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Adapting Cognitive Interviewing for Nursing Research

Shigeko Izumi, PhD, RN [Assistant Professor],
Oregon Health & Science University School of Nursing

Roxanne Vandermause, PhD, RN [Assistant Professor], and
Washington State University College of Nursing

Sandra Benavides-Vaello, PhD, RN [Assistant Professor]
Washington State University College of Nursing

Abstract

Cognitive interviewing (CI) has been used by instrument developers to examine how well an instrument generates the intended data when tested with prospective respondents. In using CI to test a new instrument to measure patients' perceptions of the quality of nursing care, the authors found challenges in applying a theory-based traditional CI approach derived from experimental psychology to more clinically-oriented nursing research. The purposes of this article are to describe these challenges and the modifications of CI to capture the nursing care perspectives of hospitalized participants, and to present interpretive phenomenology as a theoretical orientation for clinically-situated CI.

Keywords

Cognitive interviewing; nursing care quality; instrument development; interpretive phenomenology

Developing instruments to collect reliable and valid self-report data is critical in health care research. A number of approaches can be used to generate items and examine each item as well as the instrument as a whole, with the goal of maximizing validity and minimizing error from instrument design (DeVellis, 2003; Dillman, 2007; Patrick et al., 2011a, 2011b). Cognitive interviewing (CI), a means to examine and understand the cognitive processes of respondents as they answer survey and instrument questions (Knafl et al., 2007; Levine, Fowler, & Brown, 2005; Presser et al., 2004), is recommended for developing self-report instruments (Beatty & Willis, 2007; Collins, 2003; Jobe, 2003; Patrick et al., 2011b).

The traditional procedure of CI is based on cognitive theory in psychology and designed for use in cognitive laboratory settings rather than field situations (Willis, DeMaio, & Harris-Kojetin, 1999). Use of CI has expanded to clinical research fields such as health care and nursing, in which studies have been conducted in less controlled environments outside of laboratories (Ahmed, Bestall, Payne, Noble, & Ahmedzai, 2009; Beck, Towsley, Berry, Brant, & Lavoie Smith, 2010; Knafl et al., 2009; Levine et al., 2005). Theoretically-based approaches to adapt laboratory-based CI to clinically oriented research settings have not been reported.

The first author used CI to validate and refine questions in a newly developed instrument measuring patient evaluations of quality of nursing care. Despite trying to follow textbook descriptions (e.g., Presser et al., 2004; Willis, 2005) on how to conduct cognitive interviews, challenges were encountered that made it apparent that the adaptation of CI to clinical nursing research needed theoretical examination, but literature to guide this adaptation was found to be limited. The purposes of this article, therefore, are to (a) describe the challenges experienced by the researchers in conducting and analyzing cognitive interviews, (b) examine modifications of CI for research in clinical settings, and (c) propose interpretive phenomenology as a new theoretical basis for clinically-situated CI.

Use of Cognitive Interviewing in Instrument Development

To reduce the number of non-responses, non-completions, or misinterpretations and improve the accuracy of data from self-report instruments, potential problems with instruments need to be identified prior to their distribution to study subjects (Dillman, 2007). CI is one approach to pretest instrument questions with a small number of participants who are similar to the prospective respondents; the purpose of the pretest is to identify and address potential problems in the instrument (Willis et al., 1999). The cognitive perspective guiding CI is Cognitive Aspects of Survey Methodology (CASM), which is closely associated with memory theory in experimental psychology. According to CASM, the survey response is a four-stage process involving the comprehension of questions, memory retrieval, judgment, and response (Tourangeau, 1984; Willis, 2004; Willis et al., 1999). To obtain objective information about cognitive factors and the psychological aspects of the four-stage process of the survey responses, traditional CASM studies were conducted in a controlled laboratory environment (Willis, 2005). As use of CI has expanded beyond cognitive psychology, some CASM researchers have addressed limitations of this highly controlled traditional approach, such as the difficulty in obtaining practical information to refine questions (Willis, 2005).

More recently, CI has been adapted to develop patient-reported outcome (PRO) measures for use in clinical trials (DeMuro, Lewis, DiBenedetti, Price, & Fehnel, 2012; Patrick et al., 2011b). In this adapted approach, cognitive interviews are used not only to obtain objective information about how prospective respondents answer questions but to address the content validity of the instrument, including subjective experiences of patients. The settings for conducting cognitive interviews have become more flexible and less restrictive among researchers using the adapted approach, but the theoretical basis of this adapted form of CI has not been discussed.

