, equipment for managing

resident health problems, social network and responses to treatment. For example, some of the nurses had questions about the data presented in the resident scenarios, such as the names of the medications that were used, blood test results and medical diagnoses. The RNs were also searching for relevant reasons for interventions they wanted to plan for the residents. The strategy of 'asserting a practice rule' was used in a variety of ways. The RNs described their opinion about the treatment, medical diagnosis and the need for particular interventions based on each resident's medical diagnosis and condition. The importance of using special bedside (PU) prevention mattresses was suggested by two-thirds of the RNs. For example, one RN expressed: '...now if they must lie in bed, we use PU prevention mattresses to all if we have prevention mattresses available'. All RNs generated hypotheses; when the RNs 'generated hypotheses', they tried to interpret the reported observations and symptoms described in the resident scenarios. One example of this interpretation process is illustrated by the following statement: '...and when he drinks so little and has lost so much body weight, we should have tried nutritional supplement drinks'.

*Thinking strategies less frequently used in clinical reasoning*

The strategies of 'posing a question' and 'judging the value' were used by all RNs but did not occur frequently. One example of 'posing a question' is: 'How much does he really have to drink?' Most of the questions were related to the resident's health condition. The RNs judged the information presented in the scenarios. One example is: 'The resident drinks less than three glasses a day, so she drinks very little. We must try to find out what is the reason? Why does she not want to drink? Maybe she should get intravenous fluid? I will ask the physician'. The thinking strategy 'setting priorities' was used by the RNs in organising a plan of relevant interventions for the residents where most of the time the ordering of interventions was based on residents' concerns as described in the scenarios. One example of such interventions is the statement: 'The most important intervention is to try to give her a nutrition supplement'. The thinking strategy 'stating a proposition' was used when RNs connected information from the residents' scenarios and gave comments about symptoms and diagnosis. More than two-thirds of the RNs used this strategy three times or less in all sessions.

Two-thirds of the RNs used the thinking strategy 'recognising a pattern' in their reasoning about malnutrition and PUs in the resident scenarios. The RNs recognised and matched patterns in relation to the residents' general condition. The importance of the situation of the residents, interventions, their professional experience and lack of fit in the scenarios were also identified. Pattern recognition and



matching were mostly in relation to basic human needs, such as elimination, pain relief, activity, nutrition, fluid and the residents' social situation. The RNs referred to familiar situations and related these to the residents' problems and medical diagnoses. Not once did the RNs mention nursing diagnoses explicitly though many of the problems could be related to nursing diagnoses, such as balance problems, risk for PUs, risk for malnutrition and bowel constipation.

'Pondering' was used by one-third of the RNs, but not very frequently, when they stopped and summarised their reasoning process. Two examples are 'Let me see. Let me think'. The four thinking strategies 'making assumptions', 'qualifying', 'making generalisations' and 'making predictions' were used to a very limited extent in the RNs' reasoning. The thinking strategy 'making generalisations' was used by every second nurse, as, for example, in the following statement: 'She is very thin so it does not look so good. But then again, there are normally many old people who are thin'. RNs used 'making predictions' when they predicted interventions and outcomes for residents. One example is: '...he is probably heavy breathing, everything is a struggle and even eating can be hard for breathing, but being together with him when he eats might help him'. All the thinking strategies were identified in the TA sessions, but there were considerable differences in how often the RNs used the different thinking strategies.

### Clinical reasoning process

Most of the nurses started the clinical reasoning processes by assessing the data from the resident scenarios. In nine of the 120 individual sessions, RNs either started with collecting data or went straight to planning interventions.

*Collecting data:* this code was used when the RNs asked for more data, as for example: 'He doesn't feel good. What does it mean? Are there physical symptoms, or is it more a case of how he feels?' The two most commonly used heuristics in this phase were: 'Posing a question' and 'searching for information'. *Assessing:* this code was used when the RNs assessed data in the resident scenarios and reflected on their suggested interventions in the planning, as for example: '...calculate intake and output again as I said and take regular body weight to see if he still has lost weight, serum albumin continued to be followed'. When assessing data, the RNs used a variety of thinking strategies. The most common strategies used were 'searching for information', 'judging the value', 'drawing conclusions', 'generating hypotheses', 'asserting a practice rule' and 'providing explanations'. *Planning:* this code was used when RNs proposed interventions for the residents. One example

of such planning is, 'She needs a special mattress for prevention of PUs. Probably we need to turn her frequently or help her with position change'. When they planned nursing interventions, RNs referred to their education and clinical experiences, but none of the RNs referred directly to research findings. 'Making choices', 'forming relationships' and 'setting priorities' were the most common thinking strategies in this phase.

