

Construction of a parent satisfaction instrument: Perceptions of pediatric intensive care nurses and physicians

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ABSTRACT

Purpose: The aims of the study were (1) to identify parental satisfaction items through the opinions of pediatric intensive care (PICU) nurses and physicians, (2) to reach consensus on the identified items, and (3) to apply factor analysis to evaluate the items and domains toward a PICU parental satisfaction instrument.

Materials and Methods: Pediatric intensive care unit nurses and physicians working in 8 university hospitals in the Netherlands participated. A 2-round Delphi method was completed. Confirmatory factor analysis was performed on the satisfaction items and domains.

Results: Three hundred two nurses and 62 physicians participated in the Delphi study, and 269 (76%) completed 2 questionnaire rounds. In Delphi round 2, 14 of the 78 items had a mean of less than 8.0 (range, 1 [low importance] to 10 [high importance]). The interquartile range of all domains decreased almost half, and only 10 satisfaction items had a heterogeneity of less than 70%. Structure determination revealed that 4 satisfaction items needed to be excluded. Out of 74 satisfaction items, 72 showed factor loadings greater than 0.50. The reliability estimates, Cronbach's α , for the six domains varied from 0.74 to 0.92.

Conclusions: Priorities in parental satisfaction measures are identified. The findings are fundamental in the development of a PICU parental satisfaction instrument.

INTRODUCTION

Hospitals are increasingly pressured by patient organizations and health care authorities to document the delivered care. Demanding accountability for increasing health care costs, the public in general looks closely into efficiency and effectiveness of hospital care. In the past decades, quality of care received much attention in healthcare. However, the American Institute of Medicine (IOM) identified 6 areas in today's health care system that are still below standard: safety, effectiveness, timeliness, patient-centeredness, efficiency, and equity.¹ The challenge is to place patients in the center of care and to empower them towards more autonomy. Most children in the pediatric intensive care unit (PICU) are unable to express their needs and experiences. In this perspective, the experiences of parents are recognized to be fundamental for quality of care.^{2,3} Principles of family-centered care mandate incorporation of parents in daily care.⁴ Subsequently, measures of parent satisfaction may be a valuable tool in establishing a family-centered driven care model that would benefit quality of care.

Although the interest in patient satisfaction with care started a few decades ago, the current debate concerns methodological issues and the value of satisfaction data for quality improvement.⁵ In addition, patient satisfaction data should enable us to identify core strategies improving care delivery.^{6,7}

In pediatric critical care the long-established and accepted evaluation measures refer to clinical parameters such as mortality, length of stay, and severity of illness. A measure like parental satisfaction is not yet widely recognized in medicine, but is gradually being accepted as a quality performance indicator.^{8,9} Yet, a satisfaction performance indicator requires profound development before the data are recognized and accepted as valid and reliable.¹⁰ Despite the existence of many patient satisfaction surveys, only 1 validated parent satisfaction questionnaire is known specifically for PICU.¹⁰ The current general satisfaction questionnaires may not be relevant to PICU since parents might experience difficulties in separating the specific PICU care within the general satisfaction items.

All 8 PICUs in the Netherlands identified parental satisfaction as an important quality performance indicator. A multi phase project was designed to establish a reliable and validated parent satisfaction instrument. The initial phase was directed toward the current available evidence and the perceptions of the healthcare professionals working in the PICUs. The findings of this phase will be used for further exploration of the parental perceptions on the satisfaction items in the next phase of this multi-center project. Both projects should eventually result in a validated parent satisfaction instrument for the Dutch PICUs.

The main objective of the multicenter study is to develop a parent satisfaction instrument for the PICUs in the Netherlands. Specifically, the objectives of this phase are (1) to assess parental satisfaction measures based on the perceptions of PICU health care professionals, (2) to reach consensus on the satisfaction items for further exploration among a large group of parents, and (3) to perform factor analysis to evaluate the satisfaction items and domains.

MATERIAL AND METHODS

We used a multiphase design. The first phase concerned the identification and selection of satisfaction performance indicators to be included in a preliminary questionnaire. The second phase encompassed a 2-round Delphi method (Figure 1). This method is a technique of systematically consulting a panel of experts, and of collecting, evaluating and tabulating their opinions without bringing them physically together.^{11,12} Its specific characteristics are anonymity, iteration, controlled feedback, and statistical group response.¹³ Anonymity of the panel members is achieved through the use of questionnaires. Panel members are thus free to express their own opinion without being pressed by other dominant individuals. Iteration is provided by presenting questionnaires over a certain number of rounds. Controlled feedback and statistical group response take place between the rounds, when results from the previous round are analyzed and communicated back to the participants.

Approval for the study was granted by the Medical Ethical Committee of the Erasmus Medical Center. A signed consent form of the participants was not required by the Medical Ethical Committee.

Participants

There are 8 multidisciplinary level III PICUs in the Netherlands; all units are tertiary referral centers with invasive ventilation, multi-system failure, and other complex procedures and interventions. Yearly total admission rate is around 4500 children between 0 and 18 years of age. The total number of beds per PICU ranges from 9 to 24 beds. The medical and nursing directors agreed to the participation of their PICU staff and provided lists of nurses and physicians. In total, 520 professionals (physicians, n=87; nurses, n=433) were eligible to participate as experts in the Delphi panel. Inclusion for participation was defined as follows: for physicians, being a pediatric-intensivist or a fellow; for nurses, as being a PICU certified nurse or student nurse in training for PICU certification.

