Focus on Research Methods
The Analysis and Interpretation of Cognitive Interviews for Instrument Development

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Abstract: Cognitive interviews assess respondents' understanding of questionnaire items and are increasingly used to improve instrument design. Although investigators have described the contributions of cognitive interviews for instrument development, few guidelines are available for analyzing data from cognitive interviews when they are used for that purpose. In this article we address the development and application of analytic strategies for summarizing, interpreting, and using data from cognitive interviews that were conducted during the process of creating a measure of parental management of childhood chronic conditions. We discuss the contribution of cognitive interviews to establishing content validity and address the importance of developing standardized guidelines for analyzing and interpreting cognitive interviews in order to maximize their usefulness for instrument development. © 2007 Wiley Periodicals, Inc. Res Nurs Health 30:224–234, 2007

Researchers engaged in instrument development increasingly use cognitive interviewing to enhance instrument reliability and validity.

Based on cognitive theory, cognitive interviewing encompasses a family of techniques for eliciting data on how future respondents will interpret

questionnaire items and formulate responses (Strack & Martin, 1987; Tourangeau, 1987; Tourangeau & Raskinski, 1988). Cognitive interviews take multiple forms, including verbal probing and think aloud, which may be used in combination or alone (Collins, 2003; Jobe & Mingay, 1989). In verbal probing, participants are asked to verbalize their interpretation of items and to paraphrase and/or comment on the wording of items in an effort to identify ambiguous or poorly worded questions. Participants also may be asked to define terms or comment on the perceived accuracy of their response (Davison, Vogel, & Coffman, 1997; Drennan, 2003; Williamson & Ranyard, 2000). Verbal probing contributes to the further clarification and refinement of questionnaire items. The think aloud form of cognitive interviewing is used when investigators want to elicit data on participants' thought processes as they respond to questionnaire items. Participants are asked to verbalize what they are thinking as they respond to each item. Think aloud interviews provide insights into the kinds of information participants retrieve from memory as they determine their response to an item. By eliciting thought processes associated with responses, investigators gain useful insights into participants' decisions regarding what constitute appropriate responses.

Similar to input from expert researchers and clinicians, cognitive interviewing contributes to both the validity and reliability of measures by providing data on the relevance and clarity of questionnaire items (DeVellis, 2003). Cognitive interviews provide additional evidence that items address salient aspects of target participants' experiences, thereby strengthening content validity. By contributing to the refinement of ambiguously worded questions, cognitive interviews also can enhance questionnaire reliability. Cognitive interviewing reflects a trend to expand sources of relevant input for instrument development (Beck & Gable, 2001; Facione, 2002; Hyde, Wiggens, Higgs, & Blane, 2003; Padula et al., 2003).

Despite a growing literature that supports cognitive interviewing as an essential aspect of instrument development (Dillman, 2000; Drennan, 2003; Folkman & Lazarus, 1985; Fowler, 1995), there are few guidelines for analyzing, interpreting, and using the results of such interviews. Those authors who address analytic approaches provide only very general descriptions of their analyses or identify common item problems identified as a result of cognitive interviews (Collins, 2003; Skelly, Samuel-Hodge,

Elasy, Headen, & Keyserling, 2000; Willis, Royston, & Bercini, 1991; Wu & McSweeney, 2004). For example, in their review of interviewers' notes, Willis et al. described problems with the relevance, understandability, and ordering of items, but only briefly addressed how interviewers' summary notes were used in team meetings to guide the revision of questionnaire items. Wu and McSweeney used cognitive interviews to assess the clarity of items on a measure of cancer-related fatigue. Although these authors concluded that the interviews "provided an insightful understanding of the structure of each item and the dynamics of the instrument as a whole" (p. 1689), no information was provided on how they analyzed data from the 30 cognitive interviews they conducted. The cognitive interviews led to the revision of several of the questionnaire items.

In his review of the use of cognitive interviews for instrument development, Drennan (2003, p. 62) noted that "analyzing cognitive interview data remains overtly subjective, and this remains the greatest flaw in an otherwise comprehensive method of questionnaire pretesting." If instrument developers are to take full advantage of cognitive interviewing techniques, they should specify and refine appropriate analytic strategies. The purpose of this article is to describe techniques we devised in conjunction with analyzing cognitive interviews while developing a measure of family response to childhood chronic illness: the family management measure (FMM).