Use of Cognitive Interviewing for the Quality of Nursing Care Index (QNCI)[®]

The cognitive interviews reported in this article were conducted as part of an effort to develop an instrument, the Quality of Nursing Care Index (QNCI)[®], that measures quality of nursing care from the perspective of hospitalized patients with advanced illness such as stage IV cancer or organ failure. There are a number of quality measures such as the Press Ganey patient survey and data collected for the National Database of Nursing Quality Indicators[®] to assess structures and outcomes of quality nursing care or patient satisfaction, but only a limited number of scales assess the quality of the nursing care process, and these focus on specific populations such as patients with infectious diseases, acute illness, or cancer (Lynn, McMillen, & Sidani, 2007; Radwin, Alster, & Rubin, 2003; Wilde, Larsson, Larsson, & Starrin, 1994). Quality measures for the process component of care from the perspective of patients with advanced illness are lacking, and the QNCI[®] was developed to fill this gap (Izumi, Baggs, & Knafl, 2010). While the process of developing the QNCI[®] is discussed elsewhere (Izumi, Knafl, & Baggs, 2010), a brief description of the QNCI[®] follows.

Based on qualitative interviews of hospitalized patients with advanced illness such as stage IV cancer or organ failure (Izumi, Baggs et al., 2010), items for the QNCI[®] were created to measure the quality of nursing care from the perspective of hospitalized patients with advanced illness. Of 65 initial items, 45 were selected by an expert panel of seven nurses (three nurse researchers who had studied nursing care quality and four masters- or PhD-prepared nurses who worked in quality improvement in hospitals) for potential inclusion in the QNCI[®] (Izumi, Knafl, & Baggs, 2010). The QNCI[®] was designed to be a pencil-and-paper self-administered survey for English-speaking patients. Patients rate how often their nurse(s) demonstrated specific behaviors representing quality of nursing care during their hospital stay by selecting one of five responses on a Likert-type scale: 1-*not at all*, 2-*rarely*, 3-*occasionally*, 4-*often*, or 5-*all the time*. CI was used to test the QNCI[®] as part of the process of refining this instrument.

Cognitive Interview Procedure

The researcher planned to use CI as described in textbooks for instrument development (DeVellis, 2003; Dillman, 2007; Presser et al., 2004), to assess respondents' understanding and interpretation of the questions in the QNCI[®] to reduce potential measurement error and improve the validity of the questions. CI was used to evaluate the 45 proposed items in the QNCI[®] with 14 patients who were similar to prospective respondents.

Between 2009 and 2010, 14 patients (7 males, 7 females; mean age 54.5 years; age range 43–82 years) were recruited from two medical centers in the Northwest region of the US after appropriate Institutional Review Board approvals were obtained. Inclusion criteria for participants were patients: (a) who were hospitalized with stage IV (solid organ or hematologic) cancer, advanced-stage lung disease, or organ failure; (b) whose hospital stay was expected to be 3 days; (c) who had at least two prior hospital admissions in the preceding 12 months; (d) who were oriented to person, place, and time; (e) who were 21 years of age or older; and (f) who were able to read and speak English. All interviews were conducted in patients' hospital rooms by the researcher (SI) after patients gave informed consent.

The initial plan included concurrent think-aloud and prescriptive verbal probing, common techniques for CI (DeMuro et al., 2012; Jobe & Mingay, 1989). Participants were given a set of cards, each containing one item from the QNCI[®] and the five possible responses on a Likert-type scale (as suggested by M. Lynn, personal communication, October 28, 2009). Participants were asked to read each item and select a numerical response on the Likert scale, while speaking their thoughts ("Please answer the question the way you normally would, except that I want you to think out loud while you answer.") The interviewer asked participants to further elucidate their thinking when necessary, using probing questions (e.g., "tell me more," "what does XXX mean to you in this question?").

Because CI tends to be intense, and hospitalized patients with advanced illness are often frail, to reduce participant burden the 45 proposed items of the QNCI[®] were randomly divided into halves, and each participant responded to either 22 or 23 items. The mean interview time was 38 minutes, and all interviews were audio-recorded.