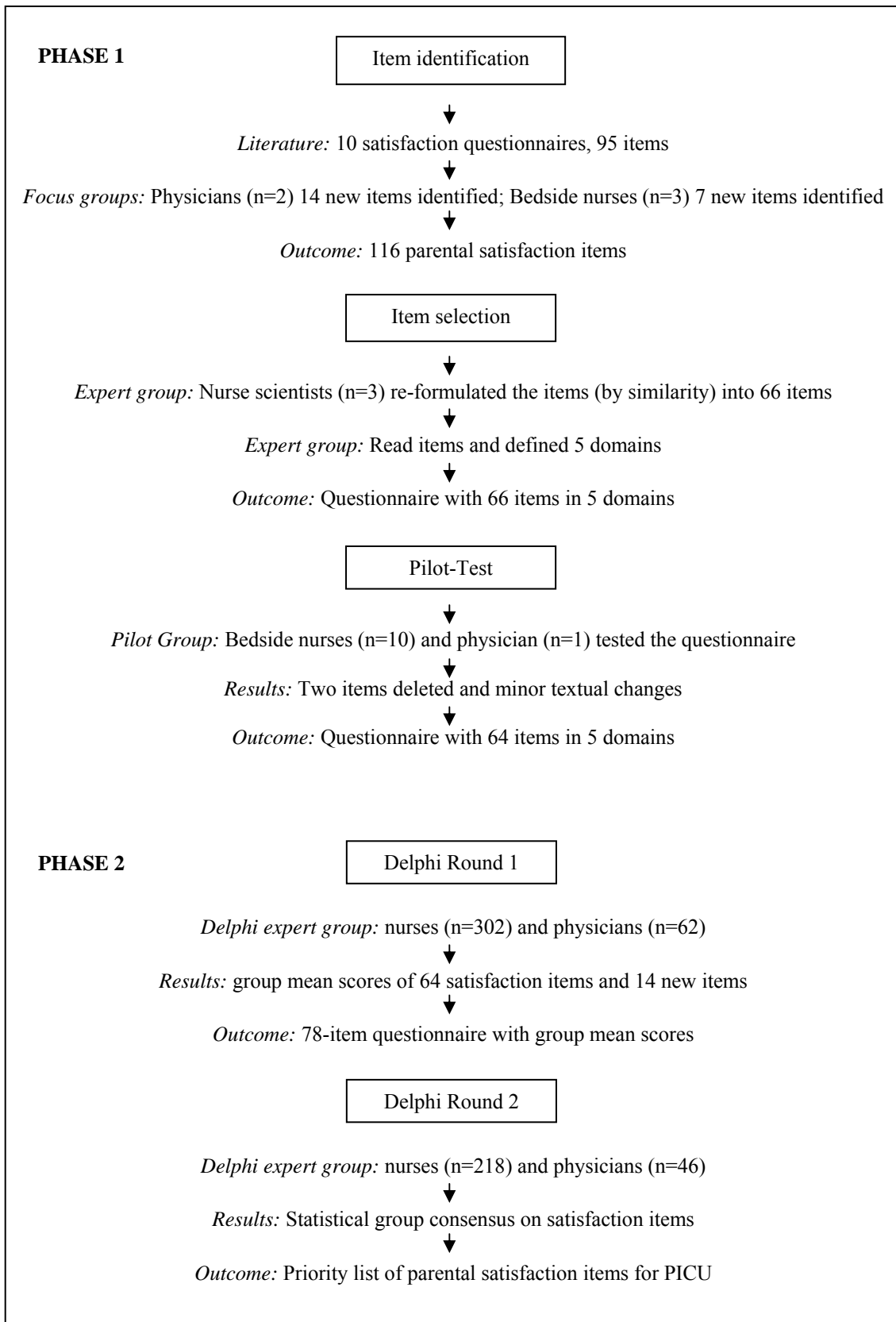


Figure 1 Process development questionnaire for the Delphi rounds

Questionnaire development

The questionnaire for the Delphi rounds was developed in a 3-step process as summarized in Figure 1. Step 1 was item identification: A literature search revealed 10 satisfaction surveys related to pediatric, neonatal, and adult intensive care and to general pediatrics. A total of 95 unique satisfaction items were identified from these surveys.⁷ Further item identification was done by unstructured focus group sessions, one with physicians (n=2) and one with nurses (n=3). Each session started with the open-ended question: What do you think parents find important in the care? At the end of the session, participants were asked to identify domains to categorize the care aspects they had put forward. Audiotapes were used for transcription. The transcripts were coded into text fragments reflecting distinctive care aspects and compared with the 95 unique satisfaction items from the literature review by 2 researchers (JL, JH). This process resulted in 21 new items. Step 2 was item selection. In an expert group session, 3 nurse scientists reviewed the items on content and similarities. Several items were merged or reformulated and consensus on conclusion was achieved via group discussion of the nurse scientists. Item selection thus resulted in 66 remaining items. The expert group defined and reached consensus on 5 domains and the groupings of the items into the domains based on similarities of the construct of the 66 formulated satisfaction items. In the third step, the questionnaire was pilot tested with a sample of 10 bedside nurses and 1 physician to assess content validity. Based on their feedback, 2 items were deleted, resulting in 64 satisfaction items; and some minor textual changes were made.

Delphi Round 1

In April 2006, an invitation, explaining the design and the 2 questionnaire rounds, was sent to the participants. The 64-item questionnaire was enclosed, including demographic information such as sex, age, location of PICU, profession, period of PICU working experience, and period of working experience as professional in general. The respondents were asked to rate each item on a visual analogue scale, ranging from “completely unimportant” to “extremely important”, discretized into 10 equal intervals. An open-ended question offered the opportunity to provide additional issues. Participants were presumed to give informed consent by returning the questionnaire.

Although participants were asked to provide their names and PICU locations, so as to ensure they could be sent the second questionnaire, the returned questionnaires were coded to warrant anonymity of the data.