All RNs reported and commented on changes in the body weight of the residents presented in the scenarios. However, less than half of the RNs suggested plans demonstrating explicit relationships between nutritional situation and PUs. Over half of the RNs mentioned that they would consult other professions, such as physicians for judgment of medication, physiotherapist to increase residents' physical activity level and occupational therapists to accommodate aids (e.g., a better wheelchair and a special wheelchair pillow to prevent the risk of PUs).

### Discussion

RNs focused on prevention of malnutrition and PUs, but none of the RNs included structured nutritional or PU risk assessment. The RNs did not explicitly base their interventions on research, and they assessed the residents presented in the scenarios in very different ways. When RNs reasoned clinically, they started with collecting data but most moved directly to assessing and planning for the residents. Although RNs used all 17 thinking strategies in the clinical reasoning process, there were considerable differences in how often the RNs used them.

### Methodological limitations

The TA method is widely used to assert details about decision-making (Ericsson & Simon 1993). Because this TA study was based on simulated scenarios and not on real-life clinical situations, contextual information was lacking that may have influenced the results. Scenarios presented on paper lack perceptual and sensory information, information that may have influenced the RNs' reasoning process (Fonteyn *et al.* 1993). Further, the information to the RNs was controlled and presented in sequences. The optimal TA study should be conducted in real-life clinical settings; however, ethical and practical reasons contributed to choosing constructed simulated resident scenarios for this study. Results from sessions in real-life (Simmons *et al.* 2003) and simulated sessions (Fonteyn 1998) have shown similarities, suggesting support to conduct studies on simulated scenarios to reduce the strain on residents and staff.

To increase the authenticity of the TA data from the sessions, the instructions explicitly urged the respondents not to give reflections, but rather to think their immediate thoughts aloud to resemble the pace of the thinking process in real-life situations. All the respondents were reminded to think aloud and express their thoughts to increase the richness of data. Similar to other studies conducted within the discipline of nursing with TA methods, the verbalisations were very rich in all the sessions (Grobe *et al.* 1991, Fonteyn 1998, Simmons *et al.* 2003).

Deductive coding was chosen, because it is a good technique to explore thinking strategies in RNs' reasoning in nursing homes. An inductive coding may have given a different result, but all 17 thinking strategies (Fonteyn 1998) were identified in the data, which may strengthen the choice of the deductive method of analysis.

### *Thinking strategies*

All 17 thinking strategies were identified in the transcripts though how often the RNs used the different strategies varied. Such variation has also been found in studies on RNs' reasoning in older people's care (Fonteyn 1998, McCarthy 2003, Funkesson *et al.* 2007). All the RNs used nine of the thinking strategies, but the frequency of use varied among the RNs. The three most used thinking strategies were 'making choices', 'forming relationships' and 'drawing conclusions'. This finding supports those from previous TA studies (Grobe *et al.* 1991, Fonteyn 1998, Simmons *et al.* 2003). This focus could be interpreted to mean that the RNs did not make thorough assessments, an event that could lead to undetected problems and risks. When making choices, none of the RNs explicitly based their interventions on research findings, which is similar to a finding from a study of nursing homes using the TA method (Funkesson *et al.* 2007).

'Recognising a pattern' (pattern matching) is an important aspect of clinical reasoning in nursing practice (Fonteyn 1998). One-third of the RNs did not use this thinking strategy. This finding indicates the need to incorporate support (e.g., in computerised decision support systems, CDSSs) for RNs to develop these skills.

The thinking strategy (judging the value) was not frequently used, and there was disagreement among the RNs about the body-weight variable presented in the scenarios. Some RNs assessed one of the residents in the scenarios as under normal weight, whereas other RNs assessed the same resident as having normal weight and still others assessed the same resident to be over normal weight. RNs showed considerable variation in their risk assessments, choice of interventions and how they planned the care for the residents in the scenarios. These results are consistent with those from

an earlier report (Thompson *et al.* 2009). Less than half of all residents in Swedish municipal care and hospital care (Persenius *et al.* 2008) and 60.2% in a study conducted in Dutch nursing homes (Meijers *et al.* 2009b) were routinely assessed for nutritional needs. Lack of risk assessment was also identified in a study of patient records (Ehrenberg & Ehnfors 1999) and in a TA study with RNs in nursing homes (Funkesson *et al.* 2007).