Data Processing and Analysis

Interview recordings for each item were transcribed by professional transcriptionists, and accuracy of the transcripts was checked by the first author. An item-by-item analysis of participants' responses was conducted guided by Knafl et al.'s (2007) approach to analyzing and interpreting CI. The goal of the analysis was to identify incomprehensible or

inconsistent items and then delete or modify them, to reduce potential response errors and improve the quality of data obtained by the QNCI®.

Three researchers (SI, SBV, and RV) independently read and summarized participants' responses to each item and then organized the items into three categories (retain, modify, or delete), with a rationale for each decision. The researchers held discussions until they reached consensus about the items to retain, delete, or modify. As a result of this process, of the 45 proposed items, 21 were retained as written, 13 were deleted, and 11 were modified. The most common reasons for deleting items were duplication, unclear meaning, or lack of response variability. Modifications were made to clarify the meaning of some items, in keeping with participant responses.

Findings, Challenges, and Modifications of Cognitive Interviews

Challenges and questions were identified during the design, interview, and analysis process of CI: (a) minimizing social interactions between participants and the interviewer, (b) eliciting thinking processes from participants using the think aloud technique, and (c) deciding how to use the information from participants to improve the quality of instrument items. These challenges served as a catalyst for the researchers to modify the process of CI and look for methodological justifications for the modified approach. Examples illustrating the challenges, modifications made in response to the issues (Table 1) and discussions justifying the changes follow.

Challenge 1: Limiting Social Interactions Between Participants and the Interviewer

The think-aloud technique developed by Ericsson and Simon (1980) and summarized by Willis (2004) was based on the assertion that verbalization neither produces reactivity nor alters the course of the cognitive processes if the “social interaction between experimenter and subject is minimized ... and the instructions limit the degree to which subjects are induced to speculate on antecedent stimuli that may have influenced or directed their thinking processes” (p.29). Strong proponents of the think-aloud approach in CASM recommend minimizing social interactions by placing participants in an observation laboratory, creating a physical and social distance between participants and interviewers, and using scripted impersonal interview guides (Ericsson & Simon, 1993, 1998; Willis, 2004).

The think-aloud approach in the traditional CASM posed a practical and philosophical challenge in testing the QNCI®. Because the goal of the CI was to identify potential errors and difficulties of future respondents might have in responding to the questions, it was necessary to choose participants who were similar to potential future participants, that is, hospitalized patients with advanced illness. It was impractical, if not impossible, to bring hospitalized patients with advanced illness into an observation room as Ericsson and Simon recommended (1993, 1998). The interviews therefore were conducted in participants' hospital rooms instead of a laboratory.

In the first few interviews, to remain true to the precepts of CI, the interviewer attempted to keep social interaction with the participant to a minimum. Yet, social interaction was inevitable in the setting of participant's hospital room, where it was natural for participants to engage the interviewer in conversation. When the interviewer responded to the participants in an uninvolved manner (such as “keep talking”), the participants tended to lose interest in the interview and offered less meaningful comments.

Likewise, when a co-author (SBV) conducted cognitive interviews in a different study with a Mexican American population, limiting interactions between the participants and the

researchers posed a significant obstacle to building rapport (Garcia, 2011). An interviewer as a distant observer with a restricted interview script and limited interactions was regarded as disrespectful. Other researchers have experienced similar issues with Latino populations, raising questions about the social and cultural acceptability of this type of interviewing method (Evans, Coon, & Crogan, 2007; Garcia, 2011).

Given that the participants in nursing research may be more vulnerable and diverse than the traditional study subjects in psychology (i.e., healthy college students), special considerations when using CI are needed to assure safety and comfort and to build rapport. No literature was identified, however, in which authors discussed theoretical justifications for modifying CI in patient populations to achieve effective interviews, or how much social interaction should be allowed (DeMuro et al., 2012).

Modification 1: Participant-Controlled Environment and Natural Social Interaction

All participants chose to be interviewed in their hospital rooms, except one who chose to be interviewed while he was being dialyzed in a treatment room. Most of the interviews were conducted while the participants sat or lay in their hospital beds. The interviewer located herself where the participant suggested, usually in a chair at the side of the bed. Locating the interviewer behind a subject to minimize interactions as suggested in some CASM literature (Ericsson & Simon, 1993) was not feasible in the typical hospital room setting. More importantly, the interviewer found that remaining out of the participant's sight was socially inappropriate, and patients were likely to be put off by such placement.