Delphi Round 2

After completion of round 1, the group mean for each of the items was calculated and added to these items in the questionnaire for round 2. In the first round, 53 suggestions were made in response to the open-ended question. Two authors (JL, JH) reviewed these data and thereupon emended 1 existing item and formulated 14 new items, resulting in the round 2 questionnaire with 78 items. This time, the rating scale was a 10-point scale ranging from 1, completely unimportant, to 10, extremely important. In July 2006 the participants received the second invitation letter, explaining the purpose of the second

Delphi round, and the questionnaire. The participants were asked to review the items with the additional group mean information. Factor analysis was performed with the empirical data of the study to evaluate the items and the domains of the instrument.

Statistical Analysis

Descriptive statistics were used to analyze the demographic variables. Mean scores were calculated for Delphi round 1 to provide a group mean for the second round. Mean and standard deviation were used for ranking the importance of the statements. Importance was defined as the highest mean and the smallest standard deviation. The responses of the panel members carried equal weight. Therefore, the median and interquartile range scores of the five domains were calculated to compare the distribution of the variables between the 2 rounds to provide a level of agreement. For the 2 Delphi rounds, the differences between nurses and physicians were tested by a 2-way analysis of variance for repeated measurements on each outcome variable separately.

The empirical data of round 2 were subjected to factor analysis to identify and estimate the dimensional structure and the importance of individual items within that structure. It was not the explorative factor analysis that was applied but, more interestingly, the confirmatory factor analysis (CFA). The reason is that explorative factor analysis does not enable statistical testing, whereas CFA, in addition to possibilities of statistical testing, is flexible in the sense that factors are allowed to be intercorrelated. Furthermore, CFA enables to fix variables on certain factors. These variables are usually considered to be of high salience of the pertinent factors. The loadings can be tested in term of statistical significance level. The adequacy of model fit can be tested on statistical plausibility. The relevant performance measures applied in this study were the χ^2 test of model fit and the χ^2 test of model fit for the baseline model. The value of χ^2 , its *P* value, and the number of degrees of freedom (*df*) were examined. A nonsignificant *P* value corresponding to the χ^2 test of model fit is indicated (*P* > .05). The ratio of χ^2/df less than 1.5 would represent a good model fit. Four other tests of model fit were used: comparative fit index (ideally > 0.95), Tucker-Lewis index (ideally > 0.95), root mean square error of approximation (ideally \approx 0.05), and the weighted root mean square residual (ideally < 1.00).¹⁴ Finally, CFA enables to analyze nonmetric, in casu ordinal variables and skewed variables. In this study, the ordinal approach was applied.

All data were analyzed using the Statistical Package for the Social Sciences (version 12; SPSS, Chicago, IL) and the software program *Mplus*, statistical modeling program (version 5, 2007; Muthén and Muthén, Los Angeles, CA).

RESULTS

Of all 520 nurses and physicians invited to participate in the Delphi study, 364 (70%) returned the questionnaire, that is 302 of 433 (70%) nurses and 62 of 87 (71%) physicians. As 9 questionnaires had been returned anonymously, the second Delphi round involved 355 eligible participants. The overall

response was now 269 of 355 (76%), that is, 218 of 293 (74%) nurses and 46 of 62 (74%) physicians. Five were returned anonymously. The demographic characteristics of the health care workers for both Delphi rounds are presented in Table 1. Their ages ranged from 23.0 to 60.0 years. Most respondents were female. In both Delphi rounds, the PICU experience ranged from 0.5 to 31.0 years; general experience was from 0.5 to 38.0 years.

Table 1 Characteristics of the PICU health care professionals

	R1	R2	
	response (n=364)	response (n=269 ^a)	non-response (n=100 ^b)
Sex (F/M)	281/83	202/62	79/21
Age (y; $\hat{\mu}$, $\hat{\sigma}$)	38.7 (7.34)	38.6 (7.28)	38.8 (7.55)
Profession (nurse/physician)	302/62	218/46	84/16
Experience PICU (y; $\hat{\mu}$, $\hat{\sigma}$)	8.4 (6.50)	8.4 (6.30)	8.5 (7.03)
Experience overall profession (y; $\hat{\mu}$, $\hat{\sigma}$)	17.5 (8.41)	17.6 (8.45)	17.0 (8.32)

R1 indicates round 1; R2 indicates round 2; F, female; M, male; $\hat{\mu}$ =mean; $\hat{\sigma}$ =standard deviation; ^a Missing: 5; ^b Including 5 missing.

Delphi rounds

The satisfaction items were categorized in 5 domains, that is, (1) Information, (2) Care and Cure, (3) Organization, (4) Parental Participation, and (5) Professional Attitudes. The scores for these domains in both Delphi rounds are visualized in the Box-whisker plots (Figure 2). The horizontal bars in the boxes represent the median scores of the domains; it appears they all exceed 8, in both rounds. In round 2, however, the medians of all domains are lower than in round 1. The plot shows smaller interquartile range for every domain in round 2. This reflects reduced data heterogeneity, which can be easily seen as smaller box sizes. The differences between the ends of the whiskers reflect the observed range of the data; and it is worthwhile to note that the range of all domains in round 2 decreases, particularly in the domains Organization and Parental Participation. The domains Care and Cure and Professional Attitude have the highest median values. The conclusion seems justified that the panel members satisfactorily agree on the items.