'Recognising a pattern', 'stating a proposition' and 'setting priorities' were thinking strategies that RNs used infrequently or not at all. The RNs did not show any diagnostic reasoning, a result that is in line with earlier work (Ehrenberg & Ehnfors 1999, McCarthy 2003, Funkesson *et al.* 2007).

### *Clinical reasoning process*

Many of the RNs spent limited time on collecting and assessing data. The RNs showed a tendency to go straight to planning without preceding data collection. The different phases in the reasoning process were linked together, a finding confirming previous research. For instance, Grobe *et al.* (1991) found that RNs linked problems and interventions and Junnola *et al.* (2002) found that RNs were capable to make the right decision, although the decision-making process, data collection and problem definition were not particularly effective. The results from our study might be explained in terms of the constructed information in the simulated scenarios, and thus the results might have been different in real-life observations.

A survey showed that Norwegian hospitals show flaws in measuring patients' body weight, food intake and planning for nutritional interventions among patients at risk for malnutrition (Mowé *et al.* 2006). Similar research in Norwegian nursing homes raised concerns about the quality of nursing care (Malmedal *et al.* 2009). Also in our study, none of the RNs performed systematic risk assessment, although national guidelines require systematic risk assessment as a routine for residents in nursing homes (Guttormsen *et al.* 2009).

One reason for our findings could be that RNs described their situation as understaffed, which could explain their lack of time to collect sufficient data. The findings might also have been influenced by the TA method and consequently, may not accurately reflect nursing home settings. Further research should investigate clinical reasoning and decision-making in nursing homes, assess the residents outcomes based on the clinical reasoning process and focus on what external factors cause RNs to use different thinking strategies. For example, do CDSSs enable RNs to locate and use important information to make quicker and safer clinical decisions for frail nursing-home residents?



Clinical reasoning unsupported by technology may lead to poor clinical decisions and negatively affect the quality of care provided. The present results show that the RNs made numerous decisions, but the decision-making process might be ineffective because of the lack of systematic data collection and problem identification. Organisation of data presentation and visualisation which do not match mental models of end users could lead to difficulty in data searches, which could result in inaccurate diagnosis and treatment (Fonteyn & Ritter 2008). The insight gained from this study can be used to develop CDSSs designed for nursing homes to support the RNs. Development of CDSSs must take into account the clinicians mental models, point of care availability and ease of use (Carter 2007).

Think aloud strategies facilitate the development of information technology that supports a user mental model for how the system works. CDSSs should be developed and tested to support RN's systematic assessment of residents at risk of malnutrition and PUs. These systems could provide RNs with suggested treatment for residents based on evidence-based knowledge. This could have significant implications for novice nurses who may use information systems as a reminder for proper evidence-based preventions or treatments, such as, a display of a task list which includes certain preventative treatments (e.g. turning and repositioning, intake and output) needed to be addressed every shift. Additionally, these tools could have important implications for experienced nurses who need to sift through large amounts of data for specific preventions or who want to prioritise preventive measures.

## Conclusion

This study provides insights into RNs' thinking strategies and clinical reasoning processes in nursing homes. RNs in nursing homes used a variety of thinking strategies when they reasoned about malnutrition and PUs. The study identified 'making choices', 'forming relationships' and 'drawing con-

clusions' as the most commonly used thinking strategies. There was both a lack of systematic risk assessment and interventions explicitly based on research findings. In our study, RNs had a strong tendency to bypass data collection, going immediately to planning care in their clinical reasoning process.

## Relevance to clinical practice

Knowing more about RNs' clinical reasoning is important in the development of decision support for nurses. This knowledge is important for optimising professional training and practice to increase good nursing and high-quality care. The knowledge from this study of thinking strategies and clinical reasoning can be used in the design of tools to deliver evidence-based information to clinicians at the point of care, to support the RNs' ability to assess residents at risk, systematically, and give decisional support for nurses to use evidenced-based interventions.

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## Contributions

Study design: MF, KG, ME, AE; data collection and analysis: MF, GA, KG, ME, AE and manuscript preparation: MF, GA, KG, ME, AE.

## Conflict of interest

None.

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