As a result of the unsatisfactory responses by the participants to the initial pre-scripted think-aloud approach in which interaction was limited, the interviewer modified the interview method, using the think-aloud approach in a more conversational and interactive way to elicit responses from the participants (see Table 1). The interviewer borrowed interview techniques that she had used in an earlier interpretive phenomenological study to build rapport and engage participants. For instance, the interview was initiated with a brief conversation introducing the interviewer, her background as a nurse researcher who was interested in learning about patient perspectives on quality nursing care. She then asked participants to briefly describe the reasons why they were in the hospital and their current health conditions. The exchange of introductions between interviewer and interviewee was critical in building rapport. In addition, this conversation was helpful to the interviewer's understanding of participants' backgrounds, which informed how the participants responded to the questions.

Challenge 2: Difficulties Eliciting Useful Information from Participants

The purpose of CI is to identify potential problems in the survey items by asking participants to describe how they interpret the questions and why they respond in certain ways. It was difficult to elicit information from participants about their interpretation and understanding of the questions. For example, in response to the item, "The nurses seemed to know what they were doing," when participants were asked to think aloud while selecting a response on the Likert scale, they tended to select the numerical answer immediately and were not able to articulate their thinking process as to how they arrived at their response.

To them, the meaning of the question was obvious (see Table 2). Despite repeated reminders to think aloud and probing about their responses to this item, participants could not articulate how they understood this question, what it meant, how they retrieved answers from their memory, or how they judged their responses. If the interviewer repeatedly asked them to talk more about their thoughts, the participants became frustrated, quit talking, or provided superficial irrelevant comments. Other items for which participants had difficulty thinking

aloud as they responded were on their impressions of nurses' qualities (e.g., competent, compassionate, professional: see Table 2) rather than on nurses' specific behaviors or events.

Modification 2: Reflective Probing with Greater Interviewer Flexibility

The think-aloud technique may not be appropriate for questions that elicit impressions, as illustrated by participants' responses to questions in the QNCI[®] that focused on impressions rather than specific events. Willis (2004) noted that the think-aloud approach was intended to elicit the memory retrieval process and thus might not be useful in understanding how a participant comprehends questions or how they make judgments.

Beatty and Willis (2007) suggested that, in practice, think-aloud and verbal probing should be used complementarily, selecting the appropriate procedure based on the age and cognitive ability of participants, topic of the questionnaire, or intended mode of administration. In the test of the QNCI[®], verbal probing was more effective than think-aloud in eliciting how respondents interpreted questions. To gain understanding of mostly unconscious processes of interpretation and responses to the questions, the interviewer needed to explore the participants' background experiences affecting the responses. Again using an interview technique common in interpretive phenomenological studies, the interviewer departed from the scripted neutral probes and used individualized reflective probes to explore participants' background experiences (Benner, 1994; van Manen, 1990). For example, in response to the item, "The nurses were attentive to what I needed," one participant rated how often his nurse(s) demonstrated attentive behavior as "5 (*always*)."

Interviewer: Give me some examples. What kind of things did you need from nurses?

Participant: Sometimes you need help walking, going to the bathroom, getting the water. If you drop something on the floor, you cannot get it. I would not call them for that. But if they come into the room, I would ask them.

Interviewer: And like the nurse [who just left the room], do they ask "Do you need anything?" before they leave the room?

Participant: "Is there anything else?" Yes. They always do.

In this conversation, by asking the participant to offer examples of nurses being attentive to his needs, the interviewer was able to confirm that the participant interpreted the question as the developer of the question intended. Furthermore, by knowing nurses' practice in the unit and contextualizing the question by referring to the behavior of a nurse who had just left the room, the interviewer understood how this participant interpreted the question and why he selected response 5 (*Always*). Similarly, for items 1, 30, and 31 in Table 2, the interviewer asked respondents for examples. Most participants were able to share examples indicating whether nurses were acting or not acting as described.

Asking participants to describe a situation they thought of when answering a question was useful when participants could not articulate why they selected a response. As the interviewer changed strategies and solicited participants' experiences, participants became more engaged in the interview and were able to offer their thoughts while responding to questions.