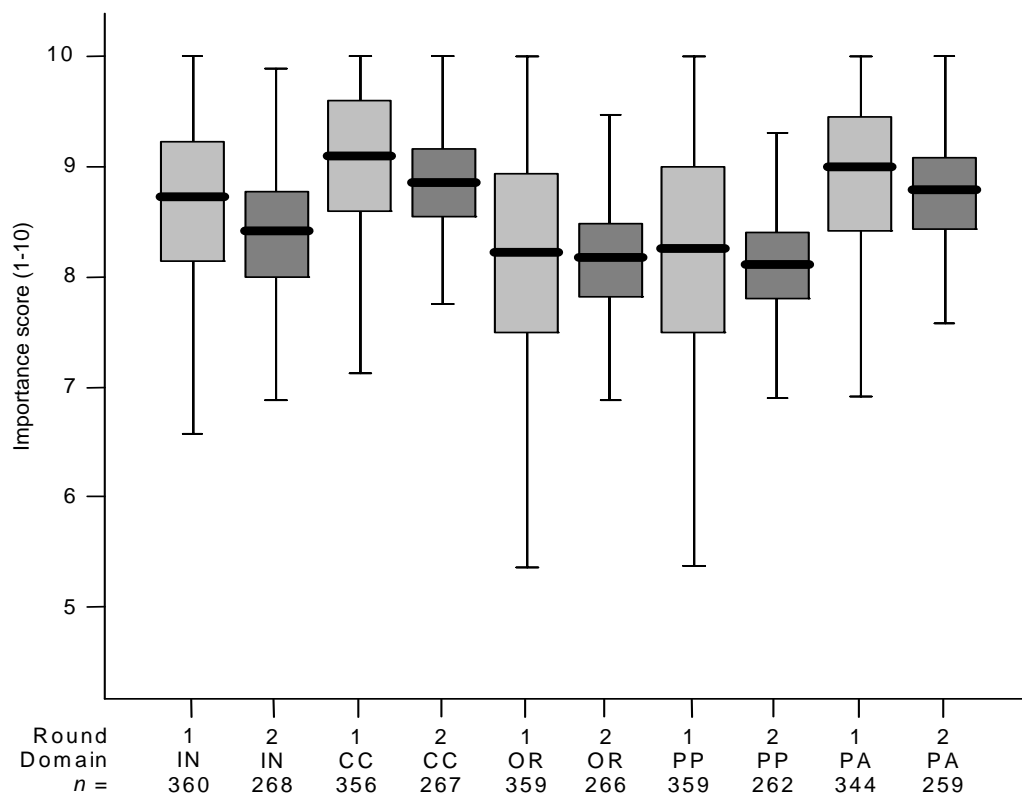


Figure 2 Importance of the domains Rounds 1 and 2

IN indicates Information; CC, Care and Cure; OR, Organization; PP, Parental Participation; PA, Professional Attitude.

The average scores of the satisfaction items were fairly high. This was not unexpected. Table 2 ranks the items per domain based on the smallest standard deviation of the second round. The standard deviations reflect the heterogeneity of the respondents' perceptions. Mean scores for 14 of 78 (18%) items were below 8, the cut-off point, in both rounds. Note that the standard deviations of these items between the rounds decreased but remain greater than 1.0 at rather low heterogeneity, implying diverging opinions among the experts. Only the domain Cure and Care had high mean scores of greater than 8.0 with standard deviations remaining less than 0.96. The item about the child's pain prevention and treatment had the highest mean score (9.55) and the smallest standard deviation (0.70) in the first round, remaining almost identical in the second round. The high scores for the items in this domain can be ascribed to the primary goal of health care professionals and a high priority given to care aspects in their daily work. This is in contrast with the domain Parental Participation, with 3 of

the original 8 items in round 1 retaining mean scores less than 8.0. Surprisingly, the item about providing a diary to parents was given the lowest score in both rounds. In all PICUs in the Netherlands, providing diaries to parents is meanwhile common practice; and maybe, consequently, this item was not rated as very important. Physicians and nurses seem to report their professional attitude as important for the care and satisfaction of parents. Half of the items in this particular domain scored a mean of at least 9.0. Only their attitude toward attention to siblings seems to be less important.

Compared with round 1, in round 2, the heterogeneity in terms of the standard deviation of the 64 items used in both rounds remained at least 70%. In general, between 1 to 5 items per domain showed a heterogeneity less than 70%. Only for 1 domain, Cure and Care, were all items above the standard level. These results can reasonably be accepted as expressing high agreement among the health care professionals on most of the satisfaction items.

Table 2 Ranking items in domains based on smallest standard deviation of round 2

Rank	Domain and Item	mean		SD		Heterogeneity ^a (%)
		R1	R2	R1	R2	
<i>Information</i>						
1	Parents are informed about the child's illness	9.38	9.35	0.87	0.69	79
2	Parents are informed about tests and procedures	9.19	9.22	0.97	0.71	73
3	Caregivers give no conflicting information to the parents	9.37	9.36	1.04	0.75	72
4	Parents have easy access to information	8.89	8.74	1.07	0.75	70
5	Caregivers answer parents' questions adequately	9.36	9.30	0.90	0.77	86
6	Caregivers inform the parents about the treatment consequences	9.10	9.15	1.01	0.78	77
7	Parents are informed about changes in the child's condition as soon as possible	9.26	9.26	1.01	0.80	79
8	Caregivers' communication with non Dutch speaking parents is through an interpreter or the interpreter-telephone	NA	8.97	NA	0.99	NA
9	Parents are informed about the child's future perspectives	8.92	8.74	1.17	1.00	85
10	Parents are informed about PICU rules	8.43	8.36	1.32	1.04	79
11	The way to the PICU is clearly signposted	8.25	8.07	1.46	1.09	75
12	Parents are informed about the (adverse) effects of the medication	7.92	7.81	1.51	1.10	73
13	Caregivers daily inform parents about the child's care and treatment	8.71	8.42	1.44	1.18	82
14	Parents are informed about sanitary units	6.96	6.83	1.92	1.41	73
15	Caregivers inform the parents on the best moment for the parents	NA	6.95	NA	1.54	NA
16	Caregivers provide not only oral but also written information	NA	6.72	NA	1.55	NA
17	Parents are informed of visiting hours for other family members	7.03	7.21	2.47	1.68	68
<i>Care and Cure</i>						
1	Caregivers are alert to the child's comfort	9.38	9.37	0.76	0.62	82
2	Caregivers react promptly to changes in the child's condition	9.43	9.47	0.88	0.63	72
3	Caregivers know their profession	9.55	9.55	0.73	0.64	88
4	Pain is prevented and/or treated	9.59	9.54	0.70	0.64	91
5	Caregivers work with a team spirit	9.09	9.03	0.97	0.69	71
6	At discharge, caregivers provide clear information to colleagues	9.22	9.15	0.91	0.70	77
7	Caregivers jointly pursue one goal: adequate care and treatment of child and parents	9.28	9.33	0.83	0.70	84
8	Caregivers are aware of the child's medical history	8.98	8.89	0.95	0.72	76
9	Caregivers provide emotional support	8.96	8.79	0.99	0.77	78
10	Caregivers display a caring attitude towards child and parents	8.97	8.81	0.94	0.79	84
11	The correct medication is given at the right time	9.01	8.92	1.00	0.79	79
12	An assigned physician and nurse serve as contacts for parents during prolonged ICU-stay	NA	9.02	NA	0.86	NA
13	Parents know which physician and nurse are responsible for the care of their child	8.77	8.67	1.09	0.87	80
14	Parents are adequately prepared for the child's discharge	8.71	8.52	1.20	0.90	75
15	Caregivers are alert to the child's developmental growth	8.53	8.41	1.10	0.91	83
16	Caregivers adequately meet the needs of the parents	8.56	8.32	1.03	0.93	90