THE FMM AND COGNITIVE INTERVIEWING

Despite the existence of well-established instruments to measure general family processes and characteristics, such as communication and problem solving, no measures exist that specifically assess family condition management and the incorporation of the condition and treatment regimen into family life (Sawin & Harrigan, 1995). The FMM is being developed to provide such a measure and to enhance clinicians' and researchers' ability to understand more fully family functioning and child adaptation in the context of childhood chronic conditions. By measuring patterns of family response to chronic conditions, the FMM will contribute to a more precise understanding of factors that support or impede optimal child and family functioning. We anticipate that the FMM will be used with other measures of family functioning, and that it will

further the development and testing of interventions to support family management of chronic conditions and the comprehensive assessment of families' management efforts.

To date, most research on family management of childhood chronic conditions has been qualitative. The family's approach to condition management, or family management style, has been identified based on intensive qualitative interviews that have led to a rich understanding of family life in the context of childhood chronic conditions (Deatrick, Knafl, & Murphy-Moore, 1999; Gilliss & Knafl, 1999; Knafl, Breitmayer, Gallo, & Zoeller, 1996; Knafl & Gilliss, 2002). This body of literature provided the substantive and conceptual foundation for developing the FMM. The FMM is based on the family management style framework (FMSF), which evolved through a series of qualitative studies and integrative reviews of the literature (Knafl et al., 1996; Knafl & Deatrick, 1990, 2003). Using the FMSF as a guide, 97 items were generated for potential inclusion in the FMM. Items were organized into eight categories reflecting the eight major dimensions of the FMSF. Twelve experts in family nursing research and/or practice were asked to rate the relevance and clarity of each item in terms of the underlying conceptual framework. Based on this expert input, items were discarded or rewritten, and a draft of the instrument containing 65 items was developed for subsequent evaluation through cognitive interviews with parents of children with a chronic condition.

The purpose of the cognitive interviews was to assess parents' understanding and interpretation of the FMM items. Twenty-seven parents (22 mothers and 5 fathers) of 25 children (13 boys and 12 girls) with a chronic condition participated in the cognitive interviews, which were conducted in the family's home. In two families, both parents participated; the mother and the father were individually interviewed. Parents were purposively selected to reflect a diversity of chronic conditions, family structures (e.g., single parent, two-parent families), and demographic characteristics (e.g., socioeconomic status). The ages of the children with the chronic condition ranged from 3 to 20 years, with a fairly even distribution of children across that age range. The 10 different chronic conditions in the sample, including type 1 diabetes, epilepsy, hemophilia, asthma, and Marfan's disease, were highly varied in terms of severity and complexity of treatment regimen. Three children had significant developmental delays, and six had two or more chronic conditions. Twenty-two of the parents were partnered,

four were divorced or separated, and the marital status of one was unknown.

We used the verbal probing approach to cognitive interviewing in order to elicit parents' understanding and interpretation of items. The 65 FMM items were randomly ordered so items reflecting the eight FMSF dimensions were dispersed throughout the questionnaire. Parents were asked to state their interpretation of items in the same sequence as their ordering on the questionnaire. The interviewer read each item to parents, asking them to state their understanding of the meaning of the item. In some cases, parents paraphrased the item; in some cases they discussed the item's meaning more generally. As they gave their paraphrase or interpretation of each item, parents also frequently offered opinions about wording and their own judgments about whether an item should be retained or deleted. Because we wanted parents to focus on the interpretation of items rather than considering how they would respond to items, we did not ask them to complete the FMM as part of the interview. Completing the FMM also would have added to participant burden. All interviews were tape recorded.

DATA PROCESSING AND ANALYSIS

After completion of the interviews, we were faced with a series of decisions regarding how best to transcribe, summarize, review, and interpret the data. The previously cited literature on the use of cognitive interviewing in instrument development informed our analysis, as did matrix display strategies developed by Miles and Huberman (1994) for analyzing qualitative data. Based on literature on the use of cognitive interviews in instrument development, we undertook an item-by-item review with regard to participants' understanding and ability and willingness to respond (Fowler, 1995; Willis et al., 1991). The Miles and Huberman text offered an approach for completing a systematic, thorough review of the data on each item.

In the following sections, we provide an overview of the specific processes we developed to manage, analyze, and interpret the cognitive interview data. Our intent was to use the results of the analysis as evidence to guide decisions about keeping, deleting, or modifying items. Items that were comprehensible and consistently interpreted across participants were retained; others

were modified or deleted. Analytic processes included transcription of interview data, summarization of parents' interpretations of items and identification of types of problems, analysis of item summaries, and decision-making about items.