Challenge 3: How to Use the Data to Improve Questions

Another challenge was how to analyze and use the data from the CI to improve the items in the instrument. Because the questions in the QNCI[®] were worded using terms hospitalized patients used in the initial qualitative study (Izumi, Baggs, & Knafl, 2010), the participants

did not appear to have difficulty understanding the questions. Challenges occurred, however, when participants added qualifiers or conditions when describing the context in which they interpreted the question. For example, one participant responded to item 4, “I had to wait for nurses when I needed their help”, by stating:

I have only had to wait when they [nurses] were changing the shift. Because if you call when they are changing the shift, they can't come right away. But if you call and they are not changing the shift, and they are not with another patient, they come right away. So, I don't know how you would really answer this one.

Another participant stated, “It was very rare that I did have to wait, but also, I knew that there were others that were getting care before me. So, it wasn't over-exceeding in time that I felt that I was being neglected. Very reasonable.” Both participants indicated that their response to this question required some consideration of nurses' workloads.

Similarly, in response to item 11, “The nurses caused me a lot of pain during treatments, such as injections, starting IVs, or dressing changes,” some participants said that certain procedures always cause pain, because pain is inherent in the procedure. Their responses, however, were based on whether nurses did their best to minimize unnecessary pain. Participants added these conditions or assumptions to frame the question in the context of their unique experiences. These responses provide useful information and ideas for revising the item, and it was reasonable to add these conditions to the question. It was possible, however, that the modified item would be too specific to an individual experience and not applicable or relevant to all prospective respondents.

Another problematic question was one in which the participants uniformly commented that nurses behaved in a particular manner because the participants influenced nurse behavior. For item 34, “The nurses talked down to me,” all of the participants selected “Not at all,” and four of them stated this was so because they did not allow nurses to behave in that way (see Table 2). It is possible that the item's statement was socially unacceptable or offensive from the participants' perspective. Knafl et al. (2007) identified that the wording or the tone of a question can cause an item to be problematic. In addition to the potentially unacceptable tone of the statement, lack of variability in responses was a concern. Using participants' narrative responses to weight their importance and improve the question items was a difficult task.

Modification 3: Contextualized Analysis of the Data

The initial analytical goal was to sort items into three groups (to retain, modify, or delete) and revise items in the modify group based on the degree of agreement among participants' interpretations of the questions and their responses. The degree of agreement of participants' interpretations was difficult to analyze, however, because the participants often added their unique qualifiers, such as how they interpreted the items and why they selected one response over another based on their experiences.

Ultimately, the decision to modify a question was made when qualifiers or conditions added by the participants were similar and increased the accuracy and clarity of the question. Questions were retained without modifications when proposed qualifiers or conditions seemed to be unique or applicable only to a narrow range of future respondents.

Because the CI interview technique was modified by borrowing from phenomenological interviewing, it changed the nature of the data and required modification of analytical strategies. Responses were compared item by item, and responses that stood out from others were examined across all responses from the same participant as well as other participants with similar responses. This constant comparison across participants and topics in narrow

and broad contexts is a commonly used qualitative analysis technique (van Manen, 1990). As commonly seen in qualitative analyses (Polkinghorne, 2007), there were no clear criteria to determine which comment or qualifier would be valid and improve the question, but in-depth and lengthy discussion among three researchers to achieve consensus added rigor to the analysis.

Considerable discussion occurred for the question, “The nurses talked down to me,” to which all participants selected “*Not at all*” as a response. The researchers opted to delete this item, primarily because of the lack of variability in responses. Additionally, the participants’ stern response stating “this does not happen” implied that the question might be socially inappropriate. We judged the uniformly stern responses from all participants as an important indication of similar future responses.

Discussion

The goal of this inquiry was to use CI to refine questions in the QNCI[®] by understanding how future respondents might interpret and respond to the questions. As a novice cognitive interviewer, the researcher chose CASM to guide her cognitive interviews because it was theoretically-based. Challenges arose, however, because there were discrepancies between the methodological assumptions in traditional CASM and the reality of interviewing respondents in clinical situations. Participants often were less engaged or unable to articulate how they interpreted and responded to a question, and creating an interview setting for objective observation with limited interactions was impractical with the diverse and vulnerable participants common in clinical research.