17	Caregivers prepare child and parents to a PICU admission	8.51	8.45	1.27	0.94	74
18	Caregivers are considerate to the child's wishes	8.48	8.34	1.16	0.95	82
19	A caregiver always advises parents during acute admission or an acute situation	NA	8.32	NA	1.07	NA
20	Parents realize they cannot always have a caregiver's immediate attention	NA	8.35	NA	1.15	NA

Organization

1	The caregiver are efficiently organized	8.84	8.74	1.05	0.69	66
2	The PICU is well accessible by phone	9.09	9.08	0.99	0.74	75
3	The PICU is clean	8.93	8.83	1.10	0.82	75
4	The child's bed space is amply enough	8.84	8.74	1.11	0.87	78
5	Noise in the PICU is muffled as far as possible	8.50	8.44	1.25	0.89	71
6	The PICU is imbued with a sense of safety	8.49	8.34	1.17	0.94	80
7	The PICU's design is child-friendly	8.23	8.19	1.41	0.96	68
8	The child's bed is clean	8.20	8.33	1.43	0.98	69
9	Written information on unit rules, diseases and procedures are available on the PICU	NA	8.60	NA	0.99	NA
10	Moment of discharge is not influenced by bed capacity	8.13	8.11	1.55	1.00	65
11	The waiting room is fitted out comfortably	7.57	7.49	1.57	1.11	71
12	The PICU has comfortable furniture	7.59	7.56	1.55	1.13	73
13	Aggression by parents or caregivers is not tolerated on the PICU	NA	9.16	NA	1.16	NA
14	Visiting hours are flexible	8.01	8.05	1.69	1.17	69
15	Rooming-in near the PICU is possible	NA	8.22	NA	1.25	NA
16	Catering for parents is well taken care of	6.73	6.69	1.96	1.43	73
17	A locker on the PICU is available for all parents	6.82	6.63	2.14	1.50	70

Parental Participation

1	Parents trust the caregivers	9.35	9.28	0.84	0.71	85
2	Caregivers facilitate parents in expressing their feelings	8.35	8.16	1.41	0.90	64
3	Caring aspects are discussed before discharged	8.54	8.48	1.30	0.91	70
4	Parents show respect to the caregivers	NA	8.59	NA	1.00	NA
5	Caregivers regularly inform after parental experiences during the course of admission	8.31	8.10	1.30	1.01	78
6	At admission, caregivers ask parents their expectations	7.59	7.41	1.77	1.03	58
7	Caregivers stimulate the parents to be close to their child	8.46	8.24	1.30	1.05	81
8	Parents share in the decision-making on the care and treatment of their child	7.96	7.63	1.74	1.24	71
9	Parents receive and are suggested to keep a diary	7.21	7.17	1.83	1.32	72
10	Caregivers stimulate parents to stay close to their child during procedures and tests	NA	7.79	NA	1.38	NA

Professional Attitude

1	Caregivers adopt principles of hygiene	9.37	9.35	0.87	0.63	72
2	Caregivers provide equal care; irrespective of race, religion, sex, and education	9.40	9.49	0.91	0.63	69
3	Caregivers safeguard privacy of child and parents	9.02	9.00	1.02	0.72	71
4	Caregivers respect the child and parents	9.31	9.24	0.91	0.74	81
5	Caregivers always work agreeably together	9.14	9.05	0.94	0.79	84
6	Caregivers refrain from unnecessary discussions at the child's bedside	9.03	9.06	1.20	0.84	70
7	Caregivers give the highest priority to the child's health	NA	9.25	NA	0.87	NA
8	Child and parents feel welcome at admission	8.97	8.79	1.21	0.92	76
9	Caregivers show empathy to child and parents	8.40	8.30	1.28	0.92	72

10	Parents are offered religious / spiritual support	8.13	8.18	1.37	0.93	68
11	Caregivers introduce themselves with name and position	8.66	8.57	1.23	0.99	80
12	Regardless the work pressure, the caregiver's attention towards child and parents is not allowed to slacken	NA	8.35	NA	1.04	NA
13	Caregivers are alert to the cultural background of the child and parents	NA	8.11	NA	1.07	NA
14	Caregivers pay attention to siblings	7.98	7.94	1.58	1.14	72

Scores were rated on a 10-point scale from “completely unimportant” to “extremely important”. NA indicates not applicable; SD, standard deviation; ^a $SD_{R2} / SD_{R1} \times 100$.