Transcription of Interviews

Because the intent of the cognitive interviews was to elicit data that could be used to evaluate the relevance and clarity of the 65 items on the FMM, the individual item and not the parent was the unit of analysis. For this reason, we chose not to generate a conventional transcript of each parent's interview. Rather, we entered all data from each respondent into a Microsoft Access® database, with each item as a field entry. Subsequently, a report was generated per item that listed the verbatim transcription of each respondent's interpretation of the item and any other comments made regarding the item. Limited demographic information also was included to facilitate considering parents' responses in the context of the child's age, condition, and family structure. This contextual information helped us to assess the appropriateness of items for different family types and situations. In particular, when certain items elicited varied interpretations or were viewed as irrelevant or objectionable by a subset of parents, we looked for a possible relationship between problematic aspects of the item and characteristics of the parents (or their children). This approach to transcription facilitated our ability to focus on the item as the unit of analysis and review all the data we had received for each of the 65 items.

Summarizing Interviews and Identification of Problems

Following creation of the database, our next task was to summarize parents' interpretation of each item and identify any problems with the item. Different interpretations and problems result in different types of modification to an instrument. Multiple interpretations of the same item indicate that it is ambiguous and a threat to the instrument's reliability. Feedback on an item may reveal that it is offensive to most respondents and needs to be modified or possibly deleted; feedback on another item may suggest that the wording limits its applicability, and it needs to be modified to be more inclusive. In order to assure the systematic review of data on each item, we developed a template for systematically summarizing parents' feedback. The format we developed included a summary of parents' interpretation of each item and an inductively derived categorization of the types of problems they noted. In order to have a standardized format for summarization and categorization, the first two authors reviewed 10 respondents' feedback on approximately half the items. Respondents were selected to include the 10 different diagnoses represented in the sample.

The descriptive summary of respondents' interpretation of an item was a statement that conveyed the underlying basis of their understanding of the item. The purpose of the descriptive summary was to facilitate comparison of parents' interpretations of each item. The following excerpts provide examples of two respondents' interpretation of the item—"We understand our child's condition better than doctors and nurses"—and the researcher's descriptive summary of the response.

Parent's interpretation: You're the expert on the child. I understand my child on a different level than doctors and nurses. The doctor can explain the condition and stick with the facts. But there is another piece to the condition. The parents live with it.

Researcher's summary: Understanding the condition in the context of the person's life; understanding in a way different from professionals.

Parent's interpretation: That means that we think we know more than the doctors because we are here with them every day. We are with them 24/7 so we are going to see things that they don't. You know what can trigger a reaction.

Researcher's summary: Parent's versus professional expertise. Understanding that comes from living with the child. Knowing what things in the child's natural environment can make the condition better or worse.

A comparison of the summaries the first two authors completed on 10 interviews indicated that with few exceptions, summaries reflected consistent descriptions of the underlying basis of respondents' statements. Inconsistencies occurred when one reviewer was more highly interpretive than the other (e.g., inferring guilt when it was not explicitly mentioned). Based on this preliminary review, we decided that summaries should be descriptive and closely linked to respondents' actual comments, because our intent was to express parents' interpretations of the item. In some cases, respondents were unable to provide a further interpretation of an item, because they

thought the meaning was obvious. These parents either restated the item as written or said, ''It says what it says.'' Their feedback was noted in the summary.

In addition to summarizing parents' interpretations of the items, we also used our preliminary analysis of data from 10 respondents to categorize other kinds of feedback respondents provided regarding problematic aspects of the items. Although there have been attempts to identify types of problems with questionnaire items, the literature on cognitive interviewing reveals variety in the types of problems encountered across questionnaires and studies (Collins, 2003; Skelly et al., 2000; Willis et al., 1991; Wu & McSweeney, 2004). Researchers point to the importance of assessing problems specific to a given measure (Willis et al.). Thus, we developed a coding scheme that reflected problems specific to the FMM items. Comparison of the various difficulties respondents noted as they gave their interpretations of an item identified four categories of problems with our items: (a) limited applicability; (b) unclear reference; (c) unclear perspective; and (d) problems with wording or tone. Table 1 defines and gives an example of each type of problem.