Although authors have criticized the traditional CASM approach that uses minimal interactions in controlled environments and pointed to the need for divergent approaches, investigators who have reported conducting cognitive interviews in healthcare settings have not provided theoretical justification for their modification of CI methods. Modifications made during this study were, therefore, mostly driven by pragmatic needs, but the lack of theoretical guidance to modify the CI method prompted philosophical questions among members of the research team, such as: how do we know how respondents interpreted questions, and what did questions mean to them? The researchers discussed ways to better understand how the participants interpreted the questions.

For the two researchers (SI and RV) who had experiences in interpretive phenomenological studies, the answer was to understand the background and experiences that formed the participants’ worldview. From an interpretive phenomenological perspective, participants’ interpretations are affected by their prior experiences, and the interpretations are usually processed unconsciously or the response occurs so rapidly that people are not aware how it occurred (Benner, 1994; Diekelmann & Ironside, 2006).

To gain an understanding of mostly unconscious processes, such as responding to a question about whether nurses appeared to be professional or compassionate and participants were unable to articulate their responses, the interview technique of asking participants to share their experiences relevant to the question was useful. Further, knowledge of the participants’ backgrounds to contextualize their experiences enhanced the researchers’ understanding of how the participants viewed and interpreted the world. The interpretive phenomenological view provided a robust framework within which to interact with participants and elicit participants’ responses to explore their understanding and interpretation of the questions.

Eliciting and understanding participants’ experiences relevant to their CI responses requires the interviewer to have certain skills. The interviewer in this study (SI) was an experienced

qualitative researcher who had conducted many interviews using interpretive phenomenological approaches. Her familiarity with interview skills commonly used in phenomenological studies enabled her to adapt them to the CI interviews and to pose appropriate reflective questions.

In a traditional CASM approach, the interviewer is expected to be an objective data collector following standardized procedures (Beatty & Willis, 2007). Such interviewers are not necessarily trained to understand the entire instrument development process or the goals of the instrument. In the present study, the interviewer was the researcher developing the instrument (QNCI[®]), was grounded in survey methodology, and understood the measurement objectives of the instrument. Thus, the interviewer was able to make decisions about the content and scope of data collection and to use un-prescribed reflective probing depending upon the participants' responses, which was appropriate and possible in this study.

To apply the CI approach as modified in this study, however, careful consideration needs to be given to preparing the interviewers. In the modified approach described here, the interviewer must have a clear understanding of the goals of CI, not only to pose the right questions in the appropriate context, but to engage the participants in co-creating relevant survey questions for future respondents.

CI data such as ours, with responses to reflective discretionary probes, necessitated a lengthy iterative process of interpretative analysis, which might be considered less reliable. In a study by Conrad and Blair (2009), a discretionary probe group generated data with lower inter-judge reliability but uncovered more potential problems as compared with a scripted probe group. Although data generated by discretionary probes might be viewed as less reliable in traditional CI analyses (Conrad & Blair), data from the modified CI approach framed in an interpretive phenomenological view can be qualitatively trustworthy if they are analyzed with qualitative rigor. Findings from the modified CI approach also may provide meaningful information to modify the items because items were validated against participants' experiences. Yet, it is undetermined whether the resulting revisions on questions in the QNCI[®] improved the reliability and validity of the instrument. Psychometric testing on the revised QNCI[®] is warranted, and novel ways to evaluate the quality of CI data and its analysis using various paradigms should be explored.

Conclusion

This article offers one example of how CI was modified to examine an instrument in nursing research. Although the modified approach for CI was practical and reasonable in this study, the same approach may not work in other inquiries, and additional examinations of CI methods are needed.

CI stands at a unique methodological crossroad where qualitatively developed questions are transformed into quantifiable questions. CI can be used to examine whether the quantifiable questions capture the qualitative characteristics of respondents' experiences. Close examination of what happens in CI from both qualitative and quantitative perspectives may bring vibrant methodological discussions worthy of further exploration.