The differences of the scores of the domains between the nurses and the physicians are presented in Tables 3 and 4. The results showed that overall the opinions of the nurses differed significantly from the physicians on all domains. The changes between round 2 compared to round 1 was significant for 3 domains; Information, Care and Cure, and Organization. The mean scores of the domains in round 2 appeared to be consistently lower than in round 1, except for the domain Organization. The trend is that nurses scored higher than physicians in all domains in both rounds. The magnitude of the differences between the nurses and the physicians was the greatest for the domain Information followed by the domain Parental Participation. The smallest effect size in terms of Cohen's *d* is observed in the domain Professional Attitude.

Table 3 Level and dispersion of the domains in round 1 and round 2 categorized to type of professional

Domain	R1				R2				ES
	Nurs (n=302)		Phys (n=62)		Nurs (n=218)		Phys (n=46)		
	mean	SD	mean	SD	mean	SD	mean	SD	
Information	8.70	0.79	8.43	0.76	8.46	0.57	8.08	0.58	0.67
Care and Cure	9.08	0.67	8.76	0.74	8.92	0.48	8.72	0.57	0.41
Organization	8.19	0.95	7.85	0.96	8.26	0.59	8.01	0.64	0.42
Parental Participation	8.30	1.03	7.80	1.22	8.17	0.67	7.76	0.80	0.59
Professional Attitude	8.91	0.81	8.70	0.87	8.81	0.55	8.61	0.56	0.37

Nurs, indicates nurses; Phys, physicians; ES, Cohen *d*; SD, standard deviation

Table 4 Statistical testing

Domains	Change R1 – R2			Type Profession			A x B		
	A			B			A x B		
	F	<i>df</i> ^a	<i>P</i>	F	<i>df</i>	<i>P</i>	F	<i>df</i>	<i>P</i>
Information	29.41	1;260	.000	11.11	1;260	.001	1.07	1;260	.31
Care and Cure	4.80	1;256	.03	9.06	1;256	.01	1.66	1;256	.20
Organization	3.35	1;258	.07	6.64	1;258	.02	0.50	1;258	.48
Parental Participation	1.20	1;259	.28	13.23	1;259	.000	0.44	1;259	.51
Professional Attitude	2.51	1;243	.12	4.17	1;243	.05	0.01	1;243	.93

Two-way analysis of variance for repeated measurements.

^a Degree of freedom (denominator) less than 260 implies missing.

Determination of dimensional structure for the satisfaction items

The structure determination of the individual domains revealed that 4 satisfaction items needed to be deleted: (1) parents are informed of visiting hours for other family members, (2) parents realize they cannot always have a caregiver's immediate attention, (3) aggression by parents or caregivers is not tolerated on the PICU, and (4) parents show respect to the caregivers. The domain Information turns out to be 2-dimensional (Table 5). The first dimension "Care Issues" is characterized by items such as parents are informed about the child's illness and caregivers informing the parents about the treatment consequences. Examples of items belonging to the second dimension "Accessibility" are parents having easy access to information and caregivers providing not only oral but also written information. Briefly, despite the fact that the model fits of most domains are weak (Table 6), it has to be stressed that the standardized factor loadings are discernible (Table 5).

Table 5 Standardized factor loadings and reliability estimates for individual items

Items and Domains	Factor loadings	Corrected item-total correlation	Cronbach α if item deleted
<i>Information - Care</i>			
Caregivers answer parents' questions adequately.	0.81	0.66	0.86
Caregivers give no conflicting information to the parents	0.70	0.54	0.87
Parents are informed about changes in the child's condition as soon as possible	0.77	0.59	0.86
Parents are informed about the child's illness	0.84	0.69	0.86
Caregivers inform the parents about the treatment consequences	0.96	0.76	0.85
Parents are informed about tests and procedures	0.90	0.75	0.85
Parents are informed about the (adverse) effects of the medication	0.70	0.57	0.87
Parents are informed about the child's future perspectives	0.70	0.63	0.86
<i>Information - Accessibility</i>			
Caregivers daily inform parents about the child's care and treatment	0.59	0.38	0.72
The way to the PICU is clearly signposted	0.61	0.47	0.71
Parents have easy access to information	0.83	0.54	0.71
Parents are informed about sanitary units	0.62	0.58	0.68
Parents are informed about PICU rules	0.55	0.44	0.71
Caregivers inform the parents on the best moment for the parents	0.41	0.36	0.73
Caregivers provide not only oral but also written information	0.48	0.43	0.72
Caregivers' communication with non Dutch speaking parents is through an interpreter or the interpreter-telephone service	0.64	0.40	0.72
<i>Care and Cure</i>			
Caregivers work in team with a strong group cohesion	0.67	0.55	0.92
Parents are adequately prepared for the child's discharge	0.76	0.68	0.91
At discharge, caregivers provide clear information to colleagues.	0.67	0.52	0.92
Pain is prevented and/or treated	0.76	0.54	0.92
Caregivers know their profession	0.66	0.47	0.92
The correct medication is given at the right times	0.55	0.47	0.92
Caregivers are aware of the child's medical history	0.63	0.51	0.92
Caregivers are alert to the child's developmental growth	0.72	0.63	0.91
Caregivers react promptly to changes in the child's condition	0.75	0.57	0.92
Caregivers are considerate to the child's wishes	0.73	0.66	0.91
Caregivers prepare child and parents for a PICU admission	0.73	0.65	0.91
Caregivers jointly pursue one goal: adequate care and treatment of child and parents	0.76	0.62	0.92
Caregivers are alert to the child's comfort	0.79	0.64	0.92
Parents know which physician and nurse are responsible for the care of their child	0.73	0.64	0.91
Caregivers provide emotional support to child and parents	0.87	0.70	0.91
Caregivers adequately meet the needs of the parents	0.85	0.71	0.91
Caregivers display a caring attitude toward child and parents	0.80	0.68	0.91
A caregiver always advises parents during acute admission or an acute situation	0.58	0.51	0.92
An assigned physician and nurse serve as contacts for the parents during prolonged ICU-stay	0.61	0.50	0.92