Identifying problem types served to differentiate issues of applicability, clarity, and wording or tone. For example, parents who noted that a particular item did not apply to their situation provided useful insights into the applicability of the FMM to different family types and situations. The FMSF was developed from interviews with parents of children who did not have developmental delays, and FMM items were based on themes reflected in these parents' comments. Nonetheless, we deliberately included several parents of children with developmental delays in our sample to obtain input on the possible applicability of the FMM for assessing patterns of family management in families in which a child had a developmental delay.

Parents' comments related to problems of unclear reference and unclear perspective helped pinpoint the sources of clarity problems. For example, with regard to the item ''We have guiding beliefs that help us manage our child's condition,'' several parents noted that the item was confusing because it was not clear if the reference was to religious values or ideas about parenting. This feedback indicated that some parents were likely to interpret the item in a way we had not intended. The focus of the item was meant to be on principles that guide illness management, not religious beliefs per se. In other cases, parents expressed confusion with regard to whose per-

Table 1. Types of Problems Reflected in Family Management Measure Items

Problem Type	Definition	Example Input
Limited applicability	Comments noting groups or situations for which the item would not be appropriate	Item only applicable to mother; item not applicable to child with develop mental delays
Unclear reference	Comments about lack of clarity regarding what aspect of the family or condition, or situation the item is intended to address	Item could refer to physical or financial aspects of taking care of child; item could refer to what parents do to take care of child or what professionals do
Unclear perspective	Comments about lack of clarity regarding the perspective from which the item should be answered	Parent unsure if they should answer what they think or what they think their child would think; parent unsure if they should answer as an individual or as a spokesperson for the family
Wording or tone	Comments about wording that is confusing, offen sive, or makes the overall tone of the item overly negative	Single word such as *burden* described as offensive; item described as so negative that parents would be reluctant to answer honestly

spective (their own or their child's) should be reflected in their response. This input pointed to the importance of clarifying in the instructions to the FMM that we were seeking parental perspectives on family life when a child has a chronic condition.

Parents' reactions to problematic wording and tone were especially helpful in identifying items that were emotionally charged or even potentially offensive. Parents' comments on the wording and tone of an item were typically linked, and often focused on how a particular word contributed to an offensive or highly negative tone. For example, 18 parents objected to the use of the word *burden* in one item. Responses such as, "I don't like the word burden. It's insulting;" "There has to be a better way to say it. No parent would ever say their child is a burden;" and "Burden is a terrible word. I hate that word," gave us a clear message that we needed to give strong consideration to rewording the items using the word burden. Parents sometimes voiced concerns that the item's negativity would make parents reluctant to answer truthfully and suggested alternative wording they thought would elicit a more truthful response. This was the case with the item "We never expect our child to live away from home," which parents described as "tough," "negative," "sensitive," and/or "emotional." Parents suggested that a slight modification in wording would lead to a more accurate response.

Once guidelines for summarizing the data from the cognitive interviews had been finalized, the work of completing a summary for each of the 65 items was shared by three of the co-investigators (Deatrick, Gallo, and Knafl) and the project director (Holcombe). Table 2 provides an excerpt from the template that was used to summarize parents' interpretation of each item as well as their feedback on types of problems identified. As shown here, a parent's response may or may not identify a problem type. Usually, not more than one type of problem was contained in a particular parent's response to a particular item. Thus, the matrix displays included some blank areas, indicating that a particular type of problem was not identified by a particular parent. The item-level data summary facilitated the next step—analysis of parents' interpretations of items and identification of specific item problems.

Analysis of Item Summaries

The analysis of data from the cognitive interviews entailed systematic comparison of the summar-

Table 2.   Summary of Data From Four Parents for Item "It Is Hard to Get Anyone Else to Help Manage Our Child's Condition"

Problem type	Parents' Interpretation of Item			
	1	2	3	4
	Anybody Who Would Help the Parent Take Care of the Child	Parent States She/He Does Not Understand the Item	Parent States She/He Does Not Understand the Item	Emotional Support and Helping with Non-Condition Related Tasks
Limits on applicability				
Unclear reference	Not clear what people item refers to		Not clear if item refers to help in the home or in the school	
Unclear perspective				
Wording/tone				
Suggestions				Reword to use the word *support* rather than *manage*