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Table 1

Initial Plan for Cognitive Interviewing, Challenges Encountered, and Modifications Made

Initial Plan based on Traditional CASM		Challenges Encountered		Modifications Made		
Limited social interactions between participant and interviewer in controlled environment.	1	Interviewer distant from the participants so as not to interfere with their thinking and to observe objectively.	1	Difficulties limiting social interactions	1	Participants selected time and location of interview (hospital room).
	2	Scripted instructions/probes, not allowing interviewer to modify their interaction with the subject.			2	Physical distance was impractical to create in hospital room settings.
					3	Participants lost interest if the interviewer did not socially interact with them.
Use think-aloud technique with scripted probes to capture participants' interpretation and understanding of the questions.			2	Difficulties eliciting useful information from participants	1	Participants selected the response without articulating their thinking process in reaching the answer.
					2	Participants unable to articulate thinking process reached to the response.
			3	Limited responses for pre-scripted think-aloud approach.	2	Asked participants to talk about their experiences or situations that the question item reminded them of.
Identify questions with apparent problems (e.g., participants misunderstand the questions, state unclear or think not relevant).			3	Difficulties using data to improve questions	1	Iterative comparison across participants of the interpretations or contextual qualifiers added to the questions.
					2	Responses lacked variability, potentially due to participants' interpretation.

Table 2

Examples of Cognitive Interview Responses

Item	Type of Response	Examples of CI Responses (Participant ID)	Final Decision
1. The nurses seemed to know what they were doing.	Unable to articulate (Challenge 2)	<ul style="list-style-type: none"> I would say all the time, number 5. I can tell the way. I can just tell. They seem to know what they are doing. (#05) Just exactly what it says. They know what they are doing. When? I will say often. (#11) Number 5. That they know what they are doing would be like, they know what to do in this situation. (#13) 	Keep
30. The nurses were compassionate when I was having a difficult time.	Unable to articulate (Challenge 2)	<ul style="list-style-type: none"> I think all of the time. Compassionate when a patient has a problem. (#02) Yes, I would say that that has happened probably all of the time. Anytime I have been sick, like just a little bit ago, they come right in and they take care of things. She got the meds coming real quick. I would say that happens all of the time. (#12) The nurses were compassionate when I was having a difficult time. All of the time. (#14) 	Keep
31. The nurses acted professionally.	Unable to articulate (Challenge 2)	<ul style="list-style-type: none"> All of the time. (Probe: What kind of behavior makes you think that this nurse is professional?) Just everything they do. I mean, they are professional. Everything they do. (#05) I think so, all of the time. (Probe: What does it mean the nurses acted professionally?) Well, I think they dress appropriately. They talk appropriately. There are no bad words said or anything like that. They aren't stiff. They are professional, but they are friendly. (#09) Often. (Probe: What kind of act is a professional act do you think?) I don't know. (#11) 	Keep
4. I had to wait for nurses when I needed their help.	Conditional (Challenge 3)	<ul style="list-style-type: none"> I have only had to wait when they were changing the shift. Because if you call when they are changing the shift, they can't come right away, but if you call and they are not changing the shift, and they are not with another patient, they come right away. So, I don't know how you would really answer this one. (#01) It was very rarely that I did have to wait, but also, I knew that there were others that were getting care before me. So, it wasn't over-exceeding in time that I felt that I was being neglected or anything of that nature. Very reasonable. (#06) 	Modified "The nurses did not respond to my call within a reasonable time"
11. The nurses caused me a lot of pain during treatments such as injections, starting IVs, or dressing changes.	Conditional (Challenge 3)	<ul style="list-style-type: none"> Sometimes to usually, but it is almost part of the job. You can't start an IV sometimes. I have veins that have a tendency to roll one way or the other, so I know it is going to be painful. (#03) I would have to go not at all with that. I have not gotten any extra pain from anything from my nurses during my stay. (#07) I would say rarely. Sometimes they don't do the vein right and it is human nature. I mean, they don't do it on purpose. (#09) 	Modified "The nurses caused me to have unnecessary pain during treatments (such as injection, starting IVs, or dressing changes.)"
34. The nurses talked down to me.	Lack of variable and socially unacceptable (Challenge 3)	<ul style="list-style-type: none"> No. That doesn't happen. I think if you present yourself in such a way, a professional, intelligent manner, that they don't do that kind of thing. (#02) No. I can't say they had at all mainly because I probably set the guidelines as how I like to be... of the relationship, you know, and that. (#08) 	Delete because of lack of variability in responses.

Item	Type of Response	Examples of CI Responses (Participant ID)	Final Decision
		<ul style="list-style-type: none">Not at all. If someone did, I would very nicely change my vocabulary and explain why they shouldn't do that, but fortunately, I have not had to do that. (#14)	