Organization

The PICU has comfortable furniture	0.75	0.64	0.87
The PICU is imbued with a sense of safety	0.77	0.67	0.87
Moment of discharge is not influenced by bed capacity	0.52	0.42	0.87
The waiting room is fitted out comfortably	0.78	0.69	0.86
The child's bed is clean	0.59	0.45	0.87
The PICU's design is child-friendly	0.72	0.63	0.87
The caregivers are efficiently organized	0.64	0.48	0.87
The PICU is well accessible by phone	0.68	0.54	0.87
Visiting hours are flexible	0.53	0.40	0.88
The child's bed space is amply enough	0.69	0.56	0.87
Catering for parents is well taken care of	0.60	0.57	0.87
A locker on the PICU is available for all parents	0.59	0.54	0.87
The PICU is clean	0.63	0.48	0.87
Noise in the PICU is muffled as far as possible	0.71	0.59	0.87
Written information on unit rules, diseases and procedures is available on the PICU	0.62	0.49	0.87
Rooming-in near the PICU is possible	0.50	0.42	0.88

Parental participation

Caregivers facilitate parents in expressing their feelings	0.78	0.69	0.86
At admission, caregivers ask parents their expectations	0.73	0.68	0.86
Parents receive and are suggested to keep a diary	0.73	0.67	0.86
Caregivers regularly inform after parental experiences during the course of admission	0.86	0.75	0.86
Parents share in decision-making on the care and treatment of their child	0.70	0.63	0.87
Caregivers stimulate parents to be close to their child	0.79	0.72	0.86
Parents trust the caregivers	0.65	0.51	0.88
Home care aspects are discussed before discharge	0.66	0.56	0.87
Caregivers stimulate parents to stay close to their child during procedures and tests	0.58	0.52	0.88

Professional Attitude

Caregivers introduce themselves with name and position	0.67	0.61	0.87
Caregivers show empathy to child and parents	0.70	0.59	0.87
Caregivers adopt principles of hygiene	0.70	0.52	0.88
Caregivers safeguard privacy of child and parents	0.77	0.61	0.87
Caregivers provide equal care; irrespective of race, religion, sex, and education	0.70	0.53	0.88
Parents are offered religious / spiritual support	0.66	0.58	0.87
Caregivers pay attention to siblings	0.70	0.58	0.87
Caregivers respect the child and parents	0.72	0.61	0.87
Caregivers refrain from unnecessary discussions at the child's bedside	0.71	0.59	0.87
Staff always work agreeably together	0.66	0.55	0.88
Child and parents feel welcome at admission	0.76	0.64	0.87
Regardless the work pressure, the caregivers' attention towards child and parents is not allowed to slacken	0.57	0.49	0.88
Caregivers are alert to the cultural background of the child and parents	0.61	0.55	0.88
Caregivers give the highest priority to the child's health	0.53	0.45	0.88

Table 6 Performance of the models

Domains	Items No.	n	χ^2 test of model fit			CFI	TLI	RMSEA	WRMR
			Value	df	P value				
Information Care and Accessibility	16	264	209.70	37	0.01	0.92	0.96	0.13	1.26
Care & Cure	19	263	322.54	45	0.01	0.88	0.96	0.15	1.54
Organization	16	263	475.65	43	0.01	0.70	0.91	0.11	1.65
Parental Participation	9	263	102.78	19	0.01	0.93	0.98	0.13	0.82
Professional Attitude	14	262	290.96	36	0.01	0.84	0.93	0.16	1.45

CFI indicates comparative fit index; TLI, Tucker-Lewis index; RMSEA, root mean square error of approximation; WRMR, weighted root mean square residual

Reliability estimates

The reliability was estimated on both the satisfaction items and the domains (Tables 5 and 7). On domain level, the Cronbach α for 5 domains are greater than 0.80. Only the domain “Information accessibility” appears to be 0.74; this might be qualified as acceptable.

Based on corrected item-total correlations for the domains, values vary from 0.30 to 0.76. As a measure of internal consistency, the values of Cronbach α were greater than 0.80, with the exception of “Information accessibility” (Table 5).

The overall values of Cronbach α for the domains are presented in Table 7, which again indicates a good level. Furthermore, for each domain, the number of items, the mean score, and the standard deviation are presented.

Table 7 Descriptives and reliability estimates for domains

Domains	Items No.	n	mean	SD	α
Information-Care	8	253	72.27	4.88	0.88
Information-Accessibility	8	260	63.21	5.76	0.74
Care and Cure	19	247	168.96	9.57	0.92
Organization	16	248	130.24	9.80	0.88
Parental Participation	9	256	72.23	6.97	0.88
Professional Attitude	14	249	122.87	7.66	0.88

SD, standard deviation; α , Cronbach’s Alpha

DISCUSSION

The objective of this study was to assess the perceptions of Dutch PICU nurses and physicians on satisfaction for the development of a national parent satisfaction instrument. The scores of the satisfaction items in both Delphi rounds were relatively high. To our knowledge, no similar study has been reported, making it difficult to compare the findings. However, from a methodological

perspective, our developmental process of the parent satisfaction instrument has some similarities with the development and validation of the Critical Care Family Needs Inventory (CCFNI). The 45 statements of family needs were developed from a literature review and a survey of 23 graduated nursing students.¹⁵ In a follow-up study, the statements were tested psychometrically, resulting in high Cronbach α coefficient ranging from 0.88 to 0.98.^{16,17} Meanwhile the CCFNI has been used extensively to identify and to evaluate the needs of family members in the adult intensive care unit. Recently, an adapted 30-item CCFNI was used to compare the perceptions of family members and nurses and also to the extent the needs were met.¹⁸ Although the samples were small, 30 nurses and 20 family members, the results revealed that 9 items of the CCFNI did significantly differ between the nurses and family. In a similar study using the 45-item CCFNI with participants divided in 3 groups – family members (n=200), physicians (n=38), and nurses (n=143) – showed differences on 24 individual needs.¹⁹ These studies stress the logical need for parental opinion in the development of the parent satisfaction instrument.