ized data for each item across parents (Miles & Huberman, 1994). The same project team members who had completed the item summaries completed the analysis of feedback on each item (Table 3). We reviewed the summary table for each item, comparing parents' interpretations and determining the major interpretations that had been made. As shown in Table 3, in some cases there was a small number of quite similar interpretations and, in other cases, there were numerous, more diverse interpretations. For example, parents' interpretations of the item ''Our child's everyday life is similar to that of other children his/her age'' were very similar. All parents interpreted the item in terms of the child's activities, with some using peers and some using everyday life as their reference point. On the other hand, parents gave more varied interpretations of the item ''We have some firm beliefs that help us balance taking care of our child's condition with other things.'' Some thought the question referred to the importance of the condition in family life and others thought it referred to religious beliefs. We also compared parents' feedback on problems with items, noting both types of problems identified and the extent to which they were mentioned. The final analysis of each item provided a concise overview of the range of interpretations and nature and extent of problems, and supported our evaluation of the quality of each item and decision-making about whether to retain, delete, or modify items.

Results and Decision-Making

The final steps in the process entailed reviewing the analysis of each item and deciding whether the item should be retained, deleted, or modified. The summaries and analyses we had completed for each item helped assure that our judgments were based on a systematic, thorough review of the data. The entire project team, not just those involved in completing the item summaries and analyses, participated in the final analysis and decision-making. During the course of a day-long meeting, the team reviewed and discussed the analysis of each item until consensus was reached as to whether the item should be retained, deleted, or revised.

Retention of items. Thirty-one items were retained without modification. Across the 31 retained items, no more than one parent provided an idiosyncratic interpretation of the item, one that varied substantially from all other respondents. In two of the retained items, several

Table 3. Analysis of Cognitive Interview Data From Three Items

Items	Our child's everyday life is similar to that of other children his/her age	*Burden* is a good word to describe the work of taking care of our child	We have some firm beliefs that help balance taking care of our child's condition with other things
Interpretations	Same activities as peers	Constant work of caring for child; difficulty when child has a chronic condition; decline to interpret, but note that word *burden* is offensive	Balancing the condition with other aspects of family life; making the family more important than the condition; religious values that guide action; Life revolves around the condition
Problem type	Applicability: not appropriate for families in which child has severe developmental delays	Wording/tone: burden identified as offensive by majority of parents	Clarity: not clear what other things are being referred to Wording/tone: wording has a religious connotation; *firm beliefs* implies rigid and unwilling to change
Decision	Retain: note that FMM may not be appropriate for use with families in which child is developmentally delayed	Omit	Revise: We are sometimes undecided about how to balance the condition with family life

parents were unable to provide any interpretation or restating of the item, noting that the meaning was obvious or that it was a good question. In addition to giving consistent interpretations of the retained items, parents noted only minimal problems with their clarity and wording/tone, though they did offer some suggestions for possible changes in the wording. They also noted that other parents might view some items (e.g., "People with our child's condition have a normal life expectancy—length of life") as difficult or emotionally laden. These items were retained, but parents' feedback was useful in determining the eventual ordering of items. Items that were identified as likely to elicit an emotional response were placed later in the FMM and not clustered together. Parents also identified problems of applicability in four of the retained items. In two cases, parents of children with developmental delays noted that items referring to the normalcy of their child's life in comparison with other children were not applicable. This feedback was useful in determining possible limitations on the applicability of the instrument. Parents identified two other retained items that referred to managing the illness with a partner as not appropriate for single parents. This feedback was useful in modifying the structure of the FMM, which was reformatted to include an optional section for partnered parents, containing items related to how the partners work together to manage the condition.

Deletion of items. The team omitted items when the analysis of the cognitive interviews indicated that respondents had multiple, competing interpretations of the item or there were problems with clarity or wording/tone that were serious and could not be resolved through revision. For example, the item "Burden is a good word to describe the work of taking care of our child" was omitted due to multiple problems. Respondents gave diverse interpretations of its meaning and found the wording offensive. Some parents thought the item referred to the daily work of taking care of the child's condition. Others thought the item referred to the impact of the condition on family life. Several respondents indicated parents would be reluctant to answer the question honestly, raising concerns about the quality of the data it would elicit. Because the item itself focused on the word burden there was no way to reword it that would resolve the multiple problems we identified, and we decided to eliminate it from the FMM.

Although six items were deleted, the topic addressed by each item was included in other items that were either retained or revised. In developing the initial pool of items for the FMM, we had included a number of items that were alternative wordings of one another. In these cases, data from the cognitive interviews informed our decisions about which version of the item should be omitted or retained. For example, in the example of the burden question described above, there are two items in the current version of the FMM that explicitly address parents' perceptions of how difficult it is to take care of the child's condition ("It's very hard to take care of our child's condition," and "Taking care of our child's condition is sometimes overwhelming"). These items provided a way to preserve a meaning we had identified as important, without using language that respondents found offensive or ambiguous.

Revision of items. Twenty-eight items were revised. These revisions included a mix of investigator-initiated changes ($n = 11$) and changes made based on our analysis of the cognitive interviews ($n = 17$). The investigator-initiated changes included minor editing and rewording of a negative question to be positive or vice versa. The latter was done to maintain the overall balance of positively and negatively worded items across the eight FMSF themes reflected in the FMM.

The 17 items that were revised based on input from the cognitive interviews showed problems with clarity, wording, or both. Seven items were revised to address clarity problems noted in the cognitive interviews. For example, the item, "We are a closer family because of our child's condition," was revised to "We are a closer family because of the way we deal with our child's condition." Several parents had pointed out that it was not the condition per se that made the family closer, but the way in which family members responded to the condition. Four items were revised to address problematic aspects of the wording or tone of the item. In the item "We often feel confused about what to do to take care of our child's condition" the word *confused* was changed to *unsure*. Two parents had suggested that unsure was a better descriptor of parents' experiences, and the team concurred with their suggestion.

Three items in which both clarity and wording problems were noted were revised. Parents noted several problems with the item "Our child's condition has a negative impact on family life." Clarity problems were related to parents' perceptions that it was managing the condition and not the condition per se that affected family life. Four parents objected to the term *negative* and the item

was revised to "Dealing with our child's condition makes family life more difficult." Items were revised if the investigators agreed that problems identified by parents were substantial and could be addressed through rewording. Following decision-making related to the retention, deletion, and revision of items, we reviewed the newly modified FMM to assure there was still a balance of items reflecting the major dimensions of the underlying conceptual framework.

CONCLUSIONS

Cognitive interview data have the potential to improve the content validity and reliability of an instrument by assessing the relevance and clarity of items for the target population. Yet this potential cannot be fully realized unless methods are developed to assure the systematic analysis of these data. The analytic techniques described here contribute to informed decision-making during the early phases of instrument development by systematizing the analysis of participant input. Our analysis also adds to a fuller understanding of the meaning of diverse expert input and ways that different sources of input inform instrument development.

The summary and analytic templates we developed assured a thorough review and analysis of the cognitive interview data. The review summarized parents' comprehension of items and developed categories of item problems. The analysis provided evidence of the extent to which parents had shared interpretations of items that also were consistent with the conceptual framework underlying the FMM. The analysis revealed potentially problematic aspects of particular items that merited further consideration. Both the review and analysis furthered instrument development.

The strategies we used addressed the criticism that analysis of cognitive interview data is the least developed aspect of this otherwise promising approach to instrument development (Drennan, 2003). Our efforts parallel those of Grant and Davis (1997) to systematize the use of content experts in instrument development. They not only developed guidelines for the systematic analysis of input from theoretical and clinical experts, but also noted that "instrument review by a sample of participants drawn from the target population is another important component of content validation" (p. 273). The importance of this additional source of input was apparent in the development of the FMM. Prior to completing the cognitive interviews, we had made substantial changes in the instrument based on input from clinical and theoretical experts. Nonetheless, 17 additional items were revised based on our analysis of the cognitive interview data, and six items were deleted.

Similar to Grant and Davis (1997), our intent was to develop analytic strategies that would assure a thorough, systematic review of data and support decision-making regarding the retention and revision of items. Although we used the methods we have described to complete a thorough review of the cognitive interview data, not every piece of parental input and advice resulted in a modification to the FMM. In some cases, parents gave conflicting input, and the analytic strategies we developed facilitated considering the weight of evidence for varying points of view. Moreover, a number of items were retained despite parents' observations that the item was emotionally charged. The literature, including our prior work (Gilliss & Knafl, 1999; Knafl et al., 1996; Knafl & Gilliss, 2002), supports the conclusion that having a child with a chronic condition can be an emotionally charged experience. To eliminate questions that tapped this aspect of the experience would have weakened the content validity of the measure. On the other hand, parents' comments on such items were taken into account as we revised item wording and made decisions regarding their placement in the FMM.