The Delphi technique has been widely used in medical and nursing research. This method is often used to establish priorities on certain topics like research priorities²⁰ or to identify and to reach consensus on care indicators.^{21,22} To identify the needs of critically ill children, a related study using the Delphi method was conducted by Endacott et al.²³ By using 2 case scenarios, 19 PICU nurses were able to identify 21 areas of needs to be considered as standard practice. Not surprisingly, that some areas cover the care of the parents, such as accommodation for parents, refreshment facilities, and aspects of family-centered care. Similar topics were found and incorporated in the satisfaction instrument of our study. The Delphi method is an easy applicable method and is legitimate for use in the development of reliable and valid questionnaires.

A PICU can be defined as a micro-system in a hospital organization interacting with related departments for transitional care of the child and parents.² The aim of a parental satisfaction survey is to assess care aspects from a patient's or parent's perspective and to improve these accordingly based on these results.¹⁰ Therefore, it can be argued whether hospital-wide satisfaction items such as parking facilities or catering need to be included in a unit based satisfaction form. A unit might have little influence on these aspects. It is observed that the satisfaction items in our study concentrate mainly on issues related to the services and care of a PICU. Compared to other ICU satisfaction instruments²⁴⁻²⁶, our study generated substantially more items. The difference appears in specifying the items. For example, items measuring information issues can be questioned on general information level such as "completeness of the information", but a more in-depth question about what information has been given and received satisfactorily might give a deeper understanding of the services provided by health care professionals. The consequence is indeed that a satisfaction instrument might add up to numerous questions. It could be questioned that the sheer size of the questionnaire in our study, 74 items, negatively influences the response rate when using among parents. Jenkinson et al studied this effect using a short and long form of questionnaires: 15 items vs 108 items.²⁷ The 949 (65.7%) returned

questionnaires revealed no differences in response rates and data quality. Thus a shorter questionnaire might not have yielded a higher response rate.

Involving parents or family members in measuring satisfaction of care provides a collaborative environment in the ICU. However, several factors need consideration to gain a sufficient response, such as selecting the appropriate elements to be measured, rating scale, lay-out, and timing of distribution. In an analysis of 210 satisfaction studies, face-to-face distribution was associated with an increased response rate instead of distribution by mail.²⁸ Consequently, a more important issue is the possible differences between the results of face-to-face, for example, in-hospital distribution versus distribution by mail after hospital discharge. To our knowledge, this issue has not been documented yet.

High ratings of satisfaction surveys can become a problem in selecting areas for improvement. Out of the box thinking becomes an art to identify core strategies tailored to improve both care and service provision. This is what resulted from a satisfaction survey performed by Haines et al among 220 parents in a PICU.²⁹ With a response rate of 50%, those parents rated the care as excellent on most of the items. The health care team reviewed these high scores and was able to identify 10 areas for improvement. Considering the high scores in our study, all items are defined as important on the grounds of the chosen cut-off point 8. It can be argued whether they are all valid satisfaction quality performance measures. In this perspective, the advice could be not to limit the items in the development of a satisfaction survey.^{30,31}

Whether the perceptions of satisfaction in health care professionals meet those of the parents can be questioned. It is not inconceivable that parents highly appreciate the satisfaction items ranked lowest by the professionals. Discrepancies in family needs perceptions have been noticed between physicians, nurses, and family members in neonatal and adult intensive care units.^{19,32} However, evaluation of family needs does not allow a direct translation into a certain degree of satisfaction with care. Unmet family needs do not always imply low satisfaction rates, while meeting the family needs does not necessarily promise satisfied parents.³³ Hence, in view of these discrepancies, parents' perceptions on the satisfaction items used in our Delphi questionnaire will be explored in a next phase of our project.

The study has some limitations to consider. The attrition between the 2 rounds was somewhat high. Nonetheless, most Dutch PICU physicians and nurses completed both rounds, warranting a representative opinion of the parental satisfaction items. Regarding the Delphi method, a qualitative round for item identification among all PICU professionals was not carried out because of the assumption that a 3-round Delphi method would increase the workload too much and might, consequently, decrease commitment. Other satisfaction items might have been proposed if the Delphi study had started with an inventory round among all PICU professionals. Therefore, an open-ended question to the questionnaire in round 1 was added, resulting in 14 additional satisfaction items. Moreover, it can be argued that, in the item identification phase, only published satisfaction surveys

related to PICU were taken into account. A wide variety of additional care elements such as parental needs, experiences, stress factors, and family-centered care issues could give valuable input in selecting the satisfaction items.³⁴ Recently, family-centered care has been promoted to reduce health disparities and to enhance the quality performance of the health care system.^{1,4} The construction of a satisfaction or evaluation questionnaire including family-centered care variables is an opportunity that such an instrument will be accepted as a quality performance measure.

The implication of our study results might affect the awareness of pediatric critical care colleagues to assess parental satisfaction. Although it is expected that a number of PICUs already use a satisfaction survey for parents, yet the fact is that to date only two general surveys are published specifically for PICU.^{25,29} McPherson et al reported the development of a reliable 24-item parent satisfaction survey.²⁵ To evaluate the quality of care delivered in a PICU setting our work provides 74 satisfaction items.

In conclusion, most of PICU nurses and physicians from the 8 Dutch PICUs provided their perceptions on satisfaction items. Besides rating the importance of the items, they suggested several additional items in the first round. Agreement among the healthcare professionals was sufficient, and the ranking of the importance of the satisfaction items provided a priority list per domain of the delivered parental care process. The confirmatory factor analysis of the instrument shows that the underlying empirical structure was satisfying, and reliabilities of the domains are considered adequate. This study provides a scientific basis for further development of a reliable and valid parental satisfaction questionnaire.

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