Sandelowski (1998) has discussed the role of experts in qualitative research, noting that it is the responsibility of the researcher to interpret different sources of expert input and decide how each will contribute to the project. This certainly was the case in our use of different kinds of experts in the development of the FMM. Feedback from clinicians and researchers familiar with the theoretical underpinnings of the FMM helped assure the conceptual integrity of the new measure, whereas parents' comments provided a check on the clarity and appropriateness of items. Our goal as researchers was to weigh the input from these different expert sources as we made decisions regarding the retention, deletion, or revision of items.

Broad categories of problems with questionnaire items are addressed in the literature on cognitive interviewing (Collins, 2003; Drennan, 2003; Willis et al., 1991). Typically problems related to respondents' comprehension of an item are distinguished from problems related to respondents' ability to retrieve information from memory and willingness to provide information. Our use of cognitive interviewing and subsequent

analysis focused on problems of comprehension. Our primary intent was to assess whether or not parents understood the items and offered similar interpretations. We identified major threats to comprehension, lack of clarity regarding reference and perspective. In some cases, parents were unsure about what aspect of family life was being referred to; in other cases parents were unsure if we were asking for their perspective or their view of their child's perspective.

In addition to identifying specific threats to parents' ability to comprehend an item, the cognitive interviews provided useful insights into whether or not they would be willing to respond to items. Most comments on problematic aspects of the wording or the tone of an item were linked to parents' concerns that respondents would either not be willing to answer the item or would not be truthful in their answers. This input was also helpful in revising the wording of several items. Because these parents were not asked to respond to the FMM, we did not elicit data on their ability to actually retrieve the information required to respond to the item, and this is a limitation of our approach to verbal probing. On the other hand, all items were grounded in extensive qualitative work and reflected aspects of the experience of having a child with a chronic condition that parents had shared with us as well as with other researchers (Knafl & Deatrick, 2003). Based on the extensive qualitative research grounding of the FMM, we felt confident that if we could develop items that clearly and accurately reflected what had been learned in prior studies, parents would be able and willing to respond to the topics those items addressed. It is important for researchers to keep in mind that there are multiple forms of cognitive interviewing (e.g., verbal probing, think aloud) and to select the form that best meets their instrument development needs. Verbal probing, the form we used, is especially helpful in identifying poorly worded or ambiguous questions. On the other hand, the think aloud form of cognitive interviewing is useful in providing insights into the kinds of information and experiences respondents can retrieve from memory and consider as they answer questionnaire items.

Regardless of the form of cognitive interviewing, reports of their outcome have not included detailed descriptions of analytic processes or specific types of problems identified. Thus, it is impossible to know the extent to which other instrument developers have identified similar kinds of specific problems. On the other hand, as Willis et al. (1991) pointed out, it is important to identify problems specific to a given instrument. Thus, investigators need to look beyond

general problems such as comprehension and retrieval, and identify more precisely the basis for problematic aspects of items. With the growing use of cognitive interviewing, especially if accompanied by more thorough analyses, it will be possible to know what kinds of measures or items are at risk for certain kinds of problems and to develop items with an eye to avoiding likely problems.

This analysis points to the important contributions that qualitative methods can make to all phases of instrument development. Traditionally, qualitative data have been viewed as an important source of item development. Indeed, the items in the FMM come from prior qualitative studies of family response to childhood chronic conditions. The growing use of cognitive interviews points to the importance of qualitative data for assessing and contributing to the validity and reliability of a developing instrument.

In addition, Barroso and Sandelowski (2001) advocated for ongoing assessments of established measures as they are used with different target samples. They argued that "the planned use of qualitative methods is critical to every phase of instrument development and use in all studies that depend for their results on instruments" (Barroso & Sandelowski, 2001, p. 492). To reap the full benefits of qualitative methods for instrument development, however, accepted analytic techniques need to be applied and/or adapted to the goals of instrument development.

The current analysis drew heavily on the matrix display techniques of Miles and Huberman (1994). These matrices facilitated our efforts to compare input from multiple parents. At the same time, our approach to data transcription, summary, and analysis was closely linked to our focus on the analysis of individual items, and was also guided by literature on the nature and intent of cognitive interviewing.

Researchers, clinicians, and the target population of respondents have unique perspectives and areas of expertise with regard to assessing the relevance and clarity of items. Accordingly, it behooves investigators to develop methods that take full advantage of the multiple sources of expert input that may contribute to the development of reliable, valid measures